1-Staff-10

Attachment 2
AlectraUtilities_APPL_Ex 4-Apx B-E_v. 3 of 7_20190528

Appendix B

Material Investment Business Cases

Alectra Utilities

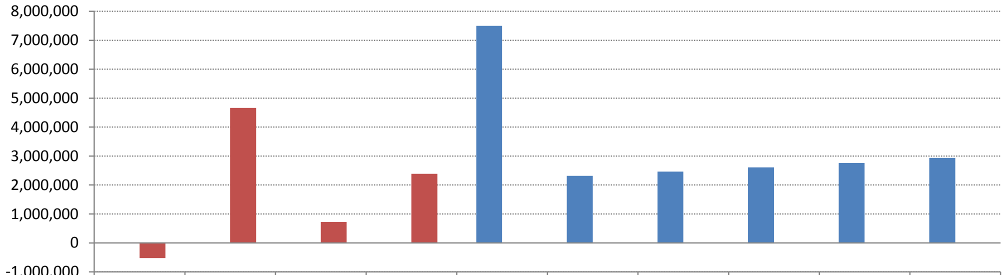
Distribution System Plan (2020-2024)

OEB Multi-Project Report

Project Code	Consolidated Case: 150665, 101761, 150675, 150674, 101763, 151052
Project Name	Customer Initiaited Distribution System Projects
Major Category	System Access
Scenario	2019-2024 - Optimized for DSP Dec 4th

Project Overview

2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various individual locations as required
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital Emerging Customer
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Emerging Customer Work
	Alectra Subcategory	Emerging Customer
4. Evaluation Criteria (OEB)	Project Summary	**Alectra Utilities distributes electricity to residential, commercial, and industrial customers through overhead and underground infrastructure. Customer Initiated Distribution Projects typically consist of system expansions or distribution system relocations based on conflicts with the distribution system. Performing these projects as a result of customer development is a regulatory requirement for Alectra and as such maintains compliance with Section 6.1.1 of the OEB Distribution System Code. Investments in emerging customer-initiated distribution projects will continue to support the requirements of Alectra Utilities’ distributor’s licence.**
	Main Driver - System Access	Service Requests
	Priority and Reasons for Priority	These are non-controllable projects and are driven by Customer demand.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	The relocation of the EDS may be a result of the need to maintain safety clearances to PowerStream's EDS.
	Cyber-Security, Privacy	This field is not applicable.
	Coordination, Interoperability	This field is not applicable.
	Economic Development	This field is not applicable.
	Environmental Benefits	This field is not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	These projects are initiated by the Customer and are Non-Controllable.
	Alternative #1	No alternatives - These are non-controllable projects.
	Alternative #2	This field is not applicable.
	Justification for Recommended Alternative	These projects are requested by a customer and are Non-Controllable. It is expected with the Places to Grow Act, Zero set backs or additional transprotation projects, Alectra Utilities will encounter more conflicts and requests for u/g and/or o/h relocation for Customers' development project.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	These projects are non-controllable and are driven by the Customer's schedule.
	Comparative Information on Equivalent Historical Projects (if any)	The level of activity/demand in Customer Relocation Requests can fluctuate from year-to-year.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Factors Relating to Customer Preferences or Input	These projects are typically required due to conflicts that the development has such as location of entraces/driveways, clearances to overhead lines, ESA related issues etc.
	Factors Affecting the Final Cost of the Project	The final costs of the project are dependent on the available space to relocate the EDS. Sometimes, undergrounding of a section of overhead line might be required. This would drive up the cost of the relocation work.
	How Controlled Costs have been Minimized	Construction services are provided by Alectra Utilities and its contractorsm which were selected through a competitive RFP process to provide best costs and cost certainty.
	Identify if Other Planning Objectives are Met by the Project, if so, which ones	This field is not applicable.
	Results of Final Economic Evaluation, if applicable	This field is not applicable.
	System Impacts (Nature, Magnitude and Costs)	This field is not applicable.

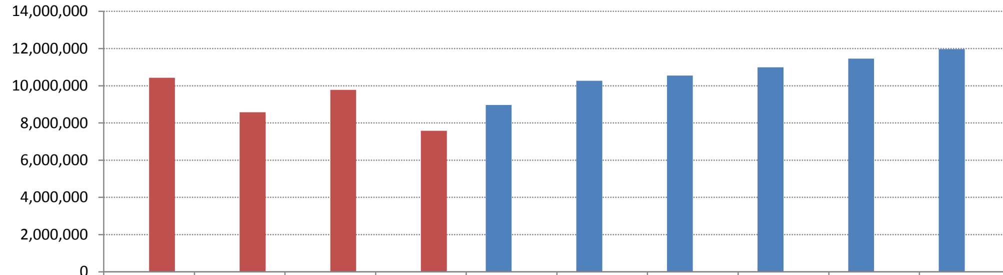


	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $20,582,455					$7,496,804	$2,319,440	$2,459,421	$2,608,002	$2,765,700	$2,933,088
Actuals: $7,247,211	-$525,081	$4,665,136	$724,271	$2,382,884	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	Consolidated Case: 150449, 150384, 150455, 150386, 101791, 151049, 101919	
Project Name	**Commercial and Institutional (ICI) Projects**	
Major Category	System Access	
Scenario	2019-2024 - Optimized for DSP Dec 4th	
Project Overview		
2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various individual locations as required
	Units	**2019:** 471; **2020:** 511; **2021**: 538; **2022:** 552; **2023:** 567; **2024:** 582
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	New Connections
	Alectra Subcategory	ICI & Layouts
4. Evaluation Criteria (OEB)	**Project Summary**	**Alectra Utilities distributes electricity to residential, commercial, and industrial customers through overhead and underground infrastructure. New insustrial/commercial connections are part of the Customer Connections category that provide customers with access to electricity. These investments are essential to permit connection to the distribution system based on customers' requests. Investments in new ICI projects will continue to support both the development community and customers as well as the requirements of Alectra Utilities' distributors licence.**
	Priority and Reasons for Priority	These investments support connection to the existing distribution system from the development community or customers . These projects are externally driven and Alectra Utilities are obligated to provide a quotation for connection in accordance with the Distribution System Code. Non-compliance would be in violation of Alectra Utilities' distribution license.
	Customer Attachment / Load (KVA)	Connections: 2019: 471; 2020: 511; 2021: 538; 2022: 552; 2023: 567; 2024: 582 Average Net Cost per Connection: $19,100 Approximately 1,100kVA per connection
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Privacy are not applicable to this project
	Coordination, Interoperability	Not Applicable
	Economic Development	This investment supports the economic growth and jobs that ICI projects create.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Continuing to service customers in accordance with the Distribution System Code and Alectra Utilities distribution license.
	Alternative #1	Do not continue to service customers in accordance with the Distribution System Code and Alectra Utilities distribution license and risk repercussions.
	Alternative #2	No second alternative
	Justification for Recommended Alternative	Meet customers expectations and to maintain compliance with the Distribution System Code and Alectra Utilities' distribution license. Alectra will continue to increase its customer base.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Historical and Future Commentary: Based on the various connection policies of the legacy utilities that formed Alectra Utilities (ie running economic models for connections vs 100% chargeable), the capital contributions varied. This was due to the 5 year connection horizon expiring on many ICI projects where load/connections did not materialize. This was the case in Brampton and Horizon where contributions were up by over 1.2M in 2018 vs 2017. In addition, PowerStream was over contributed due to timing of cheques being received and work being performed by approximately $0.8M. The historical numbers are forecasted to form the base number of connections and net spend with increases year over year due to the expected population growth and employment growth in Alectra Utilities' service territory, supported by the Metrolinx projects.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral of these investments.



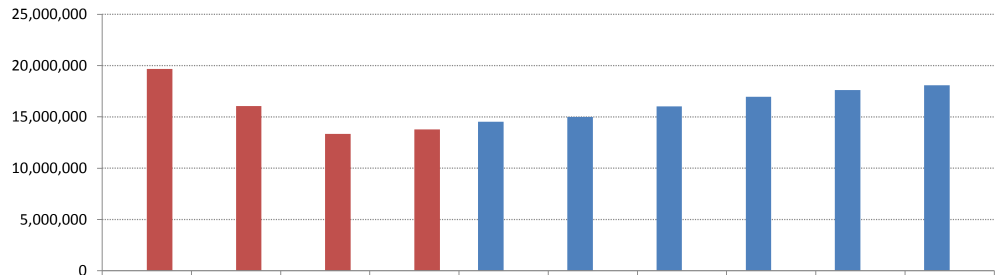
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $64,193,080					$8,963,496	$10,267,555	$10,545,464	$10,994,477	$11,458,703	$11,963,386
Actuals: $36,373,206	$10,431,457	$8,575,433	$9,783,438	$7,582,878	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	Consolidated Case: 101887, 101892, 150630, 101896, 150652, 150669, 151047, 150588, 101685, 103381, 101696, 151174, 151169, 151180	
Project Name	**Subdivision Developments**	
Major Category	System Access	
Scenario	2019-2024 - Optimized for DSP Dec 4th	
Project Overview		
2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various individual locations as required
	Units	**2020:** 8,775units; **2021**: 9,400units; **2022**: 9,350 units; **2023**: 8,575units; **2024**: 8,400units
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	New Connections
	Alectra Subcategory	Subdivisions
4. Evaluation Criteria (OEB)	**Project Summary**	**Alectra Utilities distributes electricity to residential, commercial, and industrial customers through overhead and underground infrastructure. New subdivisions are part of the Customer Connections category that provide customers with access to electricity. These investments are essential to provide connection to the distribution system based on new subdivisions requested by customers/developers. Investments in new residential subdivision will continue to support both the development community and customers as well as the requirements of Alectra Utilities' distributors licence.**
	Priority and Reasons for Priority	These investments support connection to the existing distribution system from the development community or customers . These projects are externally driven and Alectra Utilities are obligated to provide a quotation for connection in accordance with the Distribution System Code. Non-compliance would be in violation of Alectra Utilities' distribution license.
	Customer Attachment / Load (KVA)	The connected and demand kVA load is a forecast based on the following criteria: Forecasted number of connections ; Transformer size = 75 kVA ; Number of services attached to a 75 kVA transformer = 12 ;Transformer Load Factor = 48% ____ Calculations: **2019:** 8,250 connections / 12 services = 687 transformers 687 transformers x 75 kVA transformer size = 51,563 kVA 50,625 kVA * 48% LF = 24,750 kVA Connected Load = 51,563 kVA Demand Load = 24,750 kVA **2020:** 8,775 connections =731 transformers Connected Load = 54,843kva Demand Load = 26,325kva **2021:** 9,400 connections =783 transformers Connected Load = 58,750kva Demand Load=28,200kva **2022:** 9,350connections = 779 transformers Connected Load = 58,437kva Demand Load=28,050kva **2023:** 8,575 connections = 714 transformers Connected Load =5 3,594kva Demand Load= 25,725kva **2024:** 8,400 connections = 700 transformers
	Safety	This expenditure deals with new expansion and new equipment. New up-to-date equipment is to be installed, providing latest safety controls for the public and workers. Alectra Utilities installs a looped primary supply to minimize customer outages while maintaining system reliability.
	Cyber-Security, Privacy	Cyber-Security and Privacy are not applicable to this project
	Coordination, Interoperability	This expenditures' coordination is with the City that have approved subdivision applications within our service territory, regional planning and /or links with 3rd parties .
	Economic Development	This investment supports the economic growth and jobs that subdivision projects create.
	Environmental Benefits	Newly installed transformers within subdivision developments utilize biodegradable oil for cooling.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Continuing to service customers in accordance with the Distribution System Code and Alectra Utilities distribution license.
	Alternative #1	Do not continue to service customers in accordance with the Distribution System Code and Alectra Utilities distribution license and risk repercussions.
	Alternative #2	No second alternative
	Justification for Recommended Alternative	Meet customers expectations and to maintain compliance with the Distribution System Code and Alectra Utilities' distribution license. Alectra will continue to increase its customer base.

6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk to completion is usually the developer filing for bankruptcy which rarely occurs. Typically, when this happens another developer takes over the project to completion.
	Comparative Information on Equivalent Historical Projects (if any)	The historical unit amounts: 2015: 11,098 units 2016: 11,343 units 2017: 11,247 units 2018: 7,901 units
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral of these investments.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $98,226,618					$14,520,269	$14,983,195	$16,033,535	$16,974,601	$17,616,890	$18,098,127
Actuals: $62,869,918	$19,684,814	$16,049,759	$13,348,708	$13,786,638	$0	$0	$0	$0	$0	$0

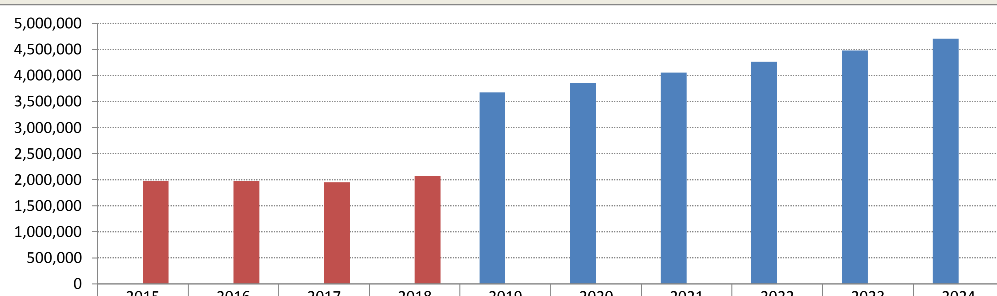
Currency scale is in literal

OEB Multi-Project Report

Project Code	Consolidated Case: 101871, 101870, 101869, 150457, 150389, 101868, 101873, 150388, 150456, 101872
Project Name	**Layout Projects**
Major Category	System Access
Scenario	2019-2024 - Optimized for DSP Dec 4th

Project Overview

2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various indivdual locations as required
	Units	**2019:** 7,447; **2020:** 7,493; **2021:** 7,520; **2022:** 7,631; **2023:** 7,745; **2024:** 7,861
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	New Connections
	Alectra Subcategory	ICI & Layouts
4. Evaluation Criteria (OEB)	**Project Summary**	**Alectra Utilities distributes electricity to residential, commercial, and industrial customers through overhead and underground infrastructure.Layouts are part of the Customer Connections category that provide customers with access to electricity. These investments are essential to provide connection to the distribution system based on customers requests for new and upgraded electrical service to single residential customers (non-subdivision type), streetlight connections, park lighting pedestals, traffic signal pedestals, billboards, etc. Investments in layout projects will continue to support customers as well as the requirements of Alectra Utilities' distributors licence.**
	Priority and Reasons for Priority	These investments support connection to the existing distribution system from customers . These projects are externally driven and Alectra Utilities are obligated to provide a quotation for connection in accordance with the Distribution System Code. Non-compliance would be in violation of Alectra Utilities' distribution license.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Privacy are not applicable to this project
	Coordination, Interoperability	Not Applicable
	Economic Development	This investment supports the economic growth and jobs that layout projects create.
	Environmental Benefits	By supporting and servicing layout projects, Alectra Utilities is facilitating economic growth across all municipalites.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Continuing to service customers in accordance with the Distribution System Code and Alectra Utilities distribution license.
	Alternative #1	Do not continue to service customers in accordance with the Distribution System Code and Alectra Utilities distribution license and risk repercussions.
	Alternative #2	No second alternative
	Justification for Recommended Alternative	Meet customers expectations and to maintain compliance with the Distribution System Code and Alectra Utilities' distribution license. Alectra will continue to increase its customer base.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Historical and Future Commentary: The historical numbers are forecasted to form the base number of connections and net spend with increases year over year due to the expected population growth and employment growth in Alectra Utilities' service territory, supported by the Metrolinx projects.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $25,043,869					$3,673,333	$3,859,941	$4,058,220	$4,262,078	$4,480,506	$4,709,791
Actuals: $7,969,836	$1,978,238	$1,971,911	$1,951,838	$2,067,849	$0	$0	$0	$0	$0	$0

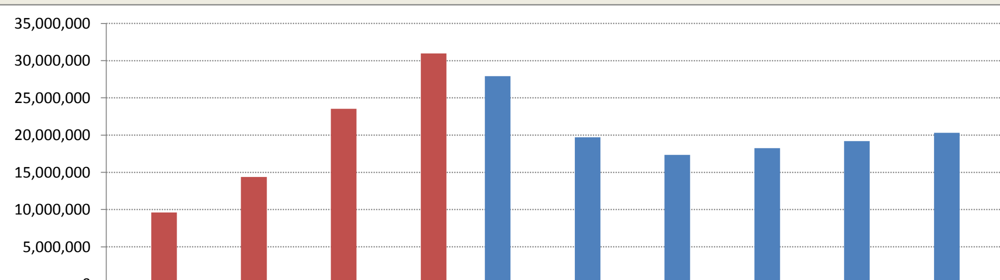
Currency scale is in literal

OEB Multi-Project Report

Project Code	Consolidated Case: 150645, 150673, 101762, 150644, 101764, 150653, 151051
Project Name	**Road Authority Projects**
Major Category	System Access
Scenario	2019-2024 - Optimized for DSP Dec 4th

Project Overview

2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various individual locations as required
	Units	not applicable
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital Road Authority
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Road Authority
	Alectra Subcategory	Road Authority
4. Evaluation Criteria (OEB)	**Project Summary**	**Alectra Utilities distributes electricity to residential, commercial, and industrial customers through overhead and underground infrastructure. To accomplish this, Alectra installs significant infrastructure along road allowances that are under the jurisdictions (owned and managed) of various authorities. In accordance with the Public Service Works on Highways Act (PSWHA), Alectra Utilities is permitted to occupy public boulevards at no cost to the utility, however, in return, Alectra Utilities is required to remove, relocate or reconstruct their facilities in order to accommodate the specific requirements of the road authorities during road related projects. Additionally, water and sewer main projects, either municipally or regionally driven, can also trigger relocation requests to Alectra Utilities. Investments in road authority projects will permit Alectra to remove, relocate or reconstruct its distribution to support the road authority initiatives and the mandated requirements of Alectra Utilities' distributors licence**
	Priority and Reasons for Priority	These projects are not controled by Alectra Utliities and are a requirement of the Public Service Works on Highways Act R.S.O. 1990, CHAPTER P.49
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	The relocation of the distribution system needs to be done in advance of the road work. Alectra Crews cannot safely work in the same time and space as the Road Crews.
	Cyber-Security, Privacy	Cyber-Security and Privacy are not applicable to this project
	Coordination, Interoperability	Not Applicable.
	Economic Development	By supporting Road Authority projects, Alectra Utilities is facilitating economic growth across all municipalites.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Complete the requests and comply with the Public Service Works on Highways Act R.S.O. 1990, Chapter. 49 and the condions of the Distributor's licences.
	Alternative #1	Do not complete the requests and comply with the Public Service Works on Highways Act R.S.O. 1990, Chapter. 49 and not be in compliance with regulatory instruments. This is not a viable alternative.
	Alternative #2	No second alternative
	Justification for Recommended Alternative	Regional and municipal Road Authorities require Alectra Utilities to relocate the distribution system to accomodate road works projects. These projects are not controlled by Alectra Utilities and the scope is defined and determined by the limits and amount of road work / road widening being done by the Road Authority. Investments in road authority projects will continue to support the requirements of Alectra Utilities' distributors licence.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The scope, timing and schedule of the road projects are determined by the Municipalities. Projects may be advanced or deferred within a calendar year based on various constraints such as budget, or based on political pressures, economic development, traffic flow, etc.
	Comparative Information on Equivalent Historical Projects (if any)	The average of the past 5 years, excluding YRRT projects, was $10.8MM.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $122,680,162					$27,927,631	$19,694,903	$17,324,656	$18,232,318	$19,172,132	$20,328,522
Actuals: $78,460,024	$9,584,937	$14,363,669	$23,544,802	$30,966,616	$0	$0	$0	$0	$0	$0

Currency scale is in literal

alectra utilities

OEB Multi-Project Report

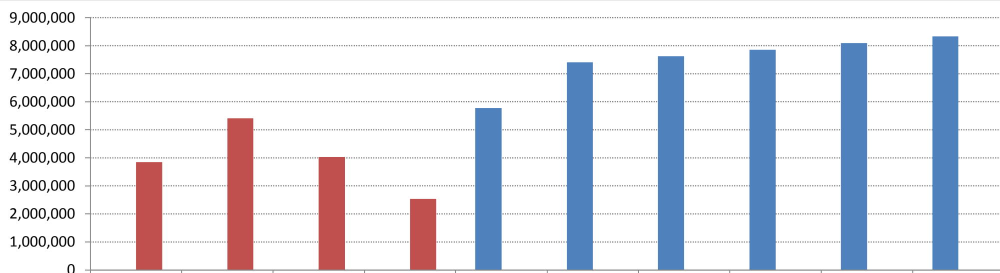
Project Code	Consolidated Case: 151091, 100859, 150282, 151083, 151087, 102075
Project Name	**Switchgear Renewal**
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP Dec 4th

Project Overview

2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various individual locations as required
	Units	400 switchgear units from 2020 to 2024
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Replacement
	Alectra Subcategory	Switchgear Replacement
4. Evaluation Criteria (OEB)	**Project Summary**	**Alectra Utilities is experiencing an increasing rate of decline in reliability on its distribution system. Defective equipment accounts for 42% of controllable outages in the distribution system, and 9% of those outages are caused by failing switchgear. Alectra Utilities has identified a need to increase the investment in replacing 25kV air-insulated "live front" switchgear and oil-insulated switchgear. Alectra Utilities plans to replace all of the poor and very poor air-insulated switchgear and the oil-insulated units system that are in very poor condition. Investments in switchgear replacements will mitigate safety and reliability risks associated with failure of these assets.**
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Underground distribution systems are based on large "trunk" feeder cables that are connected to smaller power cables that serve customers. Due to their size, the larger feeder cables cannot be directly connected to the transformers used in the distribution system. The system relies on pad-mounted switchgear to connect local distribution circuits to the main feeder cable systems, and to interconnect multiple trunk feeder circuits. A single switchgear can impact as a many as 5,000 customers. Accordingly, pad-mounted switchgear are a critical component of the underground distribution system. Alectra Utilities has identified a need to increase its investment in replacing two groups of legacy switchgear that carry significant reliability and safety risks due to: condition, past design and installation practices. These two groups are (i) 25 kV air-insulated "live front" switchgear and (ii) oil-insulated switchgear. Alectra Utilities plans to replace all of the Poor and Very Poor air-insulated switchgear on the 27.6kV system and the Very Poor condition oil-insulated units.This renewal investment is supported by customers. The reported useful life of pad-mounted switchgear is 20-45 years with a typical useful life of 30 years when operating within a normal continuous rated operating voltage of 25kV, however, when installed on the 27.6 kV distribution system (as they are in parts of Alectra Utilitiies' underground distribution system), these units have failed at service ages as low as 11 years. The low voltage rating of these switchgear contributes to their reduced life and reduces their ability to perform under abnormal conditions, leading to premature failures.Environmental factors in southern Ontario have also led to earlier failure of these switchgear. While these units function relatively well when their environment remains dry, southern Ontario's environment presents challenges that cause units to fail. High humidity, condensation from changing temperatures and water in the below grade foundations when mixed with dirt and road dust contribute to the formation of conductive paths on the insulating components. Over time this ultimately reduces the insulating properties and leads to flashover and failure of the switchgear. These switchgear use a "live front" design, in which energized components are exposed and accessible when the access doors are opened for inspection, maintenance or operation. This design means that crews must take additional safety precautions when working with this equipment. In addition, the increasing failure rate of these switchgear means that workers may be at higher risk of being exposed to an arc flash. The planned replacement units would remove this risk. Alectra Utilities plans to replace its 25 kV air-insulated switchgear with solid di-electric switchgear rated at 35 kV. This will reduce incidences of failures due to flashover, improve reliability and increase the useful life to 50 years with reduced maintenance and inventory cost. Oil-insulated switchgear are filled with oil, which operates as the switchgear's insulating medium. A typical oil-filled switchgear unit contains over 1,500 liters of oil. When these units fail, the oil within them can ignite and cause a fire, creating a public and worker safety risk. Many of these units are installed in public places and adjacent to customers' homes. Although the switchgear's oil tanks are sealed, any contamination of the oil (which occurs over time) will lead to failure. In addition to the public and worker safety risks posed by potential oil ignition and fire, oil leaks and environmental cleanup may be
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Switchgear failures pose safety risk to staff and the public. The switchgear may fail when staff are working on the unit or when the public is in close proximity to the unit. When the switchgear unit fails, there may be flashover or rupture of the enclosure, which may result in injury.
	Cyber-Security, Privacy	Cyber-Security and Privacy are not applicable to this project
	Coordination, Interoperability	For coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices do not unwilling create barriers to economic development within the affected communities.
	Environmental Benefits	In the case of oil-filled switchgear units, switchgear failures may cause rupture, resulting in oil being spilled onto the ground. Because the oil-filled units are replaced with non-oil units, the environmental risk is eliminated.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Pace the replacement at the **MODERATE** pace: The elimination of all Very Poor and Poor switchgear over a 7-year time frame (80/year) • Cost of program = $39.3M / 5 years = $7.86MM/year. This is the recommended pace.

	Alternative #1	Pace the replacement at the **ACCELERATED** pace: The elimination of all Very Poor and Poor switchgear over a 5-year time frame (117/year). •Cost of program = $53.25M /5 years = $10.65MM per year
	Alternative #2	Pace the replacement at the **REDUCED** pace: The elimination of all Very Poor and Poor switchgear over a 10-year time frame (59/year) •Cost of program = $26.85M / 5years = $5.37MM/year.
	Justification for Recommended Alternative	The failure of legacy switchgear is increasingly contributing to the duration of outages experienced by customers served by Alectra Utilities' underground distribution system. The hours of customer interruption resulting from failure of these assets has increased by 45% since 2014, and primarily driven by the deteriorating condition of Alectra' Utilities' switchgear assets. If the switchgear identified in the proposed investments are not addressed during the term of the DSP, Alectra Utilities expects that the reliability of the underground system will continue to decline. If the proposed investments are delayed, Alectra Utilities expects that a significant backlog of switchgear replacements develop, which will require significant investment and resources to correct (if possible). The Health Index (HI) values produced by Alectra's 2018 Asset Condition Assessment (ACA) pinpoint specific forms of degradation in distribution assets. 8.4% of Alectra Utilities' switchgear population is in Very Poor condition, 8.9% in Poor condition and 5% in Fair condition. The volume of work required by the Accelerated pace would not align with Alectra Utilities' available resources and system constraints. At a more practical level, by intervening on a large volume of assets at one time, there is the risk of creating future "large-volume" areas that would need to be mitigated in the future. For these reasons, Alternative #1 would not be practical to execute. Replacement at the Slow pace will create a large backlog in the future, which would have a direct impact on failures and ultimately customer reliability. This outcome would be inconsistent with customers' preference that Alectra maintain reliability. Therefore Alternative #2 is not recommended. Under the status quo or Moderate pace, reliability due to switchgear failures would worsen until 2023 at which time the replacement rate would exceed the failure rate. Over the 20-year time frame, Alectra Utilities forecasts that the average number of projected failures would be maintained at 57 failures. Alectra Utilities believes that keeping pace with projected failure rates strikes a balance between risk and cost. While the cost of the Moderate pace option is greater than historical spend, it is consistent with customers' preference for maintaining reliability in line with historical levels. Therefore, status quo is the recommended alternative.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Alectra Utilities considers the following as general risks to project schedule and cost: - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	This project is the continuation of Alectra's long-term annual switchgear replacement initiative. The average annual investments for 2015-2018 were $4MM per year. Alectra Utilities has set the recommended average investment level at $7.3MM for 2020-2024. This increase is a result of including automation at the time of renewal, which reflects customer needs and preferences as well as consistent replacement methodology across Alectra.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Switchgear units are used in distribution cable feeder loops supplying residential subdivisions and commercial/industrial customers, to isolate/control other equipment, and to reconfigure the distribution cable feeder loops for maintenance, restoration or other operating requirements. Each year, Alectra East inspects pad-mount switchgear according to the inspection requirements established by the OEB Distribution System Code and ESA Regulation 22/04. Replacement "candidates" are selected based on a combination of inspection results (physical condition) and a calculated asset health index. The following factors are used to calculate the switchgear asset health index: • Equipment age • Structural integrity • Presence of "hotspots" • Condition of mechanical mechanism • Condition of bus insulation Switchgear units that have been classified to have a poor or very poor health index condition are proposed to be replaced.The exact locations, schedule, and logistics will be jointly determined by Lines, System Control, Capital Design, and Maintenance & Reliability to achieve co-ordination of work and to minimize customer disruption. There were **285** switchgear failures between 2014 to 2018 (an average of **57** switchgear failures per year). If no proactive replacements are done, as the switchgear population ages, there will be more frequent failures to to the level that is not manageable by Alectra Utilities and not tolerable by the customers. On a prioritized basis, each year Alectra Utilities will inspect, review, and select the switchgear units that are in poorest health for replacement.
	Condition of Asset vs. Typical Life Cycle and Performance Record	According to the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board", Typical Useful Life of switchgear is 30 years. Many units of Alectra East's existing switchgear population are older than 30 years and are expected to fail more if not replaced. On average, the annual number of failures is about 22 failures per year. The majority of the switchgear will be replaced with industry standard Solid Dielectric switchgear units. The inherent design of Solid Dielectric switchgear enables these units to be relatively free from contamination and moisture issues, as compared to the switchgear they are replacing.

Number of Customers in Each Customer Class Potentially Affected by Asset Failure	5481
Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1 switchgear unit: • Frequency of Failure is: 0.20 failures per year (1 in 5 years - applicable for the switchgear units selected for replacement) For **400** switchgear units: • Frequency of Failure is: 0.20 failures x 400 = 80 failures According to Control Room data, there were **285** switchgear failures from 2014 to 2018. Average for the last 5 years (2014-2018) is used for calculations. Annually on an average there were **57** Switchgear failures affecting 51,104 Customers and 41,099 CMI. • Average number of customers affected by 1 failure is:51,104/57 = 896 customers • Projected number of customers affected by 80 failures is:896 x 80 = 71,680 customers • Average CMI for 1 failure is: 41,099/57 = 43,261 CMI • Projected CMI for 80 failures is: 43,261 x 80 = 3,460,880 CMI
Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Switchgear failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Customer engagement includes preferences for Alectra Utilities to invest in projects that maintain or improve reliability.
Value of Customer Impact	High
Factors Affecting Project Timing, if any	This is an annual investmet initiative to manage end-of-life assets. There is nothing specific to note about the project timing.
Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
Reliability and Safety Factors	This investment initiative will help avoid a total of 80 switchgear failures and 3,460,880 potential CMI. The project will also help mitigate safety risks associated with switchgear failures.
Analysis for "Like for Like" Renewal Project	Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral of these investments.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $45,086,309					$5,775,295	$7,403,668	$7,625,282	$7,854,410	$8,091,328	$8,336,326
Actuals: $15,828,537	$3,847,261	$5,415,508	$4,031,622	$2,534,146	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	Consolidated Case: 101027, 151010, 150337, 151044, 151109
Project Name	**Switch Renewal**
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP Dec 4th

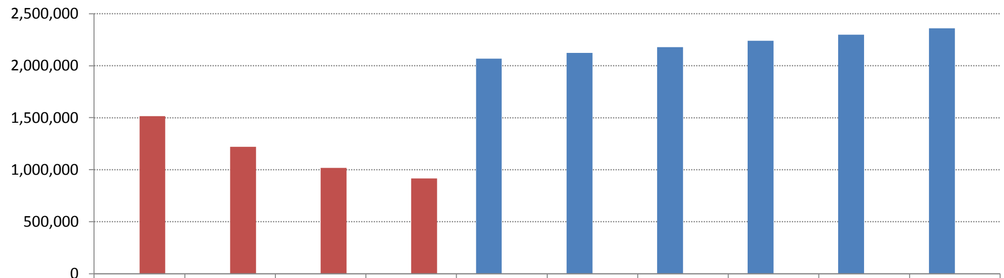
Project Overview

2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various individual locations as required
	Units	175 switches from 2020 to 2024
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Replacement
	Alectra Subcategory	Switch Replacement
4. Evaluation Criteria (OEB)	**Project Summary**	**Alectra Utilities is experiencing an increasing rate of decline in reliability on its distribution system. Defective equipment accounts for 42% of controllable outages in the distribution system, and 6% of those outages are caused by failing switches. Alectra plans to replace all of the poor and very poor condition switches in the distribution system as well as replacing switches that are functionally obsolete, no longer operable or incapable of interrupting load current. Investments in switch replacements will mitigate safety and reliability risks associated with failure of these assets.**
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Overhead switches are a distributor's main method of switching loads for system operation and to restore customers after an outage. Switches are the basic tool by which Alectra Utilities can sectionalize and isolate parts of the distribution system when needed. Replacing deteriorated switches and switches that are not fit for operation, either because they are functionally obsolete, no longer operable, or otherwise incapable of interrupting the load allow Alectra Utilities to expeditiously restore service, transfer supply and enable isolation from the Control Room. This will reduce the need to crews to operate switches and permit crews to focus on fault identification and repair. Customers will experience improved reliability as a result of the sustainment of deteriorated and functionally obsolete assets. Alectra Utilities will avoid the safety risks of manually operated switch failure through the installation of remotely controlled switches. The safety risks associated with legacy air-brake switches, which cannot be operated under load (i.e. non-load-break switches) will also be eliminated as these switches are removed from the system. This renewal investment is supported by customers.
	Customer Attachment / Load (KVA)	Not applicable as the uits are location specific.
	Safety	Devices that are inoperable or require extensive maintenance would be replaced and would not pose a hazard to staff trying to operate the system. Automated switches reduce the risk of personnel injury by having remote operation capabilities which eliminate the necessity of having a lines person manually operate the switch at its location. The removal of Air Brake switches also allows for field staff to perform less switching operations to operate the Air Brake as it cannot operate under load. Mini-Rupter switch units are an obsolete design. As a result, operations staff cannot perform switching safely inside of the vaults. Instead, they must perform switching at an upstream or downstream location. This creates outages to other customers (in addition to the local customer supplied by the Mini-Rupter switch).
	Cyber-Security, Privacy	Automated Switches and Reclosers communicate back to the control room via private/secure network. As part of its continuous improvement model, Alectra Utilities performs periodic security assessments to identify opportunities for enhanced system hardening.
	Coordination, Interoperability	All automated units are upgraded to latest standards allow units to participate in advanced sectionalizing schemes at future dates if required. Some manual units will be replaced with automated units on a case by case basis.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Pace the replacement at the **MODERATE** pace: The elimination of all Very Poor and Poor switches over a 7.5-year time frame (35/year) • Cost of program = $2.24MM /year This is the recommended alternative.
	Alternative #1	Pace the replacement at the **ACCELERATED** pace: The elimination of all Very Poor and Poor switches over a 5-year time frame (57/year). • Cost of program = $3.09MM /years While this approach mitigates switch failure risk, the high volume of work required by this plan would not align to Alectra's available resources and system constraints. For these reasons, Alternative #1 remains largely impractical to execute.

	Alternative #2	Pace the replacement at the **REDUCED** pace: The elimination of all Very Poor and Poor switches over a 10-year time frame (35/year) • Cost of program = $1.30MM /year Alternative # 2 mitigates some of the public safety risks and reliability impacts within the current planning period; however, it leaves a significant backlog of deteriorated assets that are critical to the operation of the overhead system at the start of the next five-year period. This option is viable from a resource constraint point of view, mitigates some risks and lowers the spending in the current planning period. However, it is a prelude to higher spending and a more aggressive system renewal plan beyond 2024 while incurring reliability risks within the current planning period
	Justification for Recommended Alternative	Switches are a distributor's main method of switching loads for system operation and to restore customers after an outage. Switches are the basic tool by which Alectra Utilities can sectionalize and isolate parts of the distribution system when needed. Alectra Utilities plans to replace deteriorated switches (those that are in poor or very poor condition, inoperable or obsloete) on its distribution system at a moderate pace over the term of the DSP. strikes the best balance between mitigating safety risks, reliability impacts, resource constraints, and annual cost.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Alectra Utilities considers the following as general risks to project schedule and cost: - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	This project is the continuation of Alectra's long-term switch replacement initiative. The average annual investments for 2015-2018 were $1.2MM per year. Alectra Utilities has set the recommended average investment level at $2.1MM for 2020-2024. This increase is a result of including automation at the time of renewal, which reflects customer needs and preferences.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Distribution Switches are critical devices for the operation of the distribution system and are installed at key operating points (e.g. feeder tie points, feeder sectionalizing). Unplanned failures of these devices would impact Alectra Utilities' ability to restore power, resulting in extended outages. Automated Switches provide rapid transfer of loads in emergencies, reduce restoration time which improves reliability, provide flexibility to reconfigure the system to avoid feeder and station over loads during summer peak, provide real time system readings, reduce the risk of personnel injury and are the platform for the complete distribution automation system. During deterioration, these abilities systematically become more unreliable and are often not discovered until they fail when called on to operate.
	Condition of Asset vs. Typical Life Cycle and Performance Record	The asset condition of load break switches relative to their typical lifecycle varies from switch to switch depending upon the operational stresses experienced by the switch. Distribution Switch assets are tracked and prioritized for replacement based on their health index. Assets are replaced at their end-of-life.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1300
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Cost to Customers: - Customer Interruption Cost (Frequency) = Not Applicable - Customer Interruption Cost (Duration) = 6000 kW x 0.5 hrs x $20/kWh x 2 failures/year= $40,000 Total Cost to Customers (Interruption) = $0 + $40,000 = $40,000 According to the following assumptions: - Frequency of interruption: 87 failures/year - Duration of interruption: 45 minutes (0.75 hours). - Number of customers affected in an outage: 446 customers - Customer load affected in an outage: 6000 kW - Customer Interruption Cost (Frequency): $20.00/kW (mixed Residential , Commercial & Industrial) - Customer Interruption Cost (Duration): $20.00/kWh (mixed Residential, Commercial & Industrial)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Switch failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Customer engagement includes preferences for Alectra Utilities to invest in projects that maintain or improve reliability.
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	This is an annual investmet initiative to manage end-of-life assets. There is nothing specific to note about the project timing.
	Consequences for O&M System Costs Including Implications of Not Implementing	These projects do not materially impact system O&M costs.
	Reliability and Safety Factors	Reliability will be adversely affected when an Distribution Switch fails to operate when required as part of switching to restore service. Automated Switches provide rapid transfer of loads in emergencies, reduce restoration time which improves reliability, provide flexibility to reconfigure the system to avoid feeder and station over loads during summer peak, provide real time system readings, reduce the risk of personnel injury and are the platform for the complete distribution automation system.

Analysis for "Like for Like" Renewal Project

Distribution Switches are replaced with an automated switch where an operational benefit can be realized. Otherwise they are replaced on a like-for-like basis. Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral of these investments.



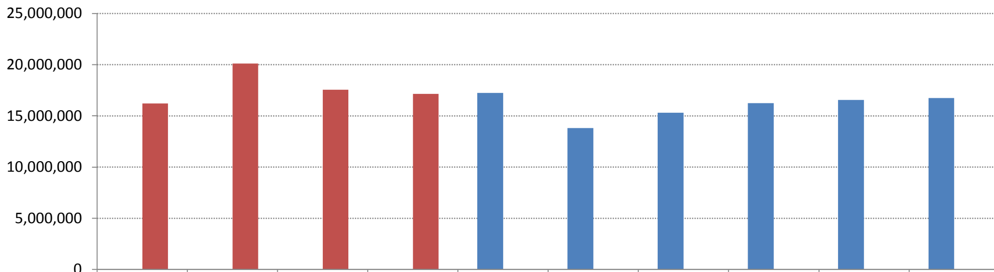
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $13,266,495					$2,066,408	$2,123,027	$2,179,719	$2,238,955	$2,298,603	$2,359,783
Actuals: $4,673,594	$1,515,418	$1,221,831	$1,019,214	$917,130	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	Consolidated Case: 150284, 100867, 151063, 150335, 151089, 101832, 151183, 151161	
Project Name	**Pole Renewal**	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP Dec 4th	
Project Overview		
2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various individual locations as required
	Units	4,480 poles over the 2020-2024 time period.
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Replacement
	Alectra Subcategory	Pole Remediation
4. Evaluation Criteria (OEB)	**Project Summary**	**Alectra Utilities relies on poles to support distribution system attachments and maintain safety to the public as poles provide physical separation between ground level and energized conductors. Alectra Utilities must maintain these assets in a safe and serviceable condition while meeting prescribed codes for safety and reliability. Pole residual strength testing is performed along with field inspections for wood poles. The poles that are in poor or very condition need to be replaced before they fail. Investments in pole replacements will mitigate safety and reliability risks associated with failure of these assets and maintian regulatory compliance with respect to minimum strength values.**
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The priority of this project is high. The planned pole investments are needed to address the volume of deteriorated poles on Alectra's distribution system, and compliance with external codes/standards. Alectra performs pole residual strength testing on wood poles to assess remaining wood fibre strength, which is a key indicator of condition. The pole residual testing is performed in addition to the field inspection for wood poles. Concrete poles are field inspected for deterioration; for example, signs of cracking, concrete spalling (breaking in fragments), and exposed rebar. Alectra Utilities complies with industry standards from Canadian Standards Association (CSA) in its overhead construction, namely CSA Standard C22.3 No. 1-10 [3]. Clause 8.3.1.3 of the Standard states: *"When the strength of a wood pole structure has deteriorated to 60% of the required design capacity, the structure shall be reinforced or replaced".* Alectra also is governed by the Electrical Safety Authority (ESA) standards, guidance and reporting requirements as part of its compliance. Without the planned pole sustainment investments, Alectra will not adhere to the adopted CSA standards and risks the compliance with ESA and other regulatory entities. Additionally, safety and realiability concerns will be mitigated. This renewal investment is supported by customers.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Pole failures pose safety risk to staff and the public. The pole may fail when staff is working on the pole or when the public is in close proximity of the unit. When the pole falls, there may be other equipment (e.g. overhead transformer or overhead switch) that will also fall.
	Cyber-Security, Privacy	Cyber-Security and Privacy are not applicable to this project
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	In the case that there are transformers on the pole, a pole falling down may also cause the transformers to fall down on to the street below, resulting in transformer tank rupturing, and oil being spilled onto the ground.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Pace the replacement at the **MODERATE** pace: The elimination of all Very Poor and Poor poles over a 7.5-year time frame (896/year) •Cost of program = \$15.7MM/ year This alternative strikes the best balance between mitigating public safety risks, resource constraints, and annual cost.
	Alternative #1	Pace the replacement at the **ACCELERATED** pace: The elimination of all Very Poor and Poor poles over a 5-year time frame (1,552/year). •Cost of program = \$27.7MM /year The volume of work required by this plan would not align with Alectra's available resources and system constraints. At a more practical level, by intervening on a large volume of assets at one time, there is the risk of creating future "large-volume" areas that would need to be mitigated in the future. For these reasons, Alternative #1 would not be practical to execute.

	Alternative #2	Pace the replacement at the **REDUCED** pace: The elimination of all Very Poor and Poor poles over a 10-year time frame (568/year) •Cost of program = $9.7M / year . This alternative mitigates some of the public safety risks within the current planning period; however, it leaves a significant backlog of deteriorated poles at the start of the next five-year period. This option is viable from a resource constraint point of view, mitigates some risks and lowers the spending in the current planning period. However, it is a prelude to higher spending and a more aggressive system renewal plan beyond 2024.
	Justification for Recommended Alternative	Alectra Utilities must assess and monitor the condition of its pole population to ensure that its poles remain in a safe and serviceable condition while meeting prescribed codes for safety and reliability. Alectra does this through annual pole inspection and testing programs. Alectra Utilites performs pole residual strength testing on wood poles to assess remaining wood fibre strength, which is a key indicator of condition. The pole residual testing is performed in addition to the field inspection for wood poles. Concrete poles are field inspected for deterioration; for example, signs of cracking, concrete spalling (breaking in fragments), and exposed rebar. The pole testing program has revealed that a large number of poles need to be replaced based on their condition (poor or very poor) or residual strength.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Alectra Utilities considers the following as general risks to project schedule and cost: - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	This project is the continuation of Alectra's long-term annual investmen\t initiative. The average annual investments for 2015-2018 were $17.8MM per year. Alectra Utilities has set the recommended average investment level at $15.9MM for 2020-2024.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Through an annual inspection and testing program, Alectra Utilities monitors the pole condition to ensure that the poles meet minimum requirements for safety and reliability. Among other factors, Alectra Utilities is guided in its pole assessment process by Clause 8.3.1.3 of Canadian Standards Association (“CSA”) Standard C22.3 No. 1-10, which states that: "When the strength of a wood pole structure has deteriorated to 60% of the required design capacity, the structure shall be reinforced or replaced”. Other considerations include pole condition information such as rot, decay, splitting, insect infestation, bending, and leaning. Alectra Utilities believes that the replacement of poles exhibiting poor condition is non-discretionary in view of compliance with the CSA code, as well as considerations for safety of the public and for workers operating in, on, or around the poles and their associated equipment.
	Condition of Asset vs. Typical Life Cycle and Performance Record	According to the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board", Typical Useful Life of wood poles is 45 years. There are poles in Alectra Utilities existing pole population which are older than 45 years and are expected to fail if not replaced. It should be noted that age is only one of the many factors affecting the physical condition of wood poles. There are cases where relatively young poles have deteriorated physical condition due to factors such as: insect infestation, fungus, rot, cracking, leaning, bending.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1600
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1 pole (applicable to those pole replacement candidates): • Frequency of Failure is: 0.1 failures per year (1 in 10 years) For 80 poles (applicable to those pole replacement candidates): • Frequency of Failure is: 0.1 failures x 4480 = 448 failures. • Estimated average number of customers affected by 1 failure is = 200 customers • Estimated projected number of customers affected by 448 failures is: 200 x 448 = 89,600 customers Duration of interruption = 4 hours per interruption CMI for 1 pole failure = 200 customers x 4 hour x 60 min = 48,000 CMI CMI for 8 pole failures = 48,000 CMI x 8 = 384,000 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Pole failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Customer engagement includes preferences for Alectra to invest in projects that maintain or improve reliability.
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	This is an annual investmet initiative to manage end-of-life assets. There is nothing specific to note about the project timing.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term pole remediation program. The project will also help reduce some safety risk (potential personal injury) that may result due to pole failures.
	Analysis for "Like for Like" Renewal Project	Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral of these investments.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $95,874,048					$17,243,305	$13,810,973	$15,297,876	$16,241,364	$16,550,792	$16,729,738
Actuals: $71,027,067	$16,209,113	$20,110,647	$17,566,736	$17,140,571	$0	$0	$0	$0	$0	$0

Currency scale is in literal

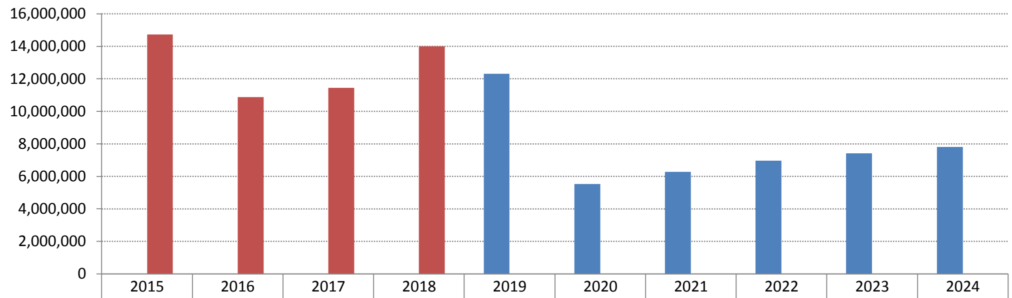
OEB Multi-Project Report

Field	Value
Project Code	Consolidated Case: 101508, 151043, 150285, 150336, 151058, 102077
Project Name	**Transformer Renewal**
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP Dec 4th

Project Overview

Section	Field	Value
2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various individual locations as required
	Units	2750 tranformers over the 2020-2024 time period.
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Transformer Replacements
	Alectra Subcategory	Transformer Replacements
4. Evaluation Criteria (OEB)	**Project Summary**	**Transformers are the equipment that change the voltage from a distribution kevel to a customer utilization level. Alectra Utilities inspects distribution transformer installations according to the inspection requirements established by the OEB Distribution System Code and ESA Regulation 22/04. Replacement candidates are selected based on their condition, identified safety issues, environmental concerns or consistent and significant overloading of the transformer. Investments in transformer replacements will mitigate safety and reliability risks associated with failure of these assets.**
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The priority of this project is high. Alectra Utilities has a very large quantity of distribution transformers in service. A portion of the transformer population is at end-of-life and requires replacement in order to maintain system integrity and reliable service to the customers. If not replaced, the transformers will get older and will fail more often to the level that is not manageable by Alectra Utilities and not tolerable by the customers. Alectra Utilities plans to replace its overhead and underground transformers (e.g. pole-top, pad-mounted and vault transformers) with the new standardized transformers. This renewal investment is supported by customers.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Transformer failures pose safety risk to staff and the public. The transformer may fail when staff are working on the unit or when the public is in close proximity to the unit. Additionally, during recent inspections it was observed that many units had excessive rusting and in some cases it had caused holes to develop in the units. Such units pose a greater safety risk to public as it gives them potential access to high-voltage conductors.
	Cyber-Security, Privacy	Cyber-Security and Privacy are not applicable to this project
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	By replacing end-of-life transformers with new units, the risk of oil contamination due to an oil leak.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The Status Quo is replace transformers, that pose safety and environmental hazards or are functionally obsolete or difficult to access. This approach will mitigate the public safety risk and environmental contamination risks. In addition, this alternative will mitigate prolonged outages due to functional obsolescence and poor accessibility that have a negative impact on system reliability and customer service. Pace the replacement at the **MODERATE** pace: The elimination of all Very Poor and Poor transformers as well as as well as all transformers that are functionally obsolete, lack adequate redundancy or are difficult to access, over a 5-year time frame (550/year). • Cost of program = $34.01MM /5 years = $6.8MM per year.
	Alternative #1	Pace the replacement at the **ACCELERATED** pace: The elimination of all Very Poor and Poor transformers over a 5-year time frame (950/year). • Cost of program = $57.5MM /5 years = $11.5MM per year Alternative 1 is the preferred alternative for the reasons that asset life is optimized by extending the useful life until just prior to the expected run-to-failure without significant impact to reliability.
	Alternative #2	Pace the replacement at the **REDUCED** pace: The elimination of all Very Poor and Poor transformers over a 10-year time frame (370/year). • Cost of program = $22.5MM /5 years = $4.5MM per year Under Alternative 3, the life of the assets is not optimized as they are recovered from service prior to failure. Also in Alternative 3, there are units being kept in service for longer times increasing the risks and consequence of failure.

	Justification for Recommended Alternative	This project is part of Alectra Utilities's long-term distribution transformer replacement initiative. Transformer replacement is carried out to replace end-of-life transformer to maintain system reliability and customer service. Each year, Alectra Utilities carries out the annual inspection program to approximately 1/3 of the transformer population, then on a prioritized basis, will re-visit, review, and select the "worst" transformer units for replacement. The locations and priority are determined based on the results from the Asset Condition Assessment (ACA) process, along with discussion and feedback among Lines, System Control, Capital Design, and Maintenance & Reliability. It is expected that every year as we continue the annual inspection program, we will identify units that are in poor conditions and require replacement.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Alectra Utilities considers the following as general risks to project schedule and cost: - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Each year Alectra Utilities conducts field inspection of transformers, and use the inspection results to prioritize and select suitable candidates for replacement.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Distribution transformers may be single-phase or three-phase depending on the customer and type of load. Sizes range from transformer as low as 25kVA typically supplying a few residential customers and as high as 3,000 kVA supplying industrial, large commercial or multi-unit residential (high-rise tower) customers. These transformers are oil filled and therefore do pose a risk to the environment for contamination. Alectra Utilities inspects distribution transformer installations according to the inspection requirements established by the OEB Distribution System Code and ESA Regulation 22/04. Replacement candidates are selected based on: • Condition (visibly deteriorated or damaged where continued operation will result in imminent failure) • Safety (major rusting) • Environmental concerns (oil leaks) • Consistent and significant overloading of the transformer These units have a high risk of imminent failure and are cost effective to replace proactively despite the low number of customers impacted by a failure. Additionally transformers that are unique and without adequate and prudent redundancy, and transformers that would be otherwise difficult to restore in the event of failure resulting in extended outages. Leaving these units to a run to failure strategy is negligent as the outage to customers can be avoided plus costs to replace the units reactively (if they fail outside of normal working hours) is higher than planned replacements when completed during normal working hours. Prioritization of these projects is influenced by factors, such as age and health index determined from inspection findings.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Each year Alectra Utilities conducts field inspection of transformers, and use the inspection results to prioritize and select suitable candidates for replacement.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	3410
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1 transformer (Applicable to those units that are selected for replacement): • Frequency of Failure is: 0.33 failures per year (1 in 3 years) For 2750 transformers: • Frequency of Failure is: 0.33 failures x 2750 = 908 failures Annually, on average, there were 317 Transformer failures affecting 20,365 Customers and 1,959,971 CMI. • Average number of customers affected by 1 failure is: 20,365/317 = 64 customers • Projected number of customers affected by 22 failures is: 64 x 908 = 58,332 customers • Average CMI for 1 failure is: 1,959,971/317 = 6187 CMI • Projected CMI for 908 failures is: 6187x 908 = 5,617,796 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Transformers failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Customer engagement includes preferences for Alectra to invest in projects that maintain or improve reliability. Transformers with visible oil leaks or containing PCBs represent a significant environmental risk. All oil spills must be tracked, reported, and the oil reclaimed where possible.
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term transformer replacement initiative. The project will help avoid a total of 908 transformer failures and 5,617,796 potential CMI. The project will also help reduce some safety risk (potential personal injury) that may result due to transformer failures.
	Analysis for "Like for Like" Renewal Project	Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral of these investments.



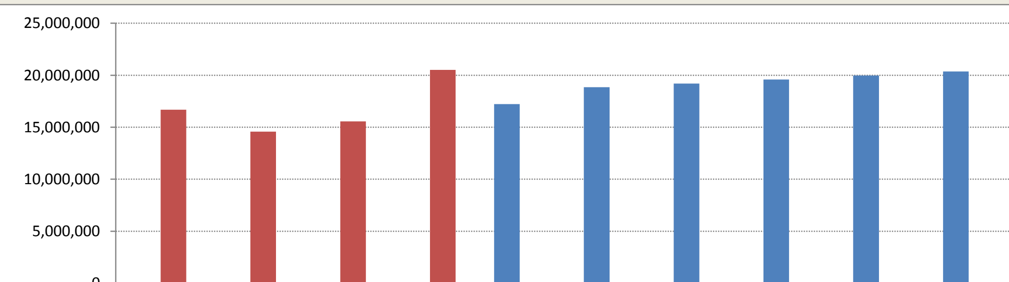
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $46,329,306					$12,320,617	$5,536,557	$6,272,918	$6,967,426	$7,416,600	$7,815,188
Actuals: $51,070,159	$14,733,152	$10,879,869	$11,455,110	$14,002,028	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	Consolidated Case: 101824, 150690, 151074, 101808, 150725, 101800, 151095, 101828, 150754, 150726, 101820, 101812, 151162	
Project Name	**Reactive Capital**	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP Dec 4th	
Project Overview		
2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various individual locations as required
	Units	not applicable
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Reactive
	Alectra Subcategory	Emergency/Restoration/Reactive
4. Evaluation Criteria (OEB)	**Project Summary**	**Alectra Utilities is obligated to maintain safe and reliable power to its customers. When a failure in the distribution system occurs, emergency replacement to restore power to customers is paramount. Additionally, any assets identified that require immediate replacement due to safety concerns or imminent failures, accidents, theft or vandalism are part of reactive capital. Investments in reactive capital projects will continue to support supply to customers and the requirements of Alectra Utilities' distributors licence.**
	Main Driver - System Renewal	Mandated Compliance
	Priority and Reasons for Priority	Projects arise from trouble calls or inspection programs identifying an urgent need to replace system assets and the scope of the equipment replacement requires engineering. Also included in this category are projects to address customer power quality issues, and Electrical Safety Authority (ESA) due diligence inspection outcomes. Not replacing the equipment would leave customers without power which is not acceptable. This investment is supported by customers.
	Customer Attachment / Load (KVA)	The number of customers impacted varies in each incident or outage.
	Safety	These projects are intended to primarily address failed assets however investments required to address immediate safety issues, including issues presenting a potential risk to public safety identified by the ESA, are included in this project.
	Cyber-Security, Privacy	Cyber-Security and Privacy are not applicable to this project
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Not replacing equipment that has failed and leave customers without power is in direct contravention of the Distribution System Code Section 4.4.
	Alternative #1	No alternatives are considered for these projects as they involve the emergency replacement of failed equipment required to restore service.
	Alternative #2	No alternatives are considered for these projects as they involve the emergency replacement of failed equipment required to restore service.
	Justification for Recommended Alternative	Not replacing equipment that has failed and leave customers without power is in direct contrevention to the Distribution System Code Section 4.4.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Alectra Utilities considers the following as general risks to project schedule and cost: - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	The 2015-2018 historical average spend was $16,733,826 The 2020-2024 forecasted average spend is $18,896,157.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0

7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	These projects are reactive in nature and are initiated from equipment that has failed or with a high risk of failure resulting in a service interruption. These projects have a very high probability of impacting Alectra Utilities' reliability targets.
	Condition of Asset vs. Typical Life Cycle and Performance Record	These projects address failed assets or assets with a high risk of imminent failure and as such, these assets are at the end of their useful life. The asset condition relative to their typical life cycle varies in each incident or outage.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	0
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	The quantitative customer impact varies in each incident or outage.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	These projects address customer satisfaction as they are required to address failed assets that have either caused a system interruption, or have a high probability of causing a service interruption.
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	These projects are reactive in nature and address failed assets, or assets at risk of imminent failure. Investments must be performed when identified.
	Consequences for O&M System Costs Including Implications of Not Implementing	These projects do not materially impact system O&M costs.
	Reliability and Safety Factors	Improvements to reliability and security are expected as secondary benefits to this project.
	Analysis for "Like for Like" Renewal Project	Assets replaced reactively to replace failed assets, or assets at risk of imminent failure are performed on a like-for-like basis. No extra costs to address other distributor planning objectives are incurred with these projects. Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral.



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $115,187,167					$17,234,674	$18,842,691	$19,206,592	$19,580,377	$19,964,282	$20,358,550
Actuals: $67,344,011	$16,684,996	$14,566,172	$15,570,224	$20,522,619	$0	$0	$0	$0	$0	$0

Currency scale is in literal

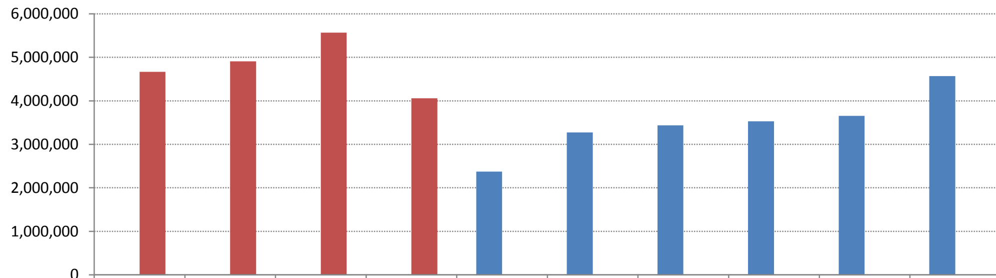
OEB Multi-Project Report

Project Code	Consolidated Case: 100886, 151092, 151104, 151057, 150334,151439, 151389, 151390, 151391, 151392	
Project Name	Distribution Automation	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP Dec 4th	

Project Overview

2. Additional Information	Service Territory	All of Alectra Utilities' rate zones
	Location	Various Locations in Alectra East. The locations will be determined by Reliability in conjunction with Control Room, Protection & Control, Station Design and Lines.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Automation, SCADA
	Alectra Subcategory	Distribution Automation - New
4. Evaluation Criteria (OEB)	Project Summary	**Alectra Untilities strives to reduce outage times by restoring power once an outage occurs as quickly as possible. Investments in Distribution Automation will replace existing manual switching locations with automated units that install eqipment that aligns with Alectra Utilities' distribution automation strategy. Investments in automated switches, reclosers, switchgears and Trip Saver devices will increase their penetration in the distribution system and reduce resoration times.**
	Main Driver - System Service	Reliability
	Priority and Reasons for Priority	A Legacy utility authored a Distribution Automation Report that identified feeders that were lacking automated devices hindering the ability to reduce feeder down time in case of outages, and to reduce the number of customers affected by outages. Investmenst in DA were recommended in order to increase overall reliability. This is especially true for areas where Alectra Utilities has limited automated switching.
	Customer Attachment / Load (KVA)	Not applicable.
	Safety	The aspects related to safety for this project include: 1. Allowing switching to occur without staff in contact with the equipment during change of state from open to close or visa versa. 2. Allowing switching to occur during an emergency. i.e. customer contact with lines via vehicle or cut down tree, critical injury, fire or explosion.
	Cyber-Security, Privacy	Automated Switches and Reclosers communicate back to the control room via private/secure network. As part of its continuous improvement model, Alectra Utilities performs periodic security assessments to identify opportunities for enhanced system hardening if applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services. All automated units are upgraded to latest standards allow units to participate in advanced sectionalizing schemes at future dates if required. Some manual units will be replaced with automated units on a case by case basis if applicable.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	As per the recommendations of the Distribution Automation Report, install Distribution Automation Scadamate Switches / Reclosers at rate of 15-20 Automated units per year, to reduce feeder down time and to reduce the number of customers affected by outages.
	Alternative #1	The main alternative to this project would be to "do nothing" and keep the number of distribution automation switches at current levels. However, "doing nothing" would not allow Alectra Utilities to make the necessary improvements to increase the reliability of its distribution system. The continued use of manual LIS (Load Interrupting Switch) switches would require lines crews to operate a significant number of manual switches to isolate faults or transfer loads between feeders. This will increase outage restoration time and have a negative impact on system reliability.
	Alternative #2	Not applicable

	Justification for Recommended Alternative	High service reliability and rapid response to power outages is critical to mission success and customer satisfaction in supplying electricity. RTU controlled switches provide rapid transfer of loads in emergencies, reduce restoration time which improves reliability, provide flexibility to reconfigure the system to avoid feeder and station over loads during summer peak, provide real time system readings, reduce the risk of personnel injury and are the platform for the complete distribution automation system. The Distribution Automation Report was updated in 2015. The report recommended that automatic switches be installed at strategic locations over a number of years to reduce feeder down time in case of outages and to reduce the number of customers affected by outages. To determine potential switch candidates, feeders are ranked based on the FAIDI, FAIFI and MAIFI contributions to the systems which determines the Worst Performing Feeders. Outage causes, feeder load balancing plan and location of existing automatic switches are also used to identify and determine the location for additional switches and re-closers wherein it is most beneficial in CMI reduction and operational needs. Also, automatic switch locations are jointly determined among System Planning, System Operations, and Lines by selecting potential switch candidates to address Customer Service reliability needs, feeder loading emergency back-up and load transfer needs and Control Room operations needs on outage sectionalisation and restoration The Distribution Automation Report identified that 2 to 3 DA switches per feeder represent the best value investment vs. received reliability improvement, using the following equation [%improvement = 0.5*NSW/(NSW+1)*100].
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Alectra Utilities considers the following as general risks to project schedule and cost: - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	This program has been on-going for the past 8 years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	The cost impact is calculated below based on the following assumptions and estimates (per Distribution Automation switch unit): - Frequency of interruption: 2/year - Duration of interruption: 30 minutes (0.5 hours). This is the estimated incremental time for manual switching in comparison to remote automatic switching - Number of customers affected in an outage: 500 customers (Segmented by manual switches) - Customer load affected in an outage: 2000 kW - Customer Interruption Cost (Frequency): $20.00/kW (mixed Residential , Commercial & Industrial) - Customer Interruption Cost (Duration): $20.00/kWh (mixed Residential, Commercial & Industrial) - Delivery Charge, etc. for loss of revenue calculation: $0.0179/kWh Cost to Customers: - Customer Interruption Cost (Frequency) = Not Applicable - Customer Interruption Cost (Duration) = 2000 kW x 0.5 hrs x $20/kWh x 2 failures/year= $40,000 Cost Comparison: -Total Cost to Customers/year (Interruption) = Cost (Freq) + Cost (Dur) = $0 + $40,000 = $40,000 -Average cost of 27.6kV Switch/Recloser = $75,000. -Average cost of 44kV Switch = $154,000
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	All Distribution Automation switches are capable of participating in Alectra Utilities' distribution automation schemes (self healing loops) if required for future Smart Grid strategies.
	Identify any reliability, efficiency, safety or coordination benefits	RTU controlled switches provide the following benefits: - rapid transfer of loads in emergencies, - reduce restoration time which improves reliability, (without automation = 50-80min, with automation = 2-5min) - provide flexibility to reconfigure the system to avoid feeder and station over loads during summer peak, - provide real time system readings, - reduce the risk of personnel injury - more efficient planned outages - enable participation in the complete distribution automation system. Alectra Utilities considered the application of CDM as a means to defer the investment. Although CDM may reduce load, these contributions will not result in deferral.



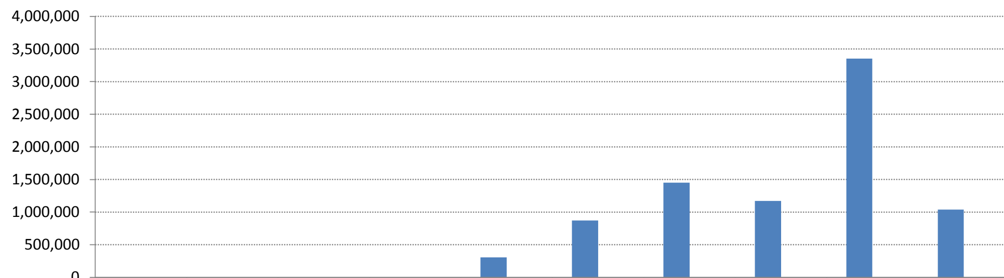
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $20,836,081					$2,375,393	$3,272,035	$3,436,777	$3,530,356	$3,653,655	$4,567,865
Actuals: $19,209,767	$4,669,324	$4,909,548	$5,569,990	$4,060,905	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150738, 150746, 150751	
Project Name	Facilities_2020 - 2024_Capital Replacement Investment Support	
	Project Description	The objectives of these projects planned for 2020 to 2024 is to maintain the buildings, assets and systems in a condition that contributes to maintaining efficiencies, business operations and to alleviate pressure on the operating expenditures. Capital Replacement refers to an expenditure that is based on the condition and/or lifecycle of a given building or component/asset and is scheduled for replacement (e.g. condenser, furnace, windows, roofing). These are planned projects base on this criteria. Other expected objectives and outcomes: • Improved energy performance of buildings systems & infrastructure; • Maintain normal business operations to support customer needs; • Reduce maintenance/breakdown costs; • Improved employee safety; • Extend the life of other supporting assets.
Major Category	General Plant	
Scenario	2020-2024 - Optimized for DSP Dec 4th	
Project Overview		
2. Additional Information	Service Territory	Undefined
	Location	All Alectra Utilities' Office Buildings and Service Centres
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Buildings, Furniture and Fixtures
	Alectra Subcategory	Buildings
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities maintains three corporate offices and seven service centres totalling over one million square feet of space with the Alectra Utilities territory. Alectra Utilities owns and maintains buildings and assets ranging in age from 10 years old to 70 years old. In order for Alectra Utilities to better understand facilities capital investment/replacement needs in all its buildings, a Facility Condition Assessment is required. In 2013 Evans Consulting Services was retained to conduct a Facility Condition Assessment (FCA) for the west region and Pinchin Ltd. was retained by Alectra Utilities to conduct a Baseline Property Condition Assessment (BPCA) very similar to a FCA in 2018 in the central and east regions. These Facility Condition Assessments (FCA) involved a team of one or more specialists inspecting each system/assets in the buildings to understand its condition. These include all mechanical, electrical, plumbing and architectural elements in a building. The condition is based on any deficiencies and the remaining useful life of the system. With this information, we are able to determine when system repairs and renewals will be required. The FCA provides an overall facility/asset condition, recommended budget and replacement schedule, enabling Alectra Utilities to budget the proper level of investment required. As a result of these FCAs Alectra Utilities has identified the following projects that will be completed over the next 5 years in each of its facilities based on the highest return on investment and risks to the operations; • Replacement Heating, Ventilation and Air Conditioning (HVAC) systems; • Upgrading emergency generators; • Upgrade and modernization of passenger and Freight elevators • Roof replacements and repairs • Asphalt replacements and repairs • Window replacements • Repairs to exterior building envelopes • Security surveillance and access control system upgrades
	Main Driver - General Plant	Capital Investment Support
	Priority and Reasons for Priority	The following is what would be the expected outcome for the FCA: • Provides an accurate data for FCI (Facility Condition Index) Calculations • Establishes the baseline conditions for the building and its systems • Identifies, classifies and prioritizes building deficiencies • Estimates cost for proposed corrective actions • Maintains building condition and cost data current • Identify and prioritize the necessary short and long term maintenance and repair requirements • Better allocation of the funding • Identifies areas of energy saving • Recommends corrective action for each deficiency • Assessment performed by professional architects and engineers
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Need to address safety issues and concerns as a result of facility asset conditions.

	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	Not applicable
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Impacts to operations. Impacts to customer service. Impacts to system reliablity
	Alternative #1	Not applicable
	Alternative #2	Not applicable
	Justification for Recommended Alternative	Not applicable
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable



	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP Dec 4th: $8,194,474					$308,000	$873,314	$1,452,270	$1,171,036	$3,352,164	$1,037,690
Actuals: $0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	100319	
Project Name	Radial Supply Remediation/Conversion - 13.8 kV to 27.6 kV on Miller Ave	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	Miller Ave from Woodbine Ave to Rodick Rd in the City of Markham
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is to rebuild existing pole line to 27.6 kV with provision for 2nd 27.6kV in the future (approx. 1 km) and convert existing 11 customers (2MVA connected in total) on Miller Ave & Rodick Rd into 27.6kV supply. They are supplied by 13.8kV feeder AMB-F1 from Amber MS.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	High City of Markham is to widen the Miller Ave and it is a good opportunity to upgrade the existing pole line. It will decrease the outage impacts due to deteriorating underground system assets. There have been many outages in Amber MS due to animal contacts and customers on Miller Ave have been complaining about reliability and power interruption. There are 13 customers on Miller Ave, and they are supplied by feeder AMBF1 from Amber MS. The SAIDI of AMBF1 was 3.86 hours in 2017 and 3 hours in 2018. Both are higher than Alectra average of approx. 1 hour (Excluding LOS and MED). The 13.8kV feeder on Miller Ave is a radial feeder any outage in the Amber MS affects the customers on Miller Avenue until repairs are completed. The customer on Miller Avenue will be a loop supply once converted to 27.6kV. This project will allow the decommission of Amber MS and John MS since the only customers on these MS will be the customers on Miller Ave . Once this project is completed, both MS and associated 13.8kV feeders can be removed.
	Customer Attachment / Load (KVA)	11 customers 2,84 kVA
	Safety	Not applicable
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	Not applicable
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status quo is do nothing continue to supply customers with the existing pole line on Miller Ave. This option is not feasible. The existing 13.8kV pole line has to be relocated when the City of Markham widens the Miller Ave.
	Alternative #1	The existing 13.8kV pole line has to be relocated when the City of Markham widens the Miller Ave. Alternative 1 is to rebuild the existing 13.8kV pole line into 13.8kV during road widening and all customers remain as 13.8kV supply. The customers will be on radial supply again. Amber MS will continue to be required to supply the 13.8kV customers. Alectra long term goal is to convert 13.8kV into 27.6kV and eliminate MS in Markham. This option does not line with Alectra's long term goal.
	Alternative #2	Not applicable

	Justification for Recommended Alternative	The existing 13.8kV supply is a radial feeder. There have been many outages in Amber MS due to animal contacts and customers on Miller Ave have been complaining about reliability and power interruption. A project (103676) "Install one 13.8kV cct on Rodick Rd" was approved in Alectra's 2015 capital budget to extend one 13.8kV cct on Rodick Rd from 14th Ave to Miller Ave so that customers on Miller Ave will be on a 13.8kV loop supply. If a pole failure on Woodbine Ave occurs, customers can still be supplied from Rodick Rd. The project was budgeted for $250k, but the budget increased to $668k after the design was completed. The project was put on hold as City of Markham informed PowerStream in 2015 that it had plans to widen Miller Avenue. In that case, all the existing 13.8kV poles would have to be relocated. In addition, the customers on Miller Avenue are supplied by 13.8kV feeder from Amber MS which is a 1972 vintage station and has very little load (3MVA) due to the conversion of customers supplied by this MS to the present day 27.6kV standard. Amber MS will be decommissioned, after all the customers fed from Amber MS are converted to present day 27.6KV supply standard. Given the change in circumstances, the most cost effective option was to coordinate Alectra Utilities' distribution work with the road widening work and convert all the existing customers on Miller Avenue to the present day 27.6kV loop supply standard and then decommission Amber MS after remaining customers on Amber MS are converted as well. The customers will be a loop supply once converted to 27.6kV. This option will allow Alectra to supply customers with 27.6kV and provide the customers with better reliability since many of the outages on the 13.8kV Amber-F1 feeders were due to problems inside the Amber MS. In the long term, this project will allow two new 27.6kV feeders from MTS#4 to be routed to Woodbine Ave via ccts on Miller Ave. Four feeders from MTS4 have been planned to go south via Rodick Rd to supply customer south of Hwy 407.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Markham in time. Capital design will start the design of the project in advance and should get the approvals in place in advance. The other risk is the coordination with the Miller Ave widening project. The project will be deferred if the City of Markham defers the road widening work. Project management will be implemented to ensure the project is on time and on budget.
	Comparative Information on Equivalent Historical Projects (if any)	Alectra has been working very closely with York Region on several road widening project in the past a few years. Usually Alectra provide high level estimates at the early stage of the project. A details estimate will be prepared once the pole line design is completed. Alectra has an existing 13.8kV pole line on Miller Ave and City of Markham will partially be responsible for the cost of relocation and Alectra will be 100% responsible for the conversion and 2nd cct.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Not applicable
	Condition of Asset vs. Typical Life Cycle and Performance Record	Not applicable
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	0
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Not applicable
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Not applicable
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	The project will be deferred if the City of Markham defers the road widening work.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not applicable
	Reliability and Safety Factors	This project will provide much better reliability for customers on Miller Ave since the 27.6kV feeders in the area are much more reliable than 13.8kV feeders from Amber MS. The customers on Miller Ave are supplied by 13.8kV Amb-F1 feeder. After this project is completed, the customers will be on a 27.6kV feeder 10M3, which has a better reliability. Therefore, the outage time and outage frequency will be reduced significantly. The existing pole line on Miller Ave was installed in 1970 and is 49 years old. It is near the end of life. After this project, pole line will be brand new, and it will improve safety to the line crew and the public.
	Analysis for "Like for Like" Renewal Project	Not applicable

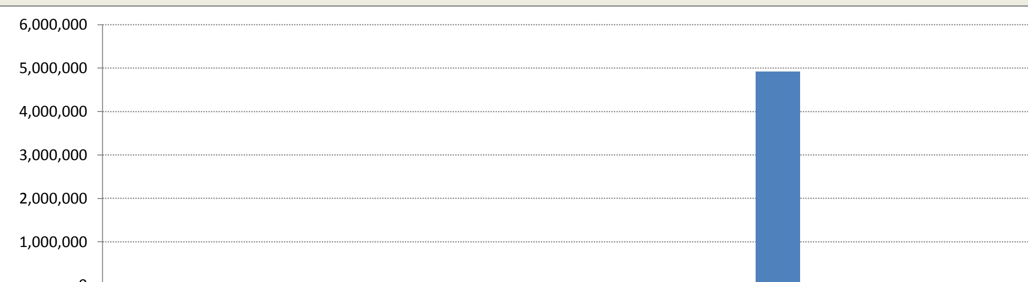
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,537,104	$0	$0	$0	$0	$1,537,104	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	100337	
Project Name	Markham TS #4 Feeder Egress Part 3	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	On Rodick Rd from Markham TS#4 to 14th Ave in Markham, approx. 1.5km.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This is the Part 3 of Markham TS #4 Feeder Integration Plan. This project is to install four 27.6kV feeders from MTS4 along Rodick Rd to 14th Ave. These feeders will be connected to existing feeders on 14th Ave and Miller Ave. This project will increase supply capacity by 80 MVA to support growth and development in Markham. The feeders will be underground from MTS4 to Rodick, and crossing Hwy 407 via ducts in the bridge to Miller Ave, appox 0.8 km. They will be overhead installation from Miller Ave to 14th Ave, approx 0.7 km.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	High. Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by intensification and redevelopment. One data center at 371 Gough Rd has been in service since 2014. The initial load is 2 MW and ultimate will be 7 MW . One data center at 4175-14th Ave has been in service since 2015. The initial load will be 5MW and ultimate will be 10 MW eventually. CDM is considered and load forecast is net of CDM.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Capacity A few data center projects are underway along 14th Ave and the peak demand is expected to increase by 20MVA. The Woodbine Ave and Steelcase area is to be redeveloped and new load is expected to added to the system. The existing feeders don't have sufficient capacity for the new load and new feeders are required. Status Quo will jeopardize Alectra's obligation to supply new customers along 14th Ave. The impact severity and timing will depend on the schedule of the ramping-up of customers on 14th Ave. Power Quality Both MTS1 and MTS3 are Jones type stations that tie breakers are closed normally. Feeders on both 27.6kV buses are subject to the same voltage sag impact when a fault occurred on the feeders. A few voltage sensitive customers have complained about the impact. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. Alectra will not be able supply customers along 14th Ave and Woodbine Ave. There will be more complaints about power quality in the future. Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI. Alectra will be at risk of compromising supply to new loads along 14th Ave and Woodbine Ave that may have negative impacts on our corporate reputation and mission. Alectra is obligated to service future growth within its service territory using "good utility practice". Failure to provide adequate levels of service could lead to regulatory sanctions, and customer damage claims.

	Alternative #1	Alectra Utilities' load forecast process considers the impact of CDM and distributed generation, which is accounted for as part of the load forecast underpinning the lines capacity projects. Alectra Utilities has considered solar and storage options and determined that this option is not economical for the capacity that is required. Based on typical loading of 15-20 MW the cost of non- wire alternatives would 15 times that of traditional solution.
	Alternative #2	Not Applicable.
	Justification for Recommended Alternative	The primary driver for this Investment is to increase supply reliability and supply capacity to the area bounded by Woodbine Ave, Steeles Ave, Kennedy Rd and Hwy 407. The recommended alternative was chosen for the following reasons: To increase supply capacity to the area. This project is going to add 80 MVA capacity to the distribution system to increase supply capacity to Steelcase area, and Warden Ave/14th Ave area. There will be intensification in the south end of Markham. Additional supply capacity is required for the new growth. To increase supply reliability to the area. This project will also provide supply capacity from different transmission line so it will also increase supply reliability. There are many data centers in the Warden/14th Av area. They always demand high supply diversity, i.e., feeders from different buses, different transformer stations and even different transmission lines. MTS4 is supplied from Buttonville Line and it is a different transmission line than that supplying the area now. New feeders from MTS4 will provide transmission line diversity to the area and satisfy customers' needs. A few data center projects are underway and the peak demand is expected to increase by 20MVA.The existing feeders don't have sufficient capacity for the new load and new feeders are required. There are many sensitive big customers along 14th Ave that have two supplies to their facilities. The feeders are from either MTS1 or MTS3. MTS1 is on the transmission line C35P/C36P and MTS3 is on the transmission line V71P/V75P. But both MTS1 and MTS3 are Jones type stations that tie breakers are closed normally. Feeders on both 27.6kV buses are subject to the same voltage sag impact when a fault occurred on the feeders. A few voltage sensitive customers have complained about the impact. Funding this project will enable Alectra to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing coordinated protections between source and load and having adequate backup capacity in the event of an outage. MTS4 has two 75/100/125 MVA transformers and the 27.kV bus tie is normally open. It will improve voltage sag issue to the customers. The new four ccts on Rodick Rd serve as ties between ccts on Woodbine Ave from MTS4 and ccts on 14th Ave from MTS1. They will provide 120 MVA contingency capacity and will allow load transfer between transformer stations under contingency such as pole failures, TS failure, and transmission line outage.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Markham and MTO in time. Capital design will start the design of the project in advance and should get the approvals in place in time. Customers load ramping up schedule will impact the timing and priority.
	Comparative Information on Equivalent Historical Projects (if any)	There are two similar feeder egress projects from MTS4: -Four feeders from MTS4 to Woodbine Ave via Yorktech Blvd via underground ductbank. -Four feeders from MTS4 to Hwy 7 via Rodick Rd via underground ductbank.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	This project will increase power supply reliability and reduce risk of prolonged outages. The project will provide for incremental feeder tie points between MTS1 and MTS4. It will improve the operational efficiency and effectiveness of these stations.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,917,602	$0	$0	$0	$0	$4,917,602	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	100340	
Project Name	Vaughan TS#4 Feeder Integration - Part 3	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	Various locations in Vaughan The project scope includes following constructions in year one: -New 4 ccts in UG on easement from VTS4 to Kirby Sdrd – 0.2 km -New 4 ccts pole line on Kirby Sdrd from VTS4 to Kipling Ave – 0.3 km - 4 ccts existing/new pole line on Kipling Ave from Kirby Sdrd to Teston Rd – 2 km -New 4 ccts pole line on Teston Rd from Kipling Ave to Pine Valley Drive – 2 km -2nd cct on existing pole line on Teston Rd from Pine Valley Drive (PVD) to Weston Rd – 2 km -2nd cct on existing pole line on Pine Valley Drive from Teston Rd to MMD – 2 km The project scope includes following constructions in year two: -Adding 2 ccts on existing pole line on Teston Rd from Weston Rd to Jane St – 2 km -Adding 2 ccts on existing pole line or rebuild pole into 4 ccts where necessary on Weston Rd from MMD to Rutherford Rd – 2km
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is necessary to bring four 27.6kV feeders (25M5/25M6/25M7/25M8) out from VTS4 and integrate them into the existing distribution system. This project will be implemented in 2 years to minimize the impact on Alectra budget and resources. The project scope includes following constructions in year one: -New 4 ccts in UG on easement from VTS4 to Kirby Sdrd – 0.2 km -New 4 ccts pole line on Kirby Sdrd from VTS4 to Kipling Ave – 0.3 km - 4 ccts existing/new pole line on Kipling Ave from Kirby Sdrd to Teston Rd – 2 km -New 4 ccts pole line on Teston Rd from Kipling Ave to Pine Valley Drive – 2 km -2nd cct on existing pole line on Teston Rd from Pine Valley Drive (PVD) to Weston Rd – 2 km -2nd cct on existing pole line on Pine Valley Drive from Teston Rd to MMD – 2 km The project scope includes following constructions in year two: -Adding 2 ccts on existing pole line on Teston Rd from Weston Rd to Jane St – 2 km -Adding 2 ccts on existing pole line or rebuild pole into 4 ccts where necessary on Weston Rd from MMD to Rutherford Rd – 2km
	Main Driver - System Service	Support Capacity Delivery

	Priority and Reasons for Priority	High. Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by intensification and redevelopment. The site for Vaughan TS4 (VTS4) is located at north-west corner of Kirby Sdrd and Kipling Ave in Vaughan. It will supply City of Vaughan. VTS4 has been constructed with 2x75/125 MVA transformers in a DESN arrangement with 12 feeder positions. Vaughan TS4 has been in-service since December 2017 with four feeders. Major future load growth areas in Vaughan are summarized below: Data Center Digital Realty has built a new data center at 1 Century Place (former Tostar building) in 2017. As per their website, this Canadian wholesale data centre spans over 66,000 square metres (711,000 square feet) with a critical power capacity of up to 46 MW. The data centre offers the best in flexibility and performance. It features 23 computer rooms ranging from 800 to 1,200 square meters (8,600 to 13,000 square feet) and can accommodate power capacities between 1.0 and 3.0 megawatts. Resiliencies range from N to 2N. The customer indicated that the ultimate load may go to 72MW. The data center is supplied by two dedicated 27.6kV feeders from VTS2. VTS2 had approx. 30MW capacity left. To accommodate this data center, 40MW of loads on VTS2 have to be transferred to other stations through feeder reconfiguration. Two new feeders are required from VTS4. West Vaughan Employment Area The West Vaughan Employment Area Secondary Plan sets out detailed policies to create a large economic opportunity for York Region. With over 500 hectares of employment designated lands, this area will continue to allow the City of Vaughan to attract a wide range of businesses requiring large tracks of land with excellent Regional road and provincial highway access. The Secondary Plan is planned to accommodate approximately 20,120 employees. The peak demand for this development is estimated to be 50MW to 80 MW when fully built out, but no time line is
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Reliability VTS4 is supplied from 230kV Minden transmission line, while the existing transformer stations in Vaughan are supplied by 230kV Parkway line (VTS1/VTS1E and VTS2) or Kleinburg Line (VTS3). VTS4 will provide backup capacity to other TS in case of transmission line contingency. This will add transmission line diversity to Alectra's distribution system. Capacity Two feeders 21M5 and 21M11 from VTS2 supply Vaughan Metro Center (VMC). The peak of VTS2 was 110 MW in 2017 due to abnormal feeder configuration and cool than normal summer weather. It was 133MW in 2016 and only 20MW capacity left before it reaches the 10 day Limited Time Rating (LTR) of 153 MW. A new data center with demand up to 72MW has been built near VTS2. It does not have extra capacity to supply new loads in the VMC development (approx. 100MW)., In fact, VTS2 needs to off loaded to supply the new data center. CDM is considered for all projects and load forecast is net of CDM. The peak demand of VTS3 was 145 MW in 2017, and it has only 8 MW left for future development in Vaughan West Employment land. Status Quo will cause VTS#2 and VTS#3 to exceed its LTR under 1-in-10 weather (extreme summer temperatures) in the long term. The impact severity and timing will depend on the schedule of the VMC and Vaughan West Employment development. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. Operating transformer stations over LTRs violates Alectra's planning philosophy and good utility practice. Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI. Alectra will be at risk of compromising supply to new loads in Vaughan north and new hospital areas that may have negative impacts on our corporate reputation and mission. Alectra is obligated to service future growth within its service territory using "good utility practice". Failure to provide adequate levels of service could lead to regulatory sanctions, and customer damage claims.
	Alternative #1	Not Applicable.
	Alternative #2	Not Applicable.

Justification for Recommended Alternative

Status quo was not chosen for the following reasons:
• it does not address risks to the reliability of customers in Vaughan and does not meet system needs for supply capacity to ensure loadings on VTS2 are kept to acceptable level.

The recommended alternative (VTS4 Feeder Integration Plan-Part 3) was chosen for the following reasons:
• It improves the reliability situation mentioned in the status quo option
• It will increase supply capacity to VMC and Vaughan West.
• It will meet the immediate need for supply capacity.
• It is consistent with the VTS4 feeder integration plan
Funding this project will enable Alectra to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing coordinated protections between source and load and having adequate backup capacity in the event of an outage.

They will provide 80 MVA supply capacity.

25M5 and 25M6 will be tapped to existing ccts on Weston Rd s/o Rutherford, and they will replace existing feeders 21M3 and 21M4 from VTS2. It will reduce peak on VTS2 by 40MVA right way.
Feeder 21M3 and 21M4 will be re-routed to VMC area to supply the new development. The peak demand on VTS2 will increase as new customers are connected to feeder 21M3 and 21M4.

25M7 and 25M8 will be tapped to existing lower ccts on Teston Rd from Weston Rd to Jane St. Feeder 25M7/25M8 will off load feeder 22M13 and 22M12 from VTS3 so that they can be used to supply new development in Vaughan West. Feeder 25M7/25M8 will also supply new hospital.

Feeders 25M5/25M6/25M7/25M8 also serve as ties between VTS4 and VTS1, VTS2, VTS3. They will provide 120 MVA contingency capacity and will allow load transfer between transformer stations under contingency such as pole failures, TS failure, and transmission line outage.
This project will increase power supply reliability and reduce risk of prolonged outages.

The completion of this project will allow for VTS1, VTS1E, VTS2, VTS3 and VTS4 to adequately supply new developments in their respective service areas.

The project will provide for incremental feeder tie points between VTS4 and VTS1, VTS2, VTS3. It will improve the operational efficiency and effectiveness of these stations.

6. General Information on the Project/Activity (OEB)

Risks to Completion and Risk Management

The risk is to get approval from the City of Vaughan in time. Capital design will start the design of the project in advance and should get the approvals in place in advance.

Comparative Information on Equivalent Historical Projects (if any)

Not Applicable.

Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)

0

7. Category-Specific Requirements for Each Project/Activity (OEB)

Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable

Not Applicable.

Regional Electricity Infrastructure Requirements which affect Project, if applicable

Not Applicable.

Description of Incorporation of Advanced Technology, if applicable

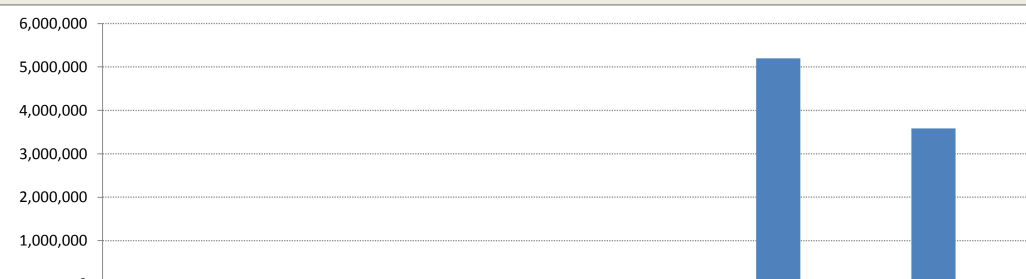
Not Applicable.

Identify any reliability, efficiency, safety or coordination benefits

This project will increase power supply reliability and reduce risk of prolonged outages.

The completion of this project will allow for VTS1, VTS1E, VTS2, VTS3 and VTS4 to adequately supply new developments in their respective service areas.

The project will provide for incremental feeder tie points between VTS4 and VTS1, VTS2, VTS3. It will improve the operational efficiency and effectiveness of these stations.



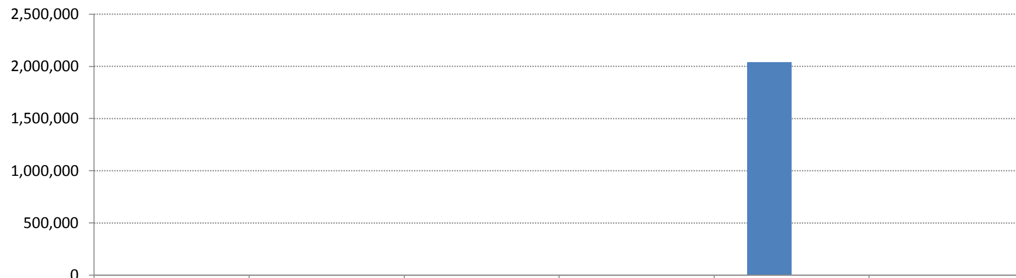
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $8,787,686	$0	$0	$0	$0	$5,202,312	$3,585,374
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	100632	
Project Name	27.6 kV Pole Line on 14th Ave from Hwy 48 to 9th Line	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	On 14th Ave from Hwy 48 to 9th Line in Markham, approx. 2km.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	Rebuild the existing 2 ccts pole line into four 27.6 kV ccts on 14th Ave between Hwy 48 and 9th Line, and install necessary load interrupter switches as per Alectra's design standard. This project will extend 2 feeders (24M3/24M6) on 14th Ave from Hwy 48 to 9th Line. 24M3/24M6 will connect to the existing 2 ccts on 14th Ave east of 9th Line so that feeder 24M3/24M6 can be rerouted to Box Grove area and Cornell area. The purpose of this project is to increase the supply capacity to Markham East.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	High. Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by green field expansion. Installing two additional 27.6kV circuits on 14th Ave will: 1. Address the loading issue of Cornell and Box Grove both in the short and long term. 2. Provide alternate supply route for Cornell development to increase reliability. 3. Consistent with the original Markham TS4 feeder integration plan and business case. The Cornell Community (OPA#20) is bounded by north of 16th Ave to the north, Reesor Road to the east, south of Hwy 7 to the south, and 9th Line to the west. It will accommodate approximately 16,000 dwelling units with approximately 46,000 people and 10,000 to 13,000 jobs. The commercial/business parks will be located at east end of Cornell development (Reesor Rd/Hwy 7 area). The total load is estimated to be 46 MW when it is fully built out. CDM is considered for all projects and load forecast is net of CDM. This development has been infilling for the past 5 years and is about 25% completed. Adjacent to the Cornell Development is the development named Box Grove (OPA#92). It has 2,600 dwelling units and will have 10,000 additional residents when completed. This development is at 50% completion and is expected to be fully developed with next few years. The existing feeders in the area don't have sufficient capacity to supply future growth. The original feeder integration plan for Markham Transformer Station Four (MTS4) was to reroute two new feeders (24M3 and 24M6) to provide additional capacity for developments in Cornell and Boxgrove. All existing supplies to Cornell are radial from 9th Line, meaning that any pole failure on 9th Line will cause large scale and prolonged outages to the customers. This project will increase reliability of Cornell area and avoid blackout situation by supplying Cornell from Reesor Rd. These two feeders will allow loads to be supplied from both the east and west. Two new feeders are required for Markham east. It has been planned to reroute feeder 24M3/M6 to this area by rebuilding multiple sections of pole lines: Section 1: Rebuild pole line on 14th Ave from 9th Line to Reesor Rd into 2 ccts pole line (2km). This section has been completed. Section 2: Rebuild pole line on Reesor Rd from 14th Ave to Hwy 7 into 2 ccts pole line (2km). This section has been completed. Section 3: Rebuild pole line on 14th Ave from Hwy 48 to 9th Line into 4 ccts pole line (2km)
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing and supply the future growth from the existing area feeders: 24M4, 24M5, 24M7 and 24M8. The peaks of these feeders in summer 2018 were: 24M4 327A 24M5 402A 24M7 223A 24M8 204A Feeders 24M5 was over planning limit and feeder 24M4 is approaching the planning limit (400A). They have no extra capacity to supply new loads. Existing load over planning limits should be redirected to alternate supplies. Feeder 24M8 has additional capacity to supply new load or to take on redirected load. Feeders 24M4/24M7/24M8 combined have only 22 MVA capacity for future load growth. Feeder 24M7 supplies customers on the east side of 9th Line between Hwy 7 and Steeles Ave, and load on Reesor Rd between Steeles Ave and Major Mack Dr. The peak demand of 24M7 was 223A in 2018. The incremental capacity remaining in the feeder is insufficient to accommodate future growth in the area. In addition, feeder 24M7 is a rural feeder with a total trunk feeder length of 40 km. Alectra's typical urban feeder length average is 10km to 16 km. To continue to supply Cornell and Box Grove from the 24M7, as configured, will result in decreased reliability (long feeder length greatly exposes customers to higher than normal interruptions) and voltage drop issues as the feeder is loaded up. In summary, there is insufficient capacity to service the Cornell and Box Grove areas after 2023. New feeder capacity is required to supply load growth in the area beyond 2023. Several sections need to be built to route capacity to the Cornell area. This project is required to meet future growth. Based on status of Cornell development, additional 30 MW's is expected to be added to the system when it is fully developed. Two additional 27.6 kV feeders are required. Looping Alectra has adopted "Open Grid Network" planning philosophy, i.e., loop supply with normal open points. Under Status Quo, all existing supplies to Cornell and Box Grove are radial from 9th Line meaning that any pole failure on 9th Line will cause large scale and prolonged outages to the customers. It has been planned to form a double ccts 27.6kV loop around Cornell and Box Grove via 9th Line, 14th Ave, Hwy 7, Reesor Rd and 16th Ave.
	Alternative #1	Non- wires Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 20 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected.
	Alternative #2	Not applicable
	Justification for Recommended Alternative	Installing 4 circuits on 14th Ave from Hwy 48 to 9th Line will reroute feeder 24M3/24M6 from Hwy 48 to 9th Line to Box Grove area. Status Quo was not chosen for the following reasons: 1. Status Quo does meet long term supply to Cornell and Box Grove. The recommended alternative (Build 4 ccts on 14th Ave) was chosen for the following reasons: 1. It addresses the loading issue of Cornell and Box Grove both in the short and long term. 2. It reduces the risk of customer outages that might arise as a result of increasing loading on existing feeders. 3. It is consistent with the original Markham TS4 feeder integration plan and business case. This project is needed to provide 40 MVA supply capacity to Markham east and address the loading issue of Cornell and Box Grove both in the short and long term. This project will also reduce the risk of customer outages that might arise as a result of the long and rural feeder. Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Markham in time. Capital design will start the design of the project in advance and approvals should be in place in time. A large number of residential and commercial projects are under construction now. New customers and load are expected in the years to come.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	These two feeders are necessary to increase supply capacity to Cornell by 40 MVA. They will increase supply reliability too. All existing supplies to Cornell are radial from 9th Line, meaning that any pole failure on 9th Line will cause large scale and prolonged outages to the customers. This project will increase reliability of Cornell area and avoid blackout situation by supplying Cornell from Reesor Rd. These two feeders will allow loads to be supplied from both the east and west.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,039,021	$0	$0	$0	$0	$2,039,021	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

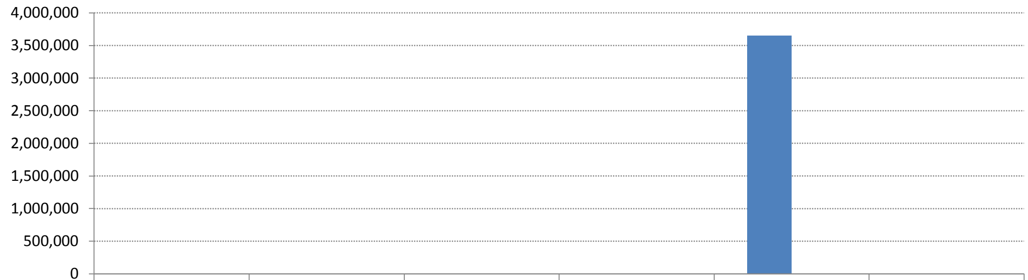
Project Code	100904
Project Name	Install Double Cct Pole Line on Major Mackenzie - Hwy 27 to Huntington Rd
Major Category	System Service
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	From Hwy 27 to Huntington Rd in Vaughan The schedule of this project will depend on YR road widening work of Major Mack Dr.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is to: 1. re-build existing single phase 4.8kV pole line into double 27.6kV ccts on Major Mack Dr from Hwy 27 to Huntington Rd 2. extend two ccts from on Major Mack Dr from Hwy 27 to Huntington Rd 3. supply existing customers and new developments along Major Mack from the new ccts.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by green field expansion. The vacant lands on both sides of Major Mack Dr are part of the The Vaughan Enterprise Zone. They will be developed and customers are expected in the coming years. There is one 4.8kV single phase cct on the west half of the section and there is one 27.6kV cct (1/0 AL) on the east half the section. They don't have sufficient capacity for future developments in the area. York Region is going to widen Major Mackenzie Drive from Hwy 27 to Huntington Rd, and further west to Hwy 50. Existing pole line has to be relocated due to road widening work. There is opportunity for Alectra to rebuild the existing single phase 4.8 kV cct to double 27.6kV ccts in conjunction with the pole line relocation project. Building 2 ccts in conjunction with the road widening project will reduce the cost and traffic impact. The Vaughan Enterprise Zone The Vaughan Enterprise Zone covers more than 3,800 acres, or approximately 1,566 hectares of employment land at Vaughan's western boundaries. The size of the enterprise zone makes it one of the largest employment areas in the Greater Toronto Area, and paired with transportation infrastructure in close proximity, potentially one of the most valuable employment areas in the province. The existing profile of the Enterprise Zone includes national head offices, international and national logistics and distribution centers, and some manufacturing. Overall, the area is projected to accommodate 60,000 jobs over the next 20 years. The estimated demand will be 90MW. CDM is considered and load forecast is net of CDM. The strength of the area is the existing transportation network that services it. Presently the employment area has direct access to Highway 407, as well as Highways 7, 27, and 50. In addition, Highway 427, which already connects to the Enterprise Zone, is planned to expand northward through the Enterprise Zone to Major Mackenzie Drive, opening up industrial and commercial opportunities north of Highway 7. All of these routes provide access to the Highway 401 corridor, which connects to the rest of Canada and important North American trade networks.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	This project will support ICI development in west Vaughan.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Capacity There is one single phase 4.8kV cct on Major Mack Dr between Huntington and Hwy 27. It does not have the capacity to supply Vaughan West Employment Area. Status Quo will jeopardize Alectra's obligation to supply new customers in Vaughan West Employment Area developments. The impact severity and timing will depend on the Vaughan West Employment Area development progressing. Reliability There is one single phase 4.8kV cct on Major Mack Dr between Huntington and Hwy 27. This does not conform to Alectra's adopted "Open Grid Network" planning philosophy, i.e., loop supply with normal open points. The Kleindor development (north east corner of Major Mack Dr and the railway track) is supplied from Hwy 27 through a radial underground cable. It has 622 customers, and 83 transformers or 4,575 kVA connected. Any failure on the cable will cause large scale and prolonged outages to the customers. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. Alectra will not be able supply all customers in Vaughan West employment developments when fully built. In addition, customers in Kleindor development will be on a radial supply. Supplying large number of customers in new developments radially violates Alectra's planning philosophy and good utility practice. Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI. Alectra will be at risk of compromising supply to new loads in Kleindor, and Vaughan west development areas that may have negative impacts on our corporate reputation and mission. Alectra is obligated to service future growth within its service territory using "good utility practice". Failure to provide adequate levels of service could lead to regulatory sanctions, and customer damage claims.
	Alternative #1	Non- wires Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs. For this project these options have not been considered as new feeders are needed to connect the customers to grid.
	Alternative #2	Not Applicable.
	Justification for Recommended Alternative	There is one single phase 4.8kV cct on Major Mack Dr between Huntington and Hwy 27. It does not have the capacity to supply Vaughan West. This project is required to supply new development on Major Mack between Hwy 27 and Huntington Rd. It includes following major future load growth areas in Vaughan are summarized below: West Vaughan Employment Area The West Vaughan Employment Area Secondary Plan sets out detailed policies to create a large economic opportunity for York Region. With over 500 hectares of employment designated lands, this area will continue to allow the City of Vaughan to attract a wide range of businesses requiring large tracks of land with excellent Regional road and provincial highway access. The Secondary Plan is planned to accommodate approximately 20,120 employees. There are 1,400 acres of vacant land on both sides of Major Mackenzie Drive that has been zoned as employment land. The potential load from these lands will be significant. The peak demand for this development is estimated to be 50MW to 80 MW when fully built out, but no time line is available at this time. Four 27.6kV feeders are required to supply the new load. This project improves the reliability situation mentioned in the status quo option. There is one single phase 4.8kV cct on Major Mack Dr between Huntington and Hwy 27. Alectra has adopted "Open Grid Network" planning philosophy, i.e., loop supply with normal open points. The Kleindor development is supplied from Hwy 27 through a radial underground cable, meaning that any pole failure on the cable will cause large scale and prolonged outages to the customers. Funding this project will enable Alectra to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing coordinated protections between source and load and having adequate backup capacity in the event of an outage. In the short term, this project increase supply reliability for Kleindor development. In the long term, a new transformer station VTS4 has been built in the Kirby and Kipling area and two new feeders from VTS4 will be extend to Hwy 27/Major Mack Dr area. This project will reroute the 40MVA capacity of VTS4 to supply Vaughan West development. The two ccts on Major Mack Dr serve as ties between ccts on Hwy 27 from VTS4 and ccts on Huntington Rd from Kleinburg TS. They will provide 60 MVA contingency capacity and will allow load transfer between transformer stations under contingency such as pole failures, TS failure, and transmission line outage. Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Vaughan and York Region in time. York Region is going to rebuild Major Mack Dr in advance. The pole line construction schedule will depend on road widening schedule. Capital design will work closely with the Region and City to coordinate the project.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.

Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
Identify any reliability, efficiency, safety or coordination benefits	It will also establish ties between feeders on Hwy 27 and feeders on Huntington Rd. It will also increase power supply reliability in the west part of Vaughan. This project will increase power supply reliability and reduce risk of prolonged outages. The project will provide for incremental feeder tie points between VTS3 and Kleinburg TS. It will improve the operational efficiency and effectiveness of these stations.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,650,586	$0	$0	$0	$0	$3,650,586	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

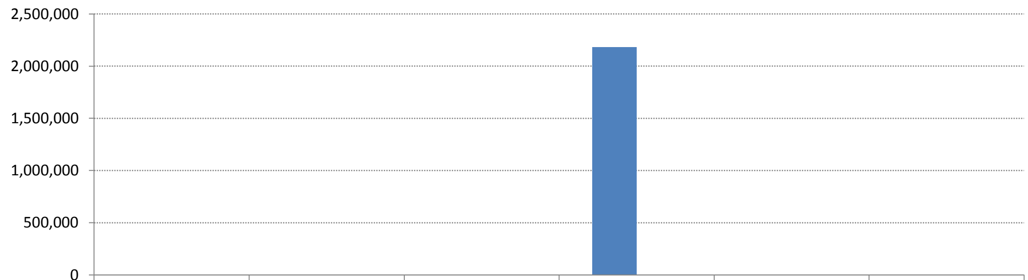
Currency scale is in literal

OEB Multi-Project Report

Project Code	100909	
Project Name	Rebuild 27.6 kV pole line for 4 Ccts on Warden Ave from Major Mack to Elgin Mills	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	On Warden Ave from Major Mack Dr to Elgin Mills Rd in Markham - 2 km
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	Rebuild the existing single cct pole line into 4 ccts, 2 ccts now and 2 ccts provision for future on Warden Ave from Major Mack Dr to Elgin Mills Rd in Markham - 2 km, and install several load interrupter switches as per Alectra design standard. This project is the third part of a multiple year project of rerouting two feeders 12M10/12M11 to Markham Future Urban Area. The first part is to add two ccts on Warden Ave from Hwy 7 to 16th Ave that has been completed in 2017. The second part is to extend the two ccts on Warden Ave f from 16th Ave to Major Mack Dr, and the fourth part is to extend 2 ccts on Warden Ave from Elgin Mills to 19th Ave. The total length is 8km from Hwy 7 to 19th Ave. The timing of the fourth part depends on the progress of the FUA development.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	High. Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by green field expansion in Markham FUA. The existing feeders supplying Markham north don't have sufficient capacity for future growth. The city of Markham is being supplied by nine 230/27.6 KV stations and 53-27.6KV feeders. The York Region recently issued the growth plans which account for approximately 613,900 new residents and 305,100 new jobs between 2016 and 2041.This growth is distributed throughout the York region. The city of Markham is working on an Official Planning Amendment which expands the Urban Area of the Town of Markham to provide opportunities for urban growth to the year 2031. The north Markham Future Urban Area covers about 1,288 hectares, or 3,183 acres, bordered by Major Mackenzie Drive to the south, the Hydro Corridor and Woodbine Avenue to the west, the northerly City limits and Elgin Mills Road to the north, and the Robinson Creek to the east. See attached for details. Approximately 675 hectares (1,668 acres) of developable lands are designated for future neighbourhoods, located primarily between Major Mackenzie Drive and Elgin Mills Road. Approximately 300 hectares (741 acres) located north of Elgin Mills Road are designated for employment uses. In total, the Future Urban Area is intended to accommodate approximately 12,000 residential units with a population of approximately 38,000 persons, and approximately 19,000 jobs. Based on 2.5kW per unit and 1.5kW per job, it is expected approx. 60 MW of new loads are expected on both sides of Warden Ave north of Major Mackenzie Dr. CDM is considered for all projects and load forecast is net of CDM. The existing feeders supplying Markham north don't have sufficient capacity to provide for future load growth.
	Customer Attachment / Load (KVA)	Not Applicable. The Future Urban Area is intended to accommodate approximately 12,000 residential units with a population of approximately 38,000 persons, and approximately 19,000 jobs. The expected load is 60MW. This project provide 40 MVA capacity.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	This provide 40 MVA capacity to area on Warden Ave north of Elgin Mills Rd. It will provide capacity for new residential and non-residential development in the FUA area.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build the proposed project), but to supply load growth from existing facilities. It will impact Alectra's distribution system capacity. Markham north is supplied by two feeders by 10M2 on Woodbine Ave and 12M1 on Warden Ave. Due to a cooler than normal summer weather in 2017, the peak in 2017 was 250A on 10M2 and 240A on 12M1. Each feeder has a capacity of 400A or 20 MVA. The total of these two feeders capacity is 800A (40MVA). There is only 310A or 15MVA capacity left on these two feeders for future development. A new development King Square on Woodbine Ave north of 16th Ave is under construction in 2017 and will add new 4MW (approx. 80A) to the system. A Power-to-Gas project (H2 plant) has been built in the Woodbine Ave/Elgin Mills area, and the estimated peak would be 2MW in 2018, and may go up to 5MW after 2020. They will be supplied by feeder 10M2. A development has also been proposed in the land south of 19th Ave and east of Woodbine Ave, and the estimated load is 10MW. The timeline is unknown at this time. Therefore, existing feeders 10M2 and 12M1 do not have sufficient capacity to supply new loads in the Hwy 404 North development and new urban expansion. In the meanwhile, feeders 12M10/12M11 end on Warden Ave just south of 16th Ave. They are very lightly utilized. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. It will cause feeder 10M2 and 12M1 overloading as the developments in Markham progress. Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI. Alectra is obligated to service future growth within its service territory using "good utility practice". Failure to provide adequate levels of service could lead to regulatory sanctions, and customer damage claims. Background The city of Markham is being supplied by nine 230/27.6 KV stations and 53-27.6KV feeders. The York Region recently issued the growth plans which account for approximately 613,900 new residents and 305,100 new jobs between 2016 and 2041.This growth is distributed throughout the York region.
	Alternative #1	Alectra load forecast is net of CDM and DG. Feeders are required to connect customers hence non wire alternative has not been considered for this investment.
	Alternative #2	Not applicable
	Justification for Recommended Alternative	This project includes following constructions: Re-build the single 27.6kV cct pole line into 4 ccts 27.6kV pole line on Warden Ave from Major Mack Dr to Elgin Mills Rd. Connect the new pole line to the existing ccts on Major Mack and Elgin Mills Install LIS switches as per PowerStream design standard This project will extend feeder 12M10/12M11 to Markham North and to increase supply capacity and reliability to Hwy 404 North area and FUA area north of Major Mack between Woodbine Ave and Kennedy Rd. York Region is working on an Official Planning Amendment which expands the Urban Area of the City of Markham to both sides of Warden Ave to provide opportunities for urban growth to the year 2031. The north Markham Future Urban Area covers about 1,288 hectares (3,183 acres bordered by Major Mackenzie Drive to the south, the Hydro Corridor and Woodbine Avenue to the west, the northerly City limits and Elgin Mills Road to the north, and the Robinson Creek to the east. Approximately 675 hectares (1,668 acres) of developable lands are designated for future neighbourhoods, located primarily between Major Mackenzie Drive and Elgin Mills Road. Approximately 300 hectares (741 acres) located north of Elgin Mills Road are designated for employment uses. In total, the Future Urban Area is intended to accommodate approximately 12,000 residential units with a population of approximately 38,000 persons, and approximately 19,000 jobs. It is expected approx. 60 MW of new loads are expected on both sides of Warden Ave north of Major Mackenzie Dr. Markham north is supplied by two feeders by 10M2 on Woodbine Ave and 12M1 on Warden Ave. Due to a cooler than normal summer weather in 2017, the peak in 2017 was 250A on 10M2 and 240A on 12M1. Each feeder has a capacity of 400A or 20 MVA. The total of these two feeders capacity is 800A (40MVA). There is only 310A or 15MVA capacity left on these two feeders for future development. For the new urban area, they expect to see building permit issued in 2019 and new houses in 2020. It is not clear where the development will start first, but the total distance is 8km from Hwy 7 to 19th Ave. Two new 27.6kV feeders are required for the Hwy 404 Development and urban expansion in Markham. The two feeders 12M10/12M11 have been planned to be rerouted to Warden Ave/Elgin Mills area to supply new growth in Markham north
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Markham and York Region in time. Capital Design will start the design of the project in advance and should get the approvals in place in time. Customers load ramping up schedule in Markham north area will impact the timing and priority.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.

Identify any reliability, efficiency, safety or coordination benefits	This project will increase supply reliability to Markham north. In the short term, the new ccts (12M10/12M11) will off load existing feeders 10M2, 12M4 and 12M1. They will reduce feeder exposure of existing feeders as well as number of customers on the feeders. As a result, they will increase supply reliability. Markham north area is supplied by feeders on Woodbine Ave. Pole line failure will cause extensive and prolonged outages. In the long term, this project will allow Markham North to be supplied from Woodbine Ave and Warden Ave. In case of pole line failure on Woodbine Ave, customers in Markham North will be supplied from Warden Ave, This project will also reduce line losses of existing feeders in the area by reducing loading on these feeders. It will increase system efficiency.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,180,514	$0	$0	$0	$2,180,514	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

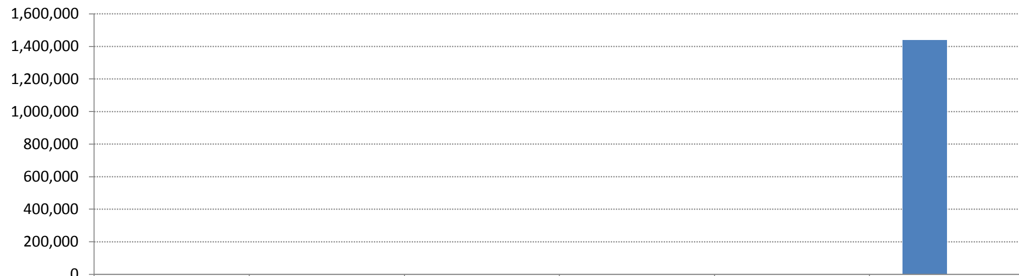
Project Code	100913	
Project Name	Pole Line Installation Double Cct on Major Mack - Huntington Rd to Hwy 50	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	On Major Mack Dr from Huntington Rd to Hwy 50 in Vaughan, approx. 2 km. This project depends on YR road widening work schedule.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	The objectives of this project is to install double a 27.6kV ccts pole line on Major Mack Dr from Huntington Rd to Hwy 50 in Vaughan, approx. 2km., install LIS at intersections, and connect the new ccts to the existing ccts on Hwy 50, and Huntington Rd.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by green field expansion. The vacant lands on both sides of Major Mack Dr are part of the The Vaughan Enterprise Zone. They will be developed and customers are expected in the coming years. There is one radial supply on Major mack Dr east of Hwy 50. It does not have sufficient capacity for future developments in the area. York Region is going to widen Major Mackenzie Drive from Hwy 27 to Huntington Rd, and further west to Hwy 50. Existing pole line has to be relocated due to road widening work. There is opportunity for Alectra to rebuild the existing single phase 4.8 kV cct to double 27.6kV ccts in conjunction with the pole line relocation project. Building 2 ccts in conjunction with the road widening project will reduce the cost and traffic impact. The Vaughan Enterprise Zone The Vaughan Enterprise Zone covers more than 3,800 acres, or approximately 1,566 hectares of employment land at Vaughan's western boundaries. The size of the enterprise zone makes it one of the largest employment areas in the Greater Toronto Area, and paired with transportation infrastructure in close proximity, potentially one of the most valuable employment areas in the province. The existing profile of the Enterprise Zone includes national head offices, international and national logistics and distribution centers, and some manufacturing. Overall, the area is projected to accommodate 60,000 jobs over the next 20 years. The estimated demand will be 90MW. CDM is considered and load forecast is net of CDM. The strength of the area is the existing transportation network that services it. Presently the employment area has direct access to Highway 407, as well as Highways 7, 27, and 50. In addition, Highway 427, which already connects to the Enterprise Zone, is planned to expand northward through the Enterprise Zone to Major Mackenzie Drive, opening up industrial and commercial opportunities north of Highway 7. All of these routes provide access to the Highway 401 corridor, which connects to the rest of Canada and important North American trade networks.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Reliability There is one radial single phase 4.8kV cct on Major Mack Dr between Huntington and Hwy 50. Customers on Major Mack Dr between Hwy 50 and Huntington Rd will be on a radial supply. Alectra has adopted "Open Grid Network" planning philosophy, i.e., loop supply with normal open points. Capacity There is one single phase 4.8kV cct on Major Mack Dr between Huntington and Hwy 50. It does not have the capacity to supply new customers on Major Mack Dr between Hwy 50 and Huntington Rd. It cannot supply development in Vaughan West area either. Status Quo will jeopardize Alectra's obligation to supply new customers in Vaughan west developments. The impact severity and timing will depend on the schedule of the Vaughan West development. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. Alectra will not be able supply all customers in Vaughan west developments when fully built. In addition, customers on Major Mack Dr between Hwy 50 and Huntington Rd will be on a radial supply. Supplying large number of customers in the new development area in radial violates Alectra's planning philosophy and good utility practice. Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI. Alectra will be at risk of compromising supply to new loads in Vaughan west areas that may have negative impacts on our corporate reputation and mission. Alectra is obligated to service future growth within its service territory using "good utility practice". Failure to provide adequate levels of service could lead to regulatory sanctions, and customer damage claims. Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner.
	Alternative #1	Non- wires Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs. For this project these options have not been considered as new feeders are needed to connect the customers to grid.
	Alternative #2	Not Applicable.
	Justification for Recommended Alternative	There is one radial supply on Major mack Dr east of Hwy 50. It does not have sufficient capacity to supply Vaughan West as well as development of the west side of Hwy 50 in Brampton. This project is required to supply new development on Major Mack between Hwy 50 and Huntington Rd. Future load growth areas in Vaughan are summarized below: Orlando Development A new development of 7 new buildings on the north west corner of major Mack and Hwy 50 in Brampton. The total area is 4.3 million square feet and the peak demand is expected to be 19.8MW. Based on distribution infrastructure, it seems more economical to supply these customers from Vaughan side. One 27.6kV feeder is required. West Vaughan Employment Area The West Vaughan Employment Area Secondary Plan sets out detailed policies to create a large economic opportunity for York Region. With over 500 hectares of employment designated lands, this area will continue to allow the City of Vaughan to attract a wide range of businesses requiring large tracks of land with excellent Regional road and provincial highway access. The Secondary Plan is planned to accommodate approximately 20,120 employees. There are 1,400 acres of vacant land on both sides of Major Mackenzie Drive that has been zoned as employment land. The potential load from these lands will be significant. The peak demand for this development is estimated to be 50MW to 80 MW when fully built out, but no time line is available at this time. Four 27.6kV feeders are required to supply the new load. This project improves the reliability situation mentioned in the status quo option. There is one single phase 4.8kV cct on Major Mack Dr between Huntington and Hwy 50. Alectra has adopted "Open Grid Network" planning philosophy, i.e., loop supply with normal open points. Funding this project will enable Alectra to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing coordinated protections between source and load and having adequate backup capacity in the event of an outage. In the short term, this project provides capacity for Vaughan west development. In the long term, a new transformer station VTS4 has been built in the Kirby and Kipling area and two new feeders from VTS4 will be extend to Hwy 27/Major Mack Dr area. This project will reroute the 40MVA capacity of VTS4 to supply Vaughan West development. The two ccts on Major Mack Dr serve as ties between ccts on Hwy 50 from VTS3 and ccts on Huntington Rd from Kleinburg TS. They will provide 60 MVA contingency capacity and will allow load transfer between transformer stations
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Vaughan and York Region in time. York Region is going to rebuild Major Mack Dr in advance. The pole line construction schedule will depend on road widening schedule. Capital design will work closely with the Region and City to coordinate the project.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.

Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
Identify any reliability, efficiency, safety or coordination benefits	This project will also establish ties between feeders on Hwy 50 and feeders on Huntington Rd. It will also increase power supply reliability in the west part of Vaughan. This project will increase power supply reliability and reduce risk of prolonged outages. The project will provide for incremental feeder tie points between VTS3 and Kleinburg TS. It will improve the operational efficiency and effectiveness of these stations.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,439,439	$0	$0	$0	$0	$0	$1,439,439
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	100924
Project Name	Install two additional 27.6 kV ccts on Hwy 7 from Jane St to Weston Rd
Major Category	System Service
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	Situated on Hwy 7 from Jane St to Weston Rd in Vaughan - 2km
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is to reroute two 27.6kV feeders (21M3 & 21M4) to supply new load in Vaughan Metro Center (VMC) in conjunction with York Region's Hwy 7wideing project. The project objectives will be achieved by rebuilding the existing pole line on Hwy 7 between Weston Rd and Jane St from 2 ccts into 4 ccts, in overhead or in underground duct bank, or combination of above options. It will be determined in the design stage and coordinate with York Region's Hwy 7 widening work and the City of Vaughan's urban design plan. There is an existing 2 ccts overhead pole line between Jane St and Weston Rd. The existing poles have to be relocated from east side of Hwy 400 to Weston Rd including the Hwy 400 crossing due to York Region’s Hwy 7 widening project in 2017 and 2018. To accommodate future 2 ccts, additional pole height and additional ducts are required. As a result, Phase 1 of the project has to be built in 2018, i.e., build 2 additional ccts for the Hwy 400 crossing in conjunction with York Region's Hwy 7 widening project.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Very high. Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by intensification and redevelopment in VMC. This project will be built in conjunction with Hwy 7 widening project in the area. The development of VMC is underway. New capacity is required as the development progresses. Vaughan Metro Center (VMC) Vaughan Tomorrow is the City’s growth management strategy, which has led to a new city-wide Official Plan and this Secondary Plan for the VMC. The Vaughan Tomorrow process, which involved extensive public outreach over two years, confirmed the objective to develop the Vaughan Metropolitan Centre as a vibrant and thriving downtown for the city. The new Official Plan for the city establishes the boundaries for the VMC and, in doing so, divides the former Vaughan Corporate Centre area into three distinct places within the overall city structure. Lands west of Highway 400 within the former VCC, centred at Weston Road and Highway 7, are identified as a Primary Centre. The VMC extends from Highway 400 to Creditstone Road at its most easterly edge, with Portage Parkway and Highway 407 remaining the northern and southern boundaries, respectively. And lands east of Creditstone (and on both sides south of Highway 7) are designated an Employment Area. City of Vaughan Official Plan states that the VMC will comprise distinct development precincts including residential neighbourhoods, office districts, employment areas and mixed-use areas, all linked by a robust system of parks, squares and open spaces and a fine grain grid pattern of streets. It establishes growth targets for the VMC of 12,000 residential units and 6,500 new jobs by 2031. And it states as a policy that the City shall encourage and facilitate the establishment of the following in the VMC: • major offices; • government offices; • post-secondary educational institutions; • cultural facilities; • public institutions; • major civic public spaces and parks; • socially diverse residential neighbourhoods that contain a mix of housing types, including
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	This project will support development of VMC.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)

Status Quo

The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in following aspects:

Capacity
Vaughan Metro Center (VMC) is supplied by two feeders 21M5 and 21M11 from VTS2. The peak of VTS2 was 133 MW in 2016 and only 20MW capacity left before it reaches the 10 day Limited Time Rating (LTR) of 153 MW. VTS4 will be in service in 2017 and will off load VTS2 so that will have extra capacity to supply new loads in the VMC development (approx. 80MW).

As of 2016, there are four feeders supplying area: 21M5, 21M11, 20M19, and 20M20. The peak demands of these feeders were:

21M5	188A
21M11	252A
20M19	367A
20M20	333A

There is only 23MVA capacity left on these 4 feeders. To meet the load growth in VMC, more feeders are required in VMC area. As per VTS4 feeder integration plan, two feeders from VTS4 will off load existing feeder 21M3 and 21M4 from VTS2 so that they can be used to supply new growth in VMC area (40MVA).

In additional, two other feeders 20M17 and 20M18 will be off loaded and supply VMC too (40 MVA).

Status Quo will cause existing feeders to exceed their loading limits under 1-in-10 weather (extreme summer temperatures) in the long term. The impact severity and timing will depend on the schedule of the VMC development.

There are no specific costs with the status quo, there are financial risks that are detailed in the risk section.

Four existing feeders supplying VMC area don't have sufficient capacity to supply VMC that is expected to have 80MW once fully developed.

Operating feeders over loading guide line violates Alectra's planning philosophy and good utility practice.

Alternative #1

Non- wires

Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs .

Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 20 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected.

Alternative #2

Not Applicable.

Justification for Recommended Alternative

The recommended alternative (Install two additional 27.6 kV ccts on Hwy 7 from Jane St to Weston Rd) was chosen for the following reasons:
• it improves the reliability situation mentioned in the status quo option
• it will increase supply capacity to VMC.
• it will meet the immediate need for supply capacity.
• it is consistent with the VTS4 feeder integration plan

The project objectives are to re-route two 21M3& 21M4 27.6kV ccts from Weston Rd/Hwy 7 east to Jane St/Hwy 7 area, and to install switches or switchgear where required. This is required to supply the Vaughan Metro Center development that is estimated to have a peak demand of 80 MW when fully built out.

As of 2016, there are four feeders supplying area: 21M5, 21M11, 20M19, and 20M20. The peak demands of these feeders were:

21M5	188A
21M11	252A
20M19	367A
20M20	333A

There is only 23MVA capacity left on these 4 feeders. To meet the load growth in VMC, more feeders are required in VMC area. As per VTS4 feeder integration plan, two feeders from VTS4 will off load existing feeder 21M3 and 21M4 from VTS2 so that they can be used to supply new growth in VMC area (40MVA).

To meet the load growth in VMC, more feeders are required in VMC area. As per VTS4 feeder integration plan, two feeders from VTS4 will off load existing feeder 21M3 and 21M4 from VTS2 so that they can be used to supply new growth in VMC area (40MVA). In additional, two other feeders 20M17 and 20M18 will be off loaded and supply VMC too (40 MVA).

This project is needed to add 40 MVA supply capacity for the new development in VMC area.

Funding this project will enable PowerStream to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing coordinated protections between source and load and having adequate backup capacity in the event of an outage

6. General Information on the Project/Activity (OEB)

Risks to Completion and Risk Management

York Region is working on the design of Hwy 7 widening from Hwy 400 to Pine Valley Dr. The Hwy y widening schedule will dominate the schedule of this project.

The risk is to get approval from the City of Vaughan and York Region in time. Capital design will start the design of the project and should get the approvals in place in advance.

Project management will be applied to ensure the project is completed on time and on budget.

Comparative Information on Equivalent Historical Projects (if any)

Alectra has built many 4 ccts pole lines in the past. The cost estimate is based on actual cost of project in the past.

Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)

0

7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	This project will increase supply capacity to VMC by 40 MVA. It will also increase supply reliability too. This project will increase power supply reliability and reduce risk of prolonged outages. The completion of this project will allow for VTS2 to adequately supply new developments in VMC. The project will provide for incremental feeder tie points between VTS2 and VTS1, Finch TS. It will improve the operational efficiency and effectiveness of these stations. Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions.

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,620,083	$0	$0	$0	$0	$2,620,083	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	101036	
Project Name	Install a new 4 ccts CNR yard overhead crossing on the south side of Hwy 7	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	on the south side of Hwy 7 crossing CN Yard between Keele St and Jane St in Vaughan
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project will create a new 4 ccts CN yard overhead crossing on the south side of Hwy 7. It will allow 4 more new 27.6kV ccts to be extended from Keel St to Jane St to increase supply capacity to Vaughan Metro Center (VMC) and Vaughan Mills. This project will also increase supply reliability to VMC and Vaughan Mills since all supplies to VMC/Vaughan Mills will be on both sides of Hwy 7. Any pole failure on the north side of Hwy 7 will only affect 4 ccts on the north side. The ccts on the south side of Hwy 7 will continue to operate through the new crossing on the south side of Hwy 7.
	Main Driver - System Service	Reliability
	Priority and Reasons for Priority	High This project allow VMC to be supplied on both sides of Hwy 7 crossing CN yard. This will mitigate the outage impacts due to increasing effect of adverse weather events. This project will increase supply reliability to VMC and Vaughan Mills since all supplies to VMC/Vaughan Mills will be on both sides of Hwy 7. Any pole failure on the north side of Hwy 7 will only affect 4 ccts on the north side. The ccts on the south side of Hwy 7 will continue to operate through the new crossing on the south side of Hwy 7.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not applicable
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	This project will also increase supply capacity to VMC and Vaughan Mills. It will support residential and commercial developments in these areas.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Capacity The number of 27.6kV ccts will be limited to 4 due to one crossing on the north side of Hwy 7, .i.e., it will limit supply capacity to VMC and Vaughan Mills. If the crossing fails, it will result in outage to 4 heavily loaded feeders for prolonged time. The total demand is approx. 80 MVA in the summer. There are four 27.6kV feeders on the north side of Hwy 7 crossing CN yard: 20M17/ 20M18/ 20M19/ 20M20. The peaks of these feeders in 2017 were: 20M17 375A 316 customers 20M18 422A 748 customers 20M19 294A 308 customers 20M20 404A 1,039 customers Feeder 20M17/20M18 supply Vaughan Mills. 20M17 also supplies the new VMC subway station that went into service after 2017 summer peak. Both 20M17 and 20M18 are at the capacity now. Feeder 20M20 has reached its capacity of 400A. The peak on 20M19 was 294A, but a few condos are under construction and will be supplied by 20M19 too. 20M19 will reach its capacity of 400A soon too. The VMC development on the west side of Jane St will be supplied by feeder 21M5/21M11 and two new future feeders from Weston Rd to Jane St. The VMC developments on the east side of Jane St are supplied by feeder 20M19/20M20 only, but they will reach the capacity soon. New capacity is required in 2022. Alectra will be at risk of compromising supply to new loads in the VMC area that may have negative impacts on our corporate reputation and mission. The load to be impacted is estimated to be 80MW ultimately. Reliability There are four 27.6kV feeders on the north side of Hwy 7 crossing CN yard: 20M17/20M18/20M19/ 20M20. Any pole failure on the will result in outage to these four feeders that supply VMC and Vaughan Mills. Customers may experience outages under contingency as described above. This will negatively impact SAIDI and SAIFI in the long term.

Alternative #1

Non- wires

Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs

Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required.   Based on typical capacity of 20 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected.

Alternative #2

Not applicable

Justification for Recommended Alternative

This project will provide four circuits on the south side of Hwy 7 that will provide an additional 80 MVA supply capacity to VMC development and Vaughan Mills. Without the use of these ccts, staying with the status quo will jeopardize the operational efficiency and reliability of this area.

In the short term, this project reduces number of ccts on the crossing on the north side of Hwy 7.

As of 2017, there are four 27.6kV ccts on Hwy 7 between CN yard and Jane St. They supply customers in VMC and Vaughan Mills. However, there are two 4 ccts pole line on Hwy 7 east of CN yard crossing. As part of York Region's Hwy 7 widening project, existing pole line on Hwy 7 between Keele St and Jane has been relocated and rebuilt. Two 4 ccts pole line are also installed on Hwy 7 west of CN yard crossing. There are 8 ccts on Hwy 7 on both sides of CN crossing. The total ccts supplying VMC and Vaughan Mills are limited to four due to only one 4 ccts pole line crossing CN yard on the north side of Hwy 7.

This implies that total of four more 27.6kV ccts can be extended from Keele St/Hwy 7 to Jane St/Hwy for capacity and reliability in the future if a new 4 ccts pole line crossing CN yard on the south side of Hwy 7.

In addition to 20M17/20M18/20M19/20M20, there are four 27.6kV feeders on Hwy 7 east of the CN yard: 20M7/20M8/20M15/20M16. The peaks of these feeders were in 2017:

20M7   300A
20M8   160A
20M15   160A
20M16   260A

There are 720A or 36MVA capacity left on these feeders that can be rerouted to supply VMC. More capacity can be freed up on these feeders if needed by feeder reconfiguration.

This project will also increase supply reliability to VMC and Vaughan Mills since supplies to VMC/Vaughan Mills will be on both sides of Hwy 7. Any pole failure on the north side of Hwy 7 will only affect 4 ccts on the north side. The ccts on the south side of Hwy 7 will continue to operate through the new crossing on the south side of Hwy 7.

The existing supplies to VMC area all cross CN Yard on the north side of Hwy 7. Any pole failure on the north side of Hwy 7 will interrupt 80MVA load and 2,411 commercial/residential customers. Replacement of a failed pole can take up to 8 hours. This project will allow supplies to cross CN yard on the south side of Hwy 7 too. It will increase reliability

6. General Information on the Project/Activity (OEB)

Risks to Completion and Risk Management

The risk is to get approval from the City of Vaughan, York Region as well CN Rail in time.
Capital design will start the design of the project in advance and should get the approvals in place in time.

Comparative Information on Equivalent Historical Projects (if any)

Not applicable

Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)

0

7. Category-Specific Requirements for Each Project/Activity (OEB)

Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable

Not applicable

Regional Electricity Infrastructure Requirements which affect Project, if applicable

Not applicable

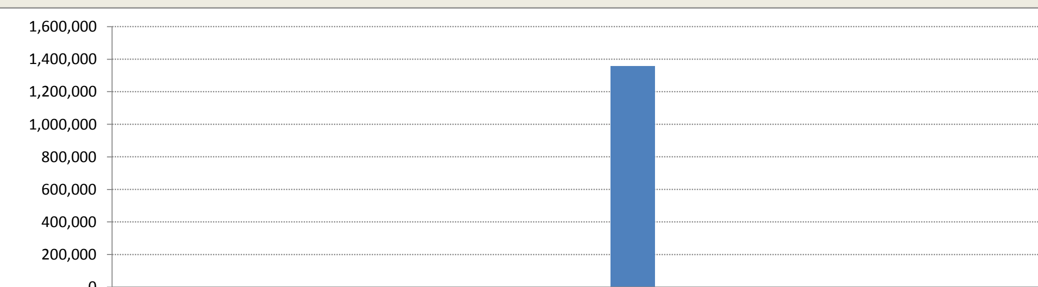
Description of Incorporation of Advanced Technology, if applicable

Not applicable

Identify any reliability, efficiency, safety or coordination benefits

In the short term, this project reduces number of ccts on the crossing on the north side of Hwy 7. The existing supplies to VMC area all cross CN Yard on the north side of Hwy 7. This project will allow supplies to cross CN yard on the south side of Hwy 7 too. It will increase reliability and operation flexibility since pole line failure at the crossing will not affect all the feeders.

In the long term, this project will provide 80 MVA for load growth in VMC development and Vaughan Mills.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,357,417	$0	$0	$0	$1,357,417	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

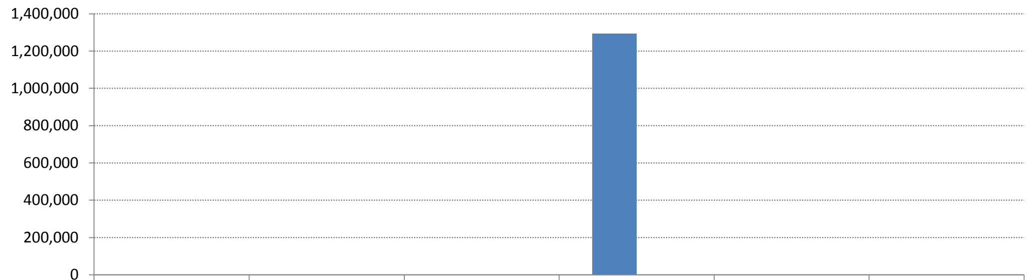
Currency scale is in literal

OEB Multi-Project Report

Project Code	101480	
Project Name	Build double ccts 27.6kV pole line on 19th Ave between Leslie St and Bayview Ave	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	On 19th Ave between Leslie St and Bayview Ave in Richmond Hill
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is to build 2 ccts pole line on 19th Ave from Leslie St to Bayview Ave to supply new development in Leslie North that is bounded by Elgin Mills Rd, Leslie St, 19th Ave and Bayview Ave).
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	High. Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by greenfield development. The Town of Richmond Hill is supplied by two 230/27.6 KV transformer stations (RH-TS1/RH-TS2) in Richmond Hill and 6-27.6KV feeders from Buttonville transformer station in the City of Markham. The York Region recently issued the growth plans which projects approximately 613,900 new residents and 305,100 new jobs between 2016 and 2041.This growth is distributed throughout the York region. The North Leslie planning area is bounded by 19th Avenue to the North, Hwy 404 to the east, Elgin Mills Road to the south and Bayview Avenue to the west. he Leslie North development may accommodate approximately 6,250 housing units with a population of approximately 19,300 people and employment of approximately 3,200 jobs. See the attachment for more details. Based on 2.5kW per unit and 1.5 kW per job (based on 300 sq.ft per no-retail job and 5W/sq.ft), the total demand would be 20 MW. CDM is considered and load forecast is net of CDM. There is no feeder on 19th Ave so new pole line is required. The development of subdivision in Leslie North has started in 2016. There will be new houses along 19th Ave between Bayview Ave and Leslie St as the subdivision secondary plan, however, there is no pole line now. Without new feeders, the ability to supply new loads will be significantly constrained. The primary driver for this Investment is to support capacity delivery for the new development in the Leslie North Area. The progress of the Leslie North development impact the loading of the feeders. There is no feeder on 19th Ave between Leslie St and Bayview Ave.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	This project will supply new residential development in Leslie North area.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Reliability There is no pole line on 19th Ave between Leslie St and Bayview Ave. There is one feeder on Leslie St between Elgin Mills Ed and 19th Ave, but it is a radial supply. Any pole failure on Leslie St between Elgin Mills Ed and 19th Ave will cause prolonged outages to customers in the Leslie North development area. Capacity There is no pole line on 19th Ave between Leslie St and Bayview Ave. The peak demand for this Leslie North development is estimated to be 20MW when fully built out, but no time line is available at this time. Two 27.6kV feeders are required to supply the new load because the existing feeders supply also other load south of this development too. These customers will be supplied from circuits surrounding the development, but there is no feeder on 19th Ave to supply new loads in the Leslie North development Area. Status Quo will jeopardize Alectra's obligation to supply new customers along 19th Ave. The impact severity and timing will depend on the schedule of the Leslie North development. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. Alectra will not be able supply customers along 19th Ave. In addition, customers on Leslie St between Elgin Mills Rd and 19th Ave will be on a radial supply. Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI. Alectra will be at risk of compromising supply to new loads in Leslie North areas that may have negative impacts on our corporate reputation and mission. Alectra is obligated to service future growth within its service territory using "good utility practice". Failure to provide adequate levels of service could lead to regulatory sanctions, and customer damage claims. Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner.
	Alternative #1	Non- wires Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs. For this project these options have not been considered as new feeders are needed to connect the customers to grid.
	Alternative #2	Not applicable
	Justification for Recommended Alternative	This project includes following constructions: • build double ccts 27.6kV pole line on 19th Ave between Leslie St and Bayview Ave • connect the new pole line to the existing ccts on Leslie St and Bayview Ave • install LIS switches as per Alectra (PowerStream) design standard. Status quo was not chosen for the following reasons: • Status Quo does not address risks to the reliability of customers in Leslie North and does not meet system needs for supply capacity The recommended alternative (Build double ccts 27.6kV pole line on 19th Ave between Leslie St and Bayview Ave) was chosen for the following reasons: • It improves the reliability situation mentioned in the status quo option • It will increase supply capacity to Leslie North. • It will meet the immediate need for supply capacity. Funding this project will enable Alectra(PowerStream) to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing coordinated protections between source and load and having adequate backup capacity in the event of an outage. They will provide 40 MVA supply capacity for Leslie North. The two ccts on 19th Ave serve will serve as ties between ccts on Leslie St from Buttonville TS and ccts on Bayview Ave from Richmond Hill TS. They will provide 60 MVA contingency capacity and will allow load transfer between transformer stations under contingency such as pole failures, TS failure, and transmission line outage. This project will increase power supply reliability and reduce risk of prolonged outages. The project will provide for incremental feeder tie points between Buttonville TS and Richmond Hill TS. It will improve the operational efficiency and effectiveness of these stations. Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the Town of Richmond Hill in time. The other risk the 19th widening work schedule may impact the pole line construction. Alectra will work with the town to coordinate the schedule.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.

Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
Identify any reliability, efficiency, safety or coordination benefits	This project will increase power supply reliability and reduce risk of prolonged outages. The project will provide for incremental feeder tie points between Buttonville TS and Richmond Hill TS. It will improve the operational efficiency and effectiveness of these stations.



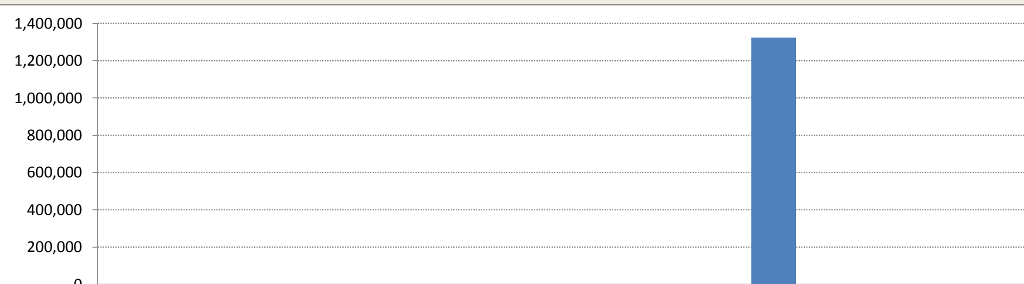
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,292,645	$0	$0	$0	$1,292,645	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	101487	
Project Name	Add one Additional 27.6 kV Cct on Major Mack Dr and 9th Line	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	Major Mack Dr from 9th Line to the west in Markham. on 9th Line from Major Mack to the south in Markham.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is to: -add one 27.6kV cct on Major Mack from CNR to 9th Line, approx 1.3 km. -add one cct on 9th Line from Bur Oak Ave to Major Mack Dr -install LIS' at intersection as per Alectra's standard. This project is to establish another tie between two ccts on Major Mack and 9th Line. The purpose is to form a supply loop and a new tie between Buttonville TS and MTS2.
	Main Driver - System Service	Reliability
	Priority and Reasons for Priority	A radial feeder is defined as a circuit or a portion of a circuit that feeds a customer(s) with no normal connection to any other supply. This is typical of long rural lines with isolated load areas. There are no pure radial feeders in Alectra. All of Alectra's feeders have normal open ties with other feeders. Most customers can be supplied from different directions (paths) by changing normal open points. However, in some areas, there is only one path between any customer and the source of supply. There are two ccts 12M1/12M3 on Major Mack Dr east of Hwy 48, but only one cct 12M3 goes all the way to 9th Line. The second cct stops half way and is a radial supply. There are two ccts 24M4/24M5 on 9th Line north of 16th Ave, but only one cct 24M4 goes all the way to Major Mack Dr. The second cct stops half way and is a radial supply. This implies that feeder 24M4/24M5 are backed up by the same feeder 12M3. Additional cct will allow 12M1 to back up feeder 24M5. It will allow customers on 24M4/24M5 to be restored faster in case outage on 24M4/24M5.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Customers on Major Mack Dr between Hwy 48 and 9th Line are on a radial supply. Customers on radial supplies will experience longer outages when components of the radial feeder fail since there are no alternate paths to supply the affected customers. The longer the radial feeder and the more customers, the more severe the impact will be. The status quo option currently does not meet Alectra's "Open Grid Network" philosophy for this area. Existing and future urbanization in the area necessitates the need for additional feeders and grid reconfiguration in this area. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. Alectra will be at risk of compromising supply reliability to customers in the area that may have negative impacts on our corporate reputation and mission. Alectra is obligated to service future growth within its service territory using "good utility practice".
	Alternative #1	Alectra Utilities has considered solar and storage options and determined that this option is not economical for the capacity that is required. Based on typical loading of 15-20 MW per feeder the cost of non-wire alternatives would significantly higher that of traditional solution.
	Alternative #2	Not Applicable.

	Justification for Recommended Alternative	This project is to establish ties between two ccts on Major Mack and 9th Line. This project will form 27.6kV feeder loops in the area and also reduce the risk of customer outages that might arise as a result of radial feeders in that area. A radial feeder is defined as a circuit or a portion of a circuit that feeds a customer(s) with no normal connection to any other supply. This is typical of long rural lines with isolated load areas. There are no pure radial feeders in Alectra. All of Alectra's feeders have normal open ties with other feeders. Most customers can be supplied from different directions (paths) by changing normal open points. However, in some areas, there is only one path between any customer and the source of supply. There are two ccts 12M1/12M3 on Major Mack Dr east of Hwy 48, but only one cct 12M3 goes all the way to 9th Line. The second cct stops half way and is a radial supply. There are two ccts 24M4/24M5 on 9th Line north of 16th Ave, but only one cct 24M4 goes all the way to Major Mack Dr. The second cct stops half way and is a radial supply. Funding this project will enable Alectra to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing adequate backup capacity in the event of an outage. This project will form 27.6kV feeder loops in Cornell area and also reduce the risk of customer outages that might arise as a result of radial feeders in that area. This project will eliminate radial supply on existing customers and provide better reliability for new customers/developments along Major Mack Dr.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Markham in time. Capital design will start the design of the project in advance and should get the approvals in place in time. Reliability performance of the existing feeders will affect the timing and priority.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	This project will form 27.6kV feeder loops in Cornell area and also reduce the risk of customer outages that might arise as a result of radial feeders in that area. This project will eliminate radial supply on existing customers and provide better reliability for new customers/developments along Major Mack Dr. This project will eliminate radial supplies on Major Mack Dr between Hwy 48 and 9th Line and enhance and improve power supply reliability in Markham East.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,324,981	$0	$0	$0	$0	$1,324,981	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

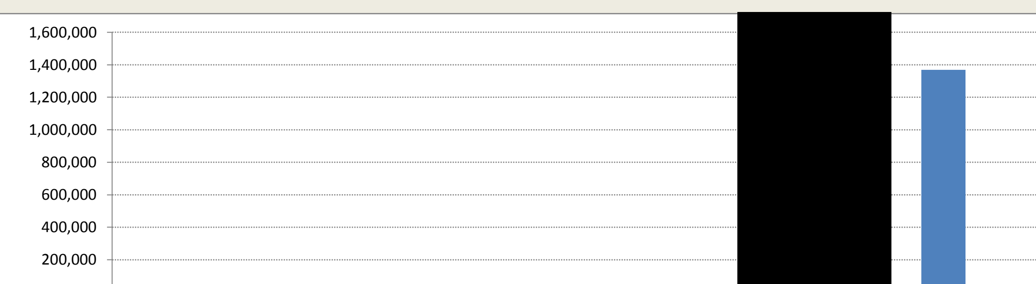
Currency scale is in literal

alectra utilities

OEB Multi-Project Report

Project Code	101542	
Project Name	New Barrie 20MVA Substation - Harvie	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Harvie Rd and Veterans Drive, Barrie
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Stations)
	Alectra Subcategory	Station Capacity Projects
4. Evaluation Criteria (OEB)	Project Summary	The project entails the purchase of a station site in the vicinity of Harvie Road and Veterans Drive in Barrie, and constructing a new 44/13.8kV, 20MVA, 4-feeder municipal substation. The project includes engineering design, purchase of station equipment, approvals, substation construction, equipment installation, and commissioning.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Growth projections provided by the City of Barrie indicate that 2,120 residential units and approximately 26 MVA of industrial and commercial developments will be completed over the next ten years. Following the completion of these developments, MS305, MS308 and MS303 are projected to exceed ONAN ratings during summer peak in 2020, 2021, and 2023 respectively. Also, MS305 and MS308 will exceed single-stage fan ONAF ratings during summer peak in 2023 and 2027 respectively. Alectra Utilities requires to prepare the distribution system to address the system capacity needs driven by these developments.
	Customer Attachment / Load (KVA)	Total new connected load of 31,300 kVA by 2027.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo will result in MS305, MS308 and MS303 exceeding ONAN ratings during summer peak in 2021 following the completion of 2,120 residential homes and 26 MVA of industrial and commercial developments along Bryne Drive, Big Bay Point Road, and Mapleview over the next 10 years. MS305 and MS308 will exceed single-stage fan ONAF ratings during summer peak in 2023 and 2027 respectively. Note that CDM is considered for all projects and the load forecast is net of CDM. For these reasons the status quo is not being recommended.
	Alternative #1	Non Wires- Alectra Utilities' load forecast process considers the impact of CDM and distribution generation, which is accounted for as part of the load forecast underpinning the Stations Capacity portfolio. Alectra Utilities has also considered other options, such as battery storage, and determined that these options will not meet the load growth and contingency conditions for the station. Wires Alternative 1 consists of constructing three new 13.8kV feeders for integration between MS302 to MS305, MS303 to MS301, and MS308 to MS303. The existing network configuration has only a single feeder integration between each respective substation, thereby limiting the transfer capacity during contingency conditions. Each proposed pole line is described below. MS302 to MS305: A new 13.8kV feeder from MS302 running north along Bayview and then west along Mapleview to reach Veterans for integration with the existing MS305 13.8kV feeders along Mapleview. MS303 to MS301: Double circuit a new 13.8kV circuit with the existing MS303-F3 north along Ferndale to Sunnidale and then east along Sunnidale for integration with the existing MS301 13.8kV feeders. MS308 to MS303: A new 13.8kV feeder from the intersection of Bayview and Big Bay Point Road, west past the Highway 400 crossing to reach Veterans and then north along Veterans to Ferndale at Essa for integration with the existing MS303 13.8kV feeders. It should be noted that the three proposed 13.8kV feeders will increase the number of interconnections between substations and thereby increase the contingency transfer capacity. Performing load transfers between existing stations (including the new 20MVA Painswick MS) will result in approximately 75% loading at MS303 and MS305, with all adjacent stations being loaded at 80% or greater. With additional load from the Park Place and Big Bay Developments the substation loading will increase beyond 80%. Assuming that the load can be distributed between MS308, MS305 and MS302, it is assumed that the ONAN rating at MS302, MS304, and MS307 will be exceeded. Considering the possible addition of another 20MVA from the industrial subdivision zoning in the area, the proposed three 13.8kV feeders and subsequent transfers between substations will not be sufficient to address exceeding the substation ONAN

	Alternative #2	Constructing a new 44-13.8kV, 20MVA, 4-feeder substation in the vicinity of Harvie Road and Veterans Drive will provide up to 33.2 MVA of 13.8 kV capacity (dual-stage fan ONAF/ONAF configuration) to supply the industrial and commercial development along Bryne Drive, Big Bay Point Road, and Mapleview Drive
	Justification for Recommended Alternative	South-west Barrie is currently supplied by five 13.8 kV municipal stations: MS302, MS303, MS305, MS308, and MS307. The first four substations have each a 20 MVA transformer with dual-stage fans with ONAN and ONAF ratings of 26.6 MVA and 33.2 MVA respectively. MS307 is a 10MVA substation with dual-stage fans with ONAN and ONAF ratings of 13.3 MVA and 16.6 MVA respectively. Growth projections provided by the City of Barrie indicate that 2,120 residential units and approximately 26 MVA of industrial and commercial developments will be completed over the next ten years. Following the completion of these developments, MS305, MS308 and MS303 are projected to exceed ONAN ratings during summer peak in 2020, 2021, and 2023 respectively. Also, MS305 and MS308 will exceed single-stage fan ONAF ratings during summer peak in 2023 and 2027 respectively. The ability to transfer load from MS303 to MS301 is limited due to there being only one existing feeder interconnection between both substations. Voltage drop issues would also arise in load transfer scenarios, given the long 7.1 km distance between MS303 to MS301. Voltage drop can cause significant issues for industrial customers, since equipment in a facility can trip due to low voltage resulting in outages and lost productivity. In recent years, load transfers have been carried out from MS305 to MS308; however, any additional transfers to MS308, coupled with the new load from ongoing commercial developments, will contribute to MS308 exceeding its ONAF single-stage fan rating of 26.6 MVA. Constructing a new 44-13.8kV, 20MVA, 4-feeder substation in the vicinity of Harvie Road and Veterans Drive will provide up to 33.2 MVA of 13.8 kV capacity (dual-stage fan ONAF/ONAF configuration) to supply the industrial and commercial development along Bryne Drive, Big Bay Point Road, and Mapleview Drive over the next ten years, as well as capacity for 2,120 new residential homes in South Barrie. Also, the new substation will provide capacity relief to both MS305 and MS308 while providing backup supply to the neighboring substations under contingency conditions, thereby ensuring compliance with the planning criteria for single contingency (N-1) operations.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The greatest risk to completion is securing the required land in the vicinity of Harvie Road and Veterans Drive in Barrie. The area surrounding the proposed site is fast being developed and there is a risk that the property cost will rise and/or the preferred site will not be available which will mean additional line (44kV and 13.8kV) costs will be incurred.
	Comparative Information on Equivalent Historical Projects (if any)	Painswick South MS, a new 44/13.8kV 20MVA, 4-feeder substation in Barrie, was completed and energized at the end of 2015. There was difficulty locating and securing available land for the substation, resulting in the purchase and demolition of two residential homes in order to secure a property. The project highlighted the importance of identifying and purchasing property as early as possible to ensure it is available when a new substation is required.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	The new substation will provide reliability benefits by providing the required capacity for the proposed future developments in the area and providing the required back-up capability during contingency conditions.



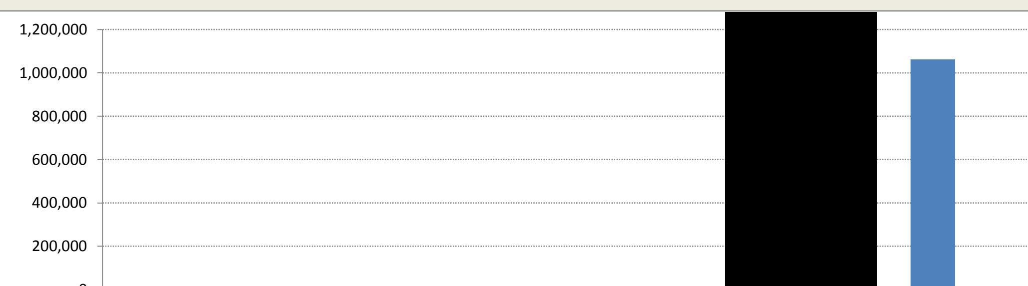
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,185,214	$0	$0	$0	$0	[redacted]	$1,369,368
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	101569	
Project Name	New Alliston 10MVA Substation - Industrial Parkway	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Dufferin St and Industrial Pkwy area, Alliston.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Stations)
	Alectra Subcategory	Station Capacity Projects
4. Evaluation Criteria (OEB)	Project Summary	The project entails the purchase of a station site in the vicinity of Dufferin St and Industrial Pkwy in Alliston, and constructing a new 10MVA, 44/13.8 kV, dual-stage fan, 4-feeder municipal substation. The project includes engineering design, purchase of station equipment, approvals, substation construction, equipment installation, and commissioning.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Growth projections obtained from the Town of New Tecumseth indicate that a 56-hectare industrial and commercial development (Westerly ICI) is planned to be completed within six years in the vicinity of Dufferin Street and Industrial Parkway. Another 30 hectares industrial and commercial development (Easterly ICI) is proposed to be developed over four years in the vicinity of Theatre Road and Industrial Parkway. A total of 2,680 residential homes are to be completed in the Alliston area over from 2019-2023. Upon completion of the developments, MS331-T2 will exceed its 10 MVA ONAN nameplate rating in 2020, and its 13.3 MVA ONAF maximum rating in 2023. In addition, Alliston is projected to experience a total of 37.6 MVA in 13.8 kV station load. This load would exceed the system's contingency capacity of 26.6 MVA upon loss of one large 13.8 kV substation transformer. Alectra Utilities requires to prepare the distribution system to address the system capacity needs driven by these developments.
	Customer Attachment / Load (KVA)	Total new connected load of 9,300 kVA by 2027.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo will not provide the required 13.8kV supply capacity for the proposed industrial/commercial subdivisions and residential developments. Note that CDM is considered for all projects and the load forecast is net of CDM. In addition, the status quo does not provide the necessary 13.8kV contingency capacity in Alliston upon loss of MS322-T1 or MS322-T2 following the completion of the residential and industrial/commercial subdivisions after 2020. For these reasons, the status quo is not being recommended.
	Alternative #1	Non Wires Alternative Alectra Utilities' load forecast process considers the impact of CDM and distribution generation, which is accounted for as part of the load forecast underpinning the Stations Capacity portfolio. Alectra Utilities has also considered other options, such as battery storage, and determined that these options will not meet the load growth and contingency conditions for the stations to be upgraded during this DSP period Wire Alternative. Alternative 1 consists of expanding 8th Avenue MS330 from 10MVA to 20MVA and adding two additional 13.8kV feeders. The alternative was rejected because the existing station is of the 1980 vintage; the building is too small to accommodate the expansion. The station was originally designed for 5kV. Replacement of existing major equipment is required including the oil containment. The existing transformer pad will not support the larger transformer. The building is too small to accommodate the additional 2 feeders, HV breaker and LV switchgear. Also, Alternative 1 does not address station back-up under contingency conditions i.e. the "Triad" Model. The Triad model ensures that there are three neighboring stations and upon loss of one station transformer the load of that station can be transferred to the adjacent two stations.
	Alternative #2	Alternative 2 consists of purchasing a station site in the vicinity of Dufferin St. and Industrial Pkwy. in Alliston suitable for constructing a new 44-13.8 kV, 2x10MVA, 4 feeder Municipal Substation for capacity relief of MS331 (14th Line) and MS330 (8th Ave) and to supply a proposed Industrial Subdivision. This alternative provides the benefit of redundancy at the substation with dual transformers and the ability to accommodate contingency transfers greater than 10MVA from adjacent substations. However, a 2x10MVA configuration results in a $2,860,000 cost premium over a single 10MVA substation design.

	Justification for Recommended Alternative	The Town of Alliston is currently supplied by two 13.8 kV stations: MS330 and MS331. MS330 has a 10 MVA single-stage fan transformer rated to 10 MVA Oil Natural Air Natural (ONAN) and 13.3 MVA Oil Natural Air Forced (ONAF) supplying north-west Alliston. MS331 has two 10 MVA transformers each supplying separate parts of Alliston: MS331-T1 feeders supply the east-end of Alliston, and MS331-T2 feeders supply west-end of Alliston. These two transformers have single-stage fans and are rated to 10 MVA ONAN and 13.3 MVA ONAF. Information obtained from the Town of New Tecumseth indicates two major industrial/commercial developments and several residential developments are planned in the Alliston region. Growth projections obtained from the Town of New Tecumseth indicate that a 56-hectare industrial and commercial development (Westerly ICI) is planned to be completed within six years in the vicinity of Dufferin Street and Industrial Parkway. The Westerly ICI lands have been marketed internationally as investment ready under Ontario's Certified Site Program with proximity to major highways, Honda Canada, and the Greater Toronto Area. Another 30 hectares industrial and commercial development (Easterly ICI) is proposed to be developed over four years in the vicinity of Theatre Road and Industrial Parkway. The Easterly ICI development has draft plan approval from the Town of New Tecumseth for an industrial plan of subdivision (File No. NT-T-1301) with approval for a period of two years until July 13, 2020. The draft plan proposes 12 blocks for industrial purposes and 3 blocks for commercial use. A total of 2,680 residential homes are to be completed in the Alliston area from 2019-2023. Some developments have completed construction of Phase 1, with the remainder of Phases to be completed over the next few years. The forecast growth will over-load one of the existing feeders (MS331-T2). Upon completion of the residential developments, MS331-T2 will exceed its 10 MVA ONAN nameplate rating in 2020, and its 13.3 MVA ONAF maximum rating in 2023. In the existing feeder configuration, the 13.8 kV component of the proposed Westerly ICI and Easterly ICI would be supplied by MS331-T2, further exceeding the substation 13.3 MVA ONAF rating. In addition to these concerns, the completion of the proposed developments will result in Alliston not having adequate contingency capacity in the event of loss of either transformer at MS331, meaning that customer could not be transferred to another supply in the event of an outage. If the distribution system were to fail in such a situation, service could be interrupted to a large number of customers for an extended period. The forecast customer growth in Alliston will also prevent Alectra Utilities from being able to shift load between feeders and restore power during outages. From an overall system perspective, the historical loading across all 13.8 kV substations in Alliston peaks at 23.4 MVA, which is within the total capacity for Alliston's 13.8 kV system, which is 39.9 MVA. However, the contingency capacity of the Alliston system with loss of the largest transformer is 26.6 MVA. If the customer load exceeds this level, Alectra Utilities may not be able to continue operating the system within nominal limits when an asset fails. When the new developments are completed, Alliston is projected to experience a total of
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The greatest risk to completion is securing the required land in the vicinity of Dufferin Street and Industrial Parkway in Alliston. The area surrounding the proposed site is part of the Westerly ICI development and there is a risk that the property cost will rise and/or the preferred site will not be available which will mean additional line (44kV and 13.8kV) costs will be incurred.
	Comparative Information on Equivalent Historical Projects (if any)	Painswick South MS, a new 44/13.8kV 20MVA, 4-feeder substation in Barrie was energized in 2015. There was difficulty locating and securing available land for the substation, resulting in the purchase and demolition of two residential homes in order to secure a property. The project highlighted the importance of identifying and purchasing property as early as possible to ensure it is available when a new substation is required.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	The new substation will offer reliability benefits by providing the required capacity for the proposed industrial/commercial developments, as well as the new residential developments in Alliston. In addition, the substation will provide the required back-up capability during contingency conditions through the triad configuration.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,902,496	$0	$0	$0	$0	[redacted]	$1,062,264
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

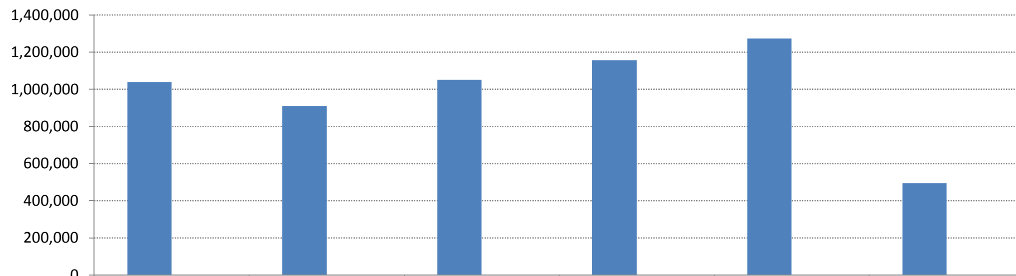
OEB Multi-Project Report

Project Code	102098
Project Name	Client Computing
Major Category	General Plant
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Undefined
	Location	Not Applicable
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Information Technology Systems
	Alectra Subcategory	IT Upgrades & Enhancements
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities must update its IT hardware on a regular basis to ensure the reliable performance of systems supporting customer-facing services, core distribution operations, and other important processes. IT hardware assets include core backend infrastructure (such as servers, networked storage and communication systems), endpoint assets (such as desktops, laptops, field devices and printers), and security appliances. Alectra Utilities plans to renew approximately 1800 endpoint assets, (such as such as desktops, laptops, field devices and printers) and approximately 650 core backend infrastructure assets (such as servers, networked storage and communication systems). Alectra Utilities replaces most IT hardware based on lifecycle management practices considering the expected lifespan of each category of hardware asset in order to mitigate functional obsolescence. As the end of a hardware asset's lifecycle approaches, the risk of failure increases significantly which then impacts core business processes.
	Main Driver - General Plant	Customer Service
	Priority and Reasons for Priority	Alectra Utilities reviews its IT Hardware standards regularly, based on the utility's requirements from operational, regulatory, security and customer service perspectives. As Alectra Utilities implements new technology, related software and hardware must be updated to keep pace. By replacing end-user hardware that is older than five years or out of warranty, Alectra Utilities can generally avoid IT equipment breaking down during normal business functions. Replacing obsolete equipment reduces support time, downtime and maintenance costs associated with older equipment. New equipment also allows Alectra Utilities to take advantage of technological advances in both software and hardware to provide a platform that is more able to support customer-facing business initiatives while fortifying the utility's cyber-security. IT Hardware assets support systems that are used to manage field crews and respond to outages, and thus are critical to the utility's ability to meet operational outcomes, including reliability. Should this hardware fail, the company would be unable to perform key tasks, harming Alectra Utilities' ability to respond to outages and otherwise manage the distribution system.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	IT Hardware underpins the utility's environmental, health, and safety processes across work centres and job sites. Processes include completion of site condition and safety forms, safety and environmental audits, and incident and claims investigations. In the event of an IT hardware or software failure, employees may not have access to the information required to make informed decisions about environmental and health and safety issues. Such issues may be serious and time-sensitive, thus potentially compromising work safety or contributing to inadvertent breaches of safety requirements.
	Cyber-Security, Privacy	All equipment purchased must have the ability to support all security and privacy policies.
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Do nothing (replace only on failure) Pros: Lower Capital investment Cons: Increased costs to maintain aging equipment (not under warranty) Efficiencies lost using older technology Equipment failure or maintenance requirements could lead to business process disruption Impacts employee morale and productivity negatively No vendor support for older equipment may weaken Alectra Utilities' cyber-security posture (since security updates would no longer be available).
	Alternative #1	Replace end user computing devices on a regular schedule to minimize the risk of unreliable, or technically obsolete equipment in use and minimize the possibility of a weakened security posture. Pros: More reliable equipment in use reduces support costs. More reliable equipment reduces the risk of business process disruption. New equipment provides added advantages relating to technological advances and security enhancements. Support is available from the vendor (firmware updates and drivers). Reduced repair costs while under warranty. Better able to support innovative business initiatives. Improved device performance provides productivity gains and improves employee morale. Cons: Higher Capital investment
	Alternative #2	Not Applicable

	Justification for Recommended Alternative	Alternative # 1 As IT works with the business to implement new technology processes including software and hardware, there is a need to upgrade computing hardware to be able to support and fully realize the value of these changes. It is also beneficial to the company to replace end-user hardware that is older than five years or out of warranty to prevent these machines from breaking down during normal business functions. Replacing obsolete equipment reduces support time, downtime and maintenance costs associated with older equipment. New equipment can take advantage of technological advances in both software and hardware to provide a platform that is able to support more innovative customer-facing business initiatives while at the same time maintaining or improving Alectra Utilities' security posture.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $5,924,642	$1,039,000	$910,248	$1,051,131	$1,156,303	$1,273,454	$494,506
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

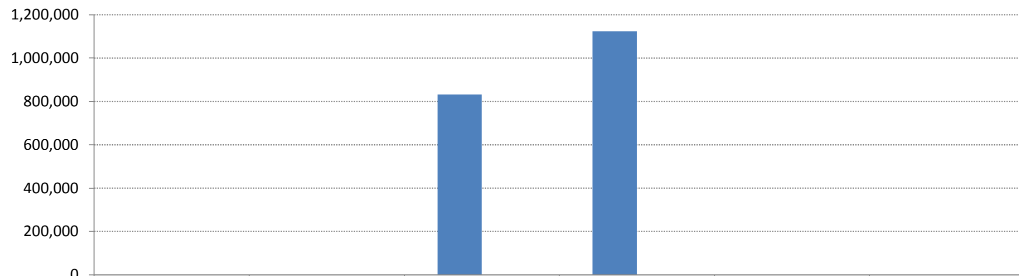
Project Code	102128
Project Name	Aurora MS6 Expansion
Major Category	System Service
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	Aurora MS6
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project includes following constructions: 1.add one main breaker for T2 2. add two 13.8kV breakers in Aurora MS6 3. construct two 13.8kV feeders from the breakers to the riser poles 4. Install switches or switchgears as per Power-Stream's design standard. 5. reconfigure existing feeders to integrate new feeders into the system After the project is completed, MS6 will be the same configuration as Aurora MS5 . The project takes two years to complete.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by intensification and redevelopment. The 2C Planning Area (as per York Regional Planning Official plan) is located at the northeast quadrant of the Town of Aurora. The 2C lands are bounded by the Town of Newmarket on the north, Highway 404 on the east, just north of Wellington Street on the south and Marsh Creek on the west. The 2C Planning Area consists of approximately 445 hectares (1,080 acres) and represents the last Greenfield development opportunity within the Town of Aurora. Lands in the 2C Secondary Plan Area are intended to accommodate approximately 8,000 residents in approx. 3,000 units and between 5,200 and 6,400 employment opportunities over the next 20 years. Based on 2.5kW per unit and 1.5 kW per job, approx. 15 MW is expected from these developments. CDM is considered for all projects and load forecast is net of CDM. The residential units will be on the west side of Leslie St and will be supplied by 13.8kV feeders. The commercial development will be on the east side of Leslie St and will supplied by 27.6kV feeders from Aurora MS7 & MS8. The development in 2C need one additional 13.8kV cct. MS#6 has two 10/13/16 MVA 44kV/13.8kV transformers, but there are only two 13.8kV feeders. The transformer capacity is not fully utilized. The peak on MS6 has exceeded 10 MVA and additional capacity is required to supply 2C land. Feeder 6F1 had a peak of 205 Amps in 2016 and 24 MVA transformer connected. 6F1 is 10km long feeder and customers on the feeder complained about low voltage during summer peak. New 13.8kV feeders are required to off load 6F2. The construction in 2C land has started and many residential units will be connected in the years to come. The existing 13.8kV feeders don't have sufficient capacity to supply the new load. Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI. Alectra will be at risk of compromising supply to new loads in Aurora that may have negative impacts on our corporate reputation and mission.
	Customer Attachment / Load (KVA)	Not applicable The new feeders can supply additional 15MW.
	Safety	Not applicable
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	This provide 10 MVA distribution capacity to Aurora. . It will provide capacity for new residential and non-residential development in Aurora.
	Environmental Benefits	Not applicable

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo would be to do nothing and overload existing transformer stations and feeders beyond their normal ratings. 2C land is currently supplied by a 13.8kV feeder 5F2. It had a peak of 269A in 2018 and does not have sufficient capacity to supply future growth in the 2C lands. New feeder capacity is required to supply the additional load. The peak on MS5 was 17MW or 19MVA. It does not have sufficient capacity for 2C land. MS6 had a peak of 11MW or 12MVA in 2018 and it does not have enough capacity for 2C land either. The construction in 2C land has started and many residential units will be connected in the years to come. The existing 13.8kV feeders don't have sufficient capacity to supply the new load. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. Running equipment beyond its rating could lead to failure and possibly cause injury to public or employees. Running equipment beyond it designed rating also reduces the life expectancy of that equipment. The existing transformer stations and feeders will experience over loading as the load grows. This will restrict the operational flexibility of transferring load between feeders and stations in case of problems on the distribution system. From a regulatory point of view we are obligated to serve the load. We run the increased risks of longer service disruptions given the status quo. If adequate backup facilities are not available during contingency conditions there is a strong probability that not all of the load could be picked up. Knowingly running equipment beyond established guidelines does not represent good utility practice.13.8kV feeder may experience overloading and customers may experience low voltage problems. Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner. The existing feeders are already loaded and nearing their capacity limits, taking no action will result in feeders becoming overloaded and exceeding their carrying capacity. Once feeders are at full utilization, load shedding will need to be executed during the summer peak period or during contingency conditions to mitigate the risk of failure from overloaded equipment. Supplying customers through highly loaded feeders may impact power quality.
	Alternative #1	Non- wires Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs . Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 15MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected.
	Alternative #2	Not applicable
	Justification for Recommended Alternative	MS#6 has two 10/13/16 MVA 44kV/13.8kV transformers, but there are only two 13.8kV feeders. The transformer capacity is not fully utilized. The peak on MS6 has exceeded 10 MVA and additional capacity is required. Feeder 6F1 had a peak of 205 Amps in 2016 and 24 MVA transformer connected. New 13.8kV feeders are required to off load 6F2. Over 600 new homes are being forecasted in Aurora every year. That is approx. 1.5MW new load each year. The development in 2C needs one additional 13.8kV cct. Alternative 1 (Status Quo) does not address risks to the reliability of customers in Aurora area and does not meet system needs for supply capacity The recommended alternative will provide 16 MVA capacity to the distribution system addresses long term growth (10 years) requirements for Aurora. The recommended alternative is consistent with Alectra approved planning guidelines for transformers and feeders. Funding this project will enable Alectra to meet its regulatory duty to supply the customers in our service area. Additionally, it will allow Alectra to operate the system in an efficient, effective and flexible manner by providing additional supply capacity and having adequate backup capacity in the event of an outage. It shows Good Utility Practice in terms of asset utilization and load security. It will enable Alectra to meet transformer station and feeder loading guide lines. This project will add two 13.8kV feeders and 16.6MVA capacity to supply 2C land. It will increase reliability. This project will increase power supply reliability and reduce risk of prolonged outages. The completion of this project will allow for Aurora MS5 and MS6 to adequately supply new developments in 2C land areas. The project will provide for incremental feeder tie points between MS5 and MS6 and improve the operational efficiency and effectiveness of these stations. Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk to get approvals from York Region and Town of Aurora in time. This project is scheduled for design in 2021 and construction in 2022. This will allow sufficient time to complete the project.
	Comparative Information on Equivalent Historical Projects (if any)	Not applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not applicable

Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable
Description of Incorporation of Advanced Technology, if applicable	Not applicable
Identify any reliability, efficiency, safety or coordination benefits	The project will provide for incremental feeder tie points between MS5 and MS6 and improve the operational efficiency and effectiveness of these stations.



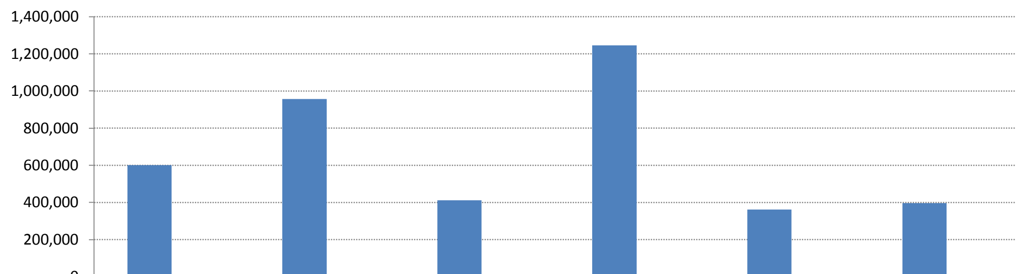
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,955,737	$0	$0	$832,601	$1,123,136	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	102157	
Project Name	Server Refresh	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Undefined
	Location	Not Applicable
	Units	1
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	Yes
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Information Technology Systems
	Alectra Subcategory	IT Upgrades & Enhancements
4. Evaluation Criteria (OEB)	Project Summary	Alectra must regularly replace back-end server hardware to support the daily operation of the utility and provide the foundation expected from our employees and customers as the utility moves to supporting the digital expectations of a modern utility and workforce. Under the Computation portfolio, Alectra plans to replace standard server hardware that has reached its end-of-physical-life as part of the normal life-cycle management of these assets. Planned Computation investments support business services for the web, individual applications and databases.
	Main Driver - General Plant	Capital Investment Support
	Priority and Reasons for Priority	Alectra Utilities relies on server hardware to operate reliably and securely. Replacing server hardware as part of the normal life-cycle management of IT assets is a cost-effective approach to maintaining the utility's business processes and functionality. Replacing end-of-life server hardware helps ensure that Alectra's computer infrastructure remains reliable (avoiding unscheduled downtime) and avoids the increasing maintenance costs and lost productivity that results from extended use of hardware.
	Customer Attachment / Load (KVA)	Not applicable.
	Safety	Not applicable.
	Cyber-Security, Privacy	These investments will provide cyber-security and privacy benefits including: • Maintaining current enterprise applications including CC&B, GIS, ERP and OMS ensure that the most up-to-date security patches have been applied and that data remains secure. • Upgrading of IT server hardware ensures that the threat of data intrusion and theft is mitigated as hardware remains supported.
	Coordination, Interoperability	Not applicable.
	Economic Development	Not applicable.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	There is a potential Security risk that could be introduced should unsupported servers remain operational within the environment. As an example, unsupported servers typically do not receive security patches from the Vendor, regardless if the devices is on a extended support agreement with a 3rd party vendor (i.e. Park Place)
	Alternative #1	Replacing older and out of warranty/support infrastructure servers and address projected growth,as well as added capacity for Hyper-converged environment and AIX/V7000 CC&B Compute Infrastructure. Alectra maintains and controls its IT Infrastructure to support customer-facing services, core distribution operations and other business processes. Maintaining these assets ensures operations perform on reliable systems, securely, and with a low risk of failure. As IT implements new technology, related software and hardware must be updated to keep pace. Replacing obsolete equipment reduces support time, downtime and maintenance costs associated with older equipment. New equipment takes advantage of technological advances in both software and hardware to provide a platform that is more able to support customer-facing business initiatives while fortifying Alectra's cyber security. Alectra Utilities replaces most IT hardware based on lifecycle management practices considering the expected lifespan of each category of hardware asset in order to mitigate functional obsolescence. As the end of a hardware asset's lifecycle approaches, the risk of failure increases significantly which then impacts core business processes. Upgrading control room hardware mitigates the risk of equipment failure and prolonged outages (since the control room would not be able to respond to outages without functional communications equipment).
	Alternative #2	Alectra moves a portion or whole of IT Infrastructure to be managed externally. Alectra is not willing to assume the security and maintenance risks as well the uncertainty associated with option 2 at this stage. Managing hardware externally would not allow Alectra the flexibility to make changes that require being addressed urgently – which could jeopardize the response time in dealing with issues that affect Alectra customers (outages and customer-facing system issues that are supported by IT hardware).

	Justification for Recommended Alternative	Alternative #1 Alectra must regularly replace back-end server hardware devices to support the daily operation of the utility and provide the foundation expected from our employees and customers as the utility moves to supporting the digital expectations of a modern utility and workforce. Under the Computation portfolio, Alectra plans to replace standard hardware that has reached its end-of-physical-life as part of the normal life-cycle management of these assets. Replacement of existing network infrastructure that is unsupported (or soon to be) including further rationalization and design modifications to support the delivery of services throughout the Alectra Environment. Continuing to rely on older server hardware can also increase costs and delays when failures occur as vendor warranties expire. Replacing older server hardware is evaluated to determine whether investment is made in physical, virtual, or cloud based infrastructure to allow the utility to manage larger environments as a result of the changing utility landscape, customer experience, and new application services.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable.
	Comparative Information on Equivalent Historical Projects (if any)	Not applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,972,447	$600,400	$956,385	$411,313	$1,246,508	$362,236	$395,605
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	102263
Project Name	Work Force Management / Mobile Dispatch
Major Category	General Plant
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information

Service Territory	Undefined
Location	Alectra Operations Centres
Units	1
Project Class	Regular
Project Includes R&D	No
Technology Project or has Technololgy Component	Yes
Project Will Generate Ongoing IT OM&A Costs	No

3. General Project Information (OEB)

Contributed Capital	Contributed Capital 0%
Expenditure Type	Controllable
Rates ID	Rate Base Funded
Alectra Grouping	Information Technology Systems
Alectra Subcategory	IT Operational

4. Evaluation Criteria (OEB)

Project Summary

The WFM Project will include the following functionality:

- Computerised tool to schedule jobs and allocate resources, with the ability to automate some functions;
- Electronic dispatch of jobs to field crews;
- Real-time tracking of jobs while in progress;
- Tracking of crew schedules and performance;
- Electronic recording and transmission of field data;
- Automation of processes such as timekeeping; and
- Route optimization.

The WFM solution will primarily bring benefit for shorter-duration field work, but there will also be benefit to having computerized resource allocation and crew management tools for larger capital projects.

This is part of a multi-year plan involving AM/Mobile/WFM/AA&PO Solution. Alectra does not have an enterprise workforce or work flow management solution. In the legacy utilities, specific project information and work instructions were housed in a variety of ways. Work process flows and project cost information were also managed in different systems. At Alectra, JDE will be the enterprise system for financials and project costs, CC&B the customer information enterprise system. and P6 (Primavera) the enterprise system for allocating and tracking the progress of Capital projects. However, day-to-day crew management is still very much a manual process. Much of the work lands on the Field/Trades Supervisor's desk and they manually sort through and decide which projects go on which day, and which personnel would be assigned to what crew. Project updates are entered manually into P6, but there is no real-time insight into crew activities or job progress. This is particularly challenging for short-duration capital, maintenance, and reactive work. There is little communication or information available while a job is executing and resource information is limited and difficult to put together to get insight and control around much of the work that is occurring. Productivity is lost through unnecessary extra field trips, scheduling errors and less than optimal resource allocation. With respect to mobile dispatch and reporting, Alectra has made an initial investment in Fieldworker, a mobile workforce solution focused on metering work. While Fieldworker is a valuable application for specific types of work, it does not provide real-time insight into job progress nor the crew management capability that an enterprise WFM solution would provide. Across Alectra Operations, other mobile applications have been or are being implemented - e.g. Mobile GIS; Mobile DigSmart; Mobile Responder. These implementations are through the use of tough books or laptops. However, these solutions require that the field user access separate applications to utilize these products. A WFM solution would provide a single integrated platform for the field user to access all required applications. Most of the workforce receives their work instructions through paper. Work instructions are entered into JDE and /or filed in FileNexus and have to be printed out. The paper is taken to the field for staff to review. Additional information on projects may or may note be available depending upon what was printed. WFM will allow for the electronic dispatch of

Main Driver - General Plant: Capital Investment Support

Priority and Reasons for Priority: This project is ranked as high priority because the volume and variety of capital and maintenance activity at Alectra has reached levels where a computerised tool is required to assist resource managers with resource allocation, job scheduling, and dispatch. At present, these activities and associated workflow processes are primarily manual, labour-intensive, and paper-based. The implementation of a computerised tool will facilitate process automation, streamlining, and improvement. The new tool will allow jobs to be scheduled (or rescheduled) and dispatched more efficiently. The WFM system will also provide insight into how work is carried out into the field and provide data on crew performance, thereby allowing analysis into how productivity can be improved.

Customer Attachment / Load (KVA): Not applicable

Safety: This project will not have an adverse impact on personnel or public safety. Safety will be considered throughout the project, and particularly for the Mobile aspects of the project. For example, field computers will be mounted in vehicles in a manner that is not detrimental to employee safety or wellness. In addition, technical options are being explored to prevent a driver from using the field computer while the vehicle is in motion.

Cyber-Security, Privacy: The WFM system will be a critical system that interfaces with other enterprise tools such as P6, JDE, OMS, and CIS. Issues of cyber-security and privacy are therefore of critical importance. The Project Team will work closely with IS and the successful vendor to ensure that these issues are addressed.

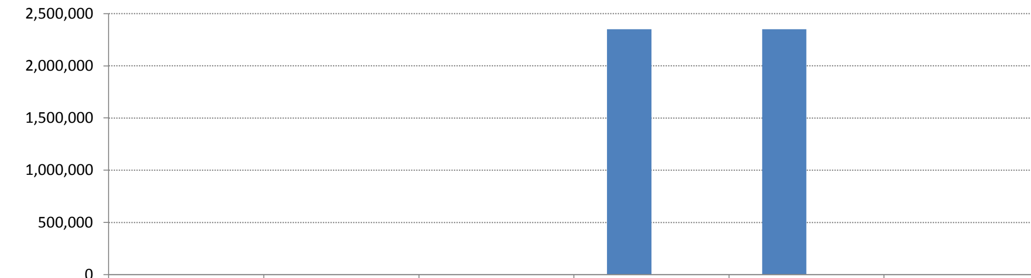
Coordination, Interoperability: Not Applicable.

Economic Development: Not Applicable.

Environmental Benefits: Environmental benefits are anticipated, in the form of reduced carbon dioxide emissions from fleet vehicles due to route optimisation. Specific benefits will be quantified in 2014 as part of the Planning phase.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	From Impact of Deferral/"Do Nothing" Option: Continue to rely on existing manual, labour-intensive workflow, resource allocation, and scheduling processes and forego the opportunity to realize efficiencies and improve productivity. Continue to use the systems and processes which exist today to schedule, coordinate, dispatch, record and manage projects and resources. Data on how field crews carry out work would continue to be not readily available. Maintaining the status quo is not considered acceptable because PowerStream would forego the opportunity to realise efficiencies and improve productivity.
	Alternative #1	Alternative 1 - Incremental Changes to Existing Systems - This alternative would involve incremental changes to existing systems and the use of "home grown" programming to meet the needs. Examples of possible changes: a) continue to build on the "home grown" AEx tool to include the capture of inspection reporting information in the field b) continue to build upon FileNexus, JDE and Access databases for the workflow management c) continue to use the old CIS for the workflow management of customer work d) continue to use Excel spreadsheet for the scheduling of large capital work e) build Excel spreadsheets for the scheduling of maintenance and small capital work f) build a "home grown" mobile time reporting program
	Alternative #2	Alternative 2- New Work Force Management, Dispatch and Reporting Tool - Implement a new system to support Alectra's needs related to Mobile Work Force and Work Flow Management. The solution would support scheduling of all crew work, enable resource planning for the work, and allow tracking of jobs, and pertinent information, from start to finish with individuals flagged when they need to take action. The solution would also enable mobile dispatch of work instructions and allow crews to report on all needed information for a job using mobile tools. 2019 will be a planning year. The plan would be to hire a consultant to assist with a detailed needs analysis and creation of a multi-year project plan. One staff member would be assigned to the project for a major part of their time in 2019, with additional resources required in 2020-2024 for the Implementation phase. The initial implementation will focus on short term customer connection work, with the rollout to maintenance, large capital, and other work in the corporation to follow. Recommended alternative is the New Work Force Management, Dispatch and Reporting Tool.
	Justification for Recommended Alternative	From Justification: In 2011 PowerStream developed an IT Strategy. It was updated in 2012 and in 2013. The strategy identified four solutions to be considered for implementation over 2014 & 2015. These solutions were Asset Management; Mobile Workforce; Workforce Management; and Asset Analytics and Project Optimization. There are three main drivers for changing the status quo. First - the current systems and processes in place are combined systems and practices from predecessor utilities. They have served the predecessor utilities well. As smaller utilities using programs such as Excel, Microsoft Project, Access Database, paper, etc. to manage assets and work, it was easier as the volume of data and work was more manageable and the number of people involved in the process needing access to the data were fewer. With increased staff, assets, projects, and geography those tools are no longer viable to be used. Second - the regulatory environment and customers demand that utilities continue to gain efficiencies in the execution of the work. Specific targets are set by the regulator for improved efficiencies. Improved workforce management and processes/systems for data capture and analytics is an area where efficiencies can be gained through the implementation of new systems and processes. Third - the regulatory environment is placing increased demands for solid analytics in defending appropriate spend levels. In order to provide sophisticated analytics, new tools and processes are required to ensure current and historical data is fully available, and to aid in the efficient and effective completion of the analysis. In 2013 PowerStream undertook to perform a high level needs analysis of these four solutions and subsequently developed a high level implementation plan. As a result of this work it was identified that there is a need to purchase new systems software and implement new processes for Workforce Management, Work Flow Management, Mobile Dispatch and Mobile Reporting. This work is of priority as the current systems in these areas are largely paper based. There is some use systems of P6, JDE, FileNexus, Excel and Access Databases for Workflow Management. The systems are not integrated and information can be entered in multiple systems. It is believed that efficiencies can be gained in a multiple of ways through the implementation of new technology. These include: reduced input of information multiple times, reduced number of process steps and wait times in the execution of work with one source for project information; increased efficiency in crew scheduling with optimized drive times, and optimized schedules filling in the small gaps of time with appropriate work. These pieces can be defined as: Workforce Management A technology solution that enables resource managers to allocate, schedule & assign work to resources. The solution would include the ability to report on crew/individual performance in the completion of the work. Workflow Management A technology solution that provides an easy way to track a project through various stages, milestones & triggers. The solution would allow capture of all necessary project information & allow the sending of automatic emails upon specific trigger events Mobile WFM The ability to interface with the Work Management System to automate dispatch of jobs. The solution includes the ability to view work instructions electronically & report on job completion, asset
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	At present, Alectra does not have a computerised WFM system, so this is a new tool to be implemented. The new system will impact several Departments, particularly Lines, Metering, Engineering, and Customer Service. The system will have to integrate with other enterprise systems, such as P6, CC&B, JDE and OMS. Change management will be required for employees to adapt to the new tool. IS resources will be required to support the implementation. Alectra has adopted a systematic and prudent approach to this project. The WFM tool will be phased in over several years, with implementation commencing in 2020. Planning activities are being undertaken in 2019. A cross-functional Project Team, comprising key stakeholders from across the company, has been assembled and a Project Governance model is in place. A consultant will be engaged to assist the Project Team with the identification and analysis of needs, opportunities for improvement, and benefits. The consultant will be a subject matter expert in the WFM field, and will also assist the team to understand the relative strengths and weaknesses of various solutions available on the market, as well as lessons learned from similar WFM implementations. A detailed project plan will be prepared with clearly defined project phases, goals, and timelines. Existing business processes are being documented in detail and opportunities for streamlining and automation will be explored. A change management plan will be prepared and executed to ensure that employees are engaged in the change process and adopt the new tool. Mobile technology (that is, field computing devices and accessories) is a critical component of this project, as it enables real-time, digital communication with field resources. The implementation of Mobile technology in the field is part of the WFM project, and key leaders of the Mobile initiative are also part of the WFM Project Team. This ensures that there is alignment of goals and activities of the two initiatives. IS resources are also part of the Project Team, which will ensure that IS resources are available to support the WFM project and also that critical issues such as security are addressed.

	Comparative Information on Equivalent Historical Projects (if any)	Legacy Alectra utilities successfully managed the implementation of several significant computerised systems, including SCADA, Outage Management System, GIS, P6, and the C55 Optimiser system. Alectra is currently standardizing on the JDE and CC&B applications as corporate enterprise systems.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	This project is expected to yield net benefits in terms of productivity and efficiency. These benefits will be quantified as part of the 2019 Planning phase. Expected benefits include: - reduced time spent on allocating resources and scheduling jobs; - productivity gains in the execution of field work; - reduced fuel costs due to route optimization; - improved scheduling and tracking of short-duration work.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,700,000	$0	$0	$0	$2,350,000	$2,350,000	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	102352	
Project Name	Vaughan TS#4 Feeder Integration - Part 2	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	- from swgr building in VTS4 to riser poles on Kirby Sdrd - on Kirby Sdrd from VTS4 to Hwy 27 in Vaughan - on Hwy 27 from Nashville Rd to Major Mack Dr (MMD) in Vaughan - on Major Mack Dr from Islington Ave to Weston Rd in Vaughan
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project will integrate 2 new 27.6kV feeders 25M9/25M10 to Alectra's distribution system to provide capacity and backup to Kleinburg and Vaughan West areas. It includes following constructions: - feeder egress from VTS4 to Kirby Sdrd -One additional cct on Kirby Sdrd on existing pole line from VTS4 to Hwy 27 – 2 km (the existing poles may have to be replace if the poles don't meet current standard). -One additional cct on existing pole line on Hwy 27 from Nashville Rd to MMD – 2 km (the existing poles may have to be replace if the poles don't meet current standard). -two additional ccts on existing pole line on MMD from Islington Ave to Weston Rd – 4 km See attached for details.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	High. Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by green field expansion, intensification and redevelopment. All existing feeders are at their capacity and have no capacity for future development. Some feeders have low voltage issue during summer peak time due to high loading and long supply distance. This project will provide 40MVA capacity to west Vaughan employment area that will have will have 50MW to 80 MW when fully developed. VTS3 is supplied by transmission line V43/V44, and VTS4 is supplied by transmission line H82V/H83V. This project will create ties between VTS4 and VTS3/Kleinburg TS so that VTS4 can provide 60MVA backup capacity in case of 230kV transmission line contingency. The major developments in the area that are intended to be supplied by this project include: West Vaughan Employment Area The West Vaughan Employment Area Secondary Plan sets out detailed policies to create a large economic opportunity for York Region. With over 500 hectares of employment designated lands, it is planned to accommodate approximately 20,120 employees. The peak demand for this development is estimated to be 50MW to 80 MW when fully built out, but no time line is available at this time. CDM is considered and load forecast is net of CDM. VTS3 is in the center of this development and Kleinburg TS is nearby too. Alectra has two 27.6kV feeders from Kleinburg TS and they can supply up to 40 MVA load. VTS3 has approx. 30 MVA capacity left as of 2019.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	This project will provide 40 MVA capacity to Vaughan, and it support commercial and residential development in Vaughan.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Reliability VTS4 is supplied from 230kV Minden transmission line, while the existing transformer stations in Vaughan are supplied by 230kV Parkway line (VTS1/VTS1E and VTS2) or Kleinburg Line (Kleinburg TS & VTS3). VTS4 will provide backup capacity to other TS in case of transmission line contingency. This will add transmission line diversity to Alectra's distribution system. Capacity The West Vaughan Employment Area is supplied by two feeders 45M3 and 45M4 from Kleinburg TS. The total available capacity is 20 MVA. The peak demand for this development is estimated to be 50MW to 80 MW when fully built out, but no time line is available at this time. Four 27.6kV feeders are required to supply the new load. The existing feeders do not have sufficient capacity to supply new loads in the West Vaughan Employment Area. Status Quo will cause overloading on existing feeders under 1-in-10 weather (extreme summer temperatures) in the long term. The impact severity and timing will depend on the schedule of the West Vaughan Employment Area development. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. The West Vaughan Employment Area is supplied by two feeders 45M3 and 45M4 from Kleinburg TS. Feeders 45M3/45M4 are backed up by feeders from VTS3. VTS3 had a peak of 145MW in 2017 and has 8MW extra capacity to supply the new load in the area, and additional 30MVA will be transferred from VTS3 to VTS4. In addition, Kleinburg TS and VTS3 are connected to the same set of 230kV transmission lines (Kleinburg Line). Both stations will be affected in case of transmission line contingency. VTS4 is supplied from 230kV Minden transmission line and these two feeders from VTS4 will provide 60MVA backup capacity in case of transmission line contingency. Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI. Alectra will be at risk of compromising supply to new loads in Vaughan north and new hospital areas that may have negative impacts on our corporate reputation and mission.
	Alternative #1	Non- wires Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 20 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected.
	Alternative #2	Not applicable
	Justification for Recommended Alternative	The Vaughan TS4 Feeder Integration Plan Part 2 will integrate 2 feeders 25M9/25M10 into the existing distribution system and include following constructions: • Two feeders from VTS4 to Kirby Sdrd in underground duct bank • One additional cct on Kirby Sdrd from VTS4 to Hwy 27 – 2 km • One additional cct on Hwy 27 from Kirby Sdrd to Major Mack Dr – 2 km • LIS switches at intersections as per Alectra design standard Status quo was not chosen because it does not address risks to the reliability of customers in Vaughan and does not meet system needs for supply capacity to ensure loadings existing feeders are kept to acceptable level. The recommended alternative (VTS4 Feeder Integration Plan 2) was chosen for the following reasons: • it improves the reliability situation mentioned in the status quo option • it will increase supply capacity to Vaughan West. • it will meet the immediate need for supply capacity. • it is consistent with the VTS4 feeder integration plan Funding this project will enable Alectra to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing coordinated protections between source and load and having adequate backup capacity in the event of an outage. They will provide 40 MVA supply capacity for Vaughan West. Feeders 25M9/25M10 also serve as ties between VTS4 and VTS3, Kleinburg TS. They will provide 60 MVA contingency capacity and will allow load transfer between transformer stations under contingency such as pole failures, TS failure, and transmission line outage. This project will increase power supply reliability and reduce risk of prolonged outages. The completion of this project will allow for VTS3, VTS4 and Kleinburg TS to adequately supply new developments in their respective service areas. The project will provide for incremental feeder tie points between VTS4 and Kleinburg TS, VTS3. It will improve the operational efficiency and effectiveness of these stations.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Vaughan and York Region in time. Capital design will start the design of the project in advance and should get the approvals in place in time. Customers load ramping up schedule in VMC and other areas in Vaughan will impact the timing and priority.
	Comparative Information on Equivalent Historical Projects (if any)	Alectra has built 11 transformer stations. Feeders from these stations were integrated into the distribution system in phases as needs arose.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.

Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
Identify any reliability, efficiency, safety or coordination benefits	This project will increase power supply reliability and reduce risk of prolonged outages. The completion of this project will allow for VTS3, VTS4 and Kleinburg TS to adequately supply new developments in their respective service areas. The project will provide for incremental feeder tie points between VTS4 and Kleinburg TS, VTS3. It will improve the operational efficiency and effectiveness of these stations.

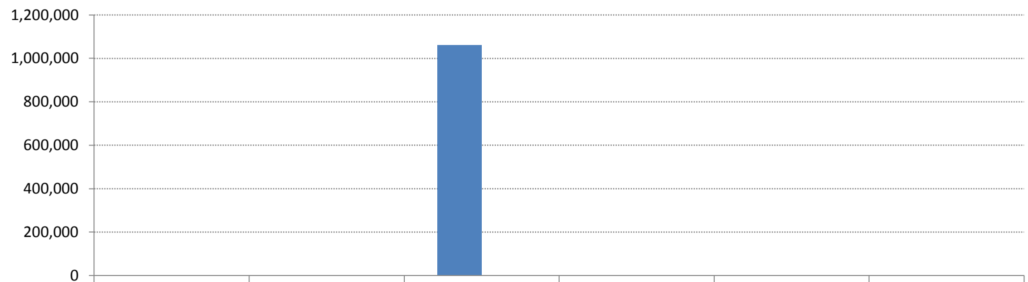
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,978,365	$0	$3,978,365	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	102387	
Project Name	Install 44kV & 13.8kV Bryne Drive	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Bryne Dr south of switch SC13487 to pole P6231 south of Harvie Road.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	Lines expansion project along Bryne Drive from P6231 to Harvie Road with 44kV & 13.8kV circuits (approx. 700m) including new N/O 44kV automated switch to sectionalize 44kV feeder south of Harvie Road, and new pole line along Bryne Drive from Harvie Road to SC13487 (approx. 700m) with 13.8kV circuit and additional pole height for future treetop 44kV. The City of Barrie is scheduled for road works along the existing Bryne south section in 2019 and Bryne north section in 2020; any relocation of existing plant will be under road authority. The City of Barrie will be constructing the new road along Bryne Drive in 2021 with Alectra pole line construction anticipated in 2022.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	The City of Barrie has identified 64 acres north of Harvie Road along Bryne Drive for development of industrial/commercial/residential. Another 34 acres south of Harvie Road along Bryne Drive has been identified for industrial/commercial development. The developable areas will result in 4MVA of new load north of Harvie Road and 2.2MVA of load south of Harvie Road. There is currently no existing 44kV or 13.8kV supply along Bryne Drive between P6231 and SC13487. The City of Barrie is scheduled for road works along the existing Bryne south section in 2019 and Bryne north section in 2020; any relocation of existing plant will be under road authority. The City of Barrie will be constructing the new road along Bryne Drive in 2021 with Alectra pole line construction anticipated in 2022. As a result Alectra Utilities requires to prepare the distributions system to address the system capacity needs driven by these new developments and support economic development.
	Customer Attachment / Load (KVA)	Total new connected load of 6,200 kVA by 2025 along Bryne Drive
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo will not supply the 64 acres of proposed development north of Harvie Road or the 34 acres of proposed development south of Harvie Road along Bryne Drive; there is currently no existing 44kV or 13.8kV supply along Bryne Drive between P6231 and SC13487. The City of Barrie is scheduled for road works along the existing Bryne south section in 2019 and Bryne north section in 2020; any relocation of existing plant will be under road authority. The City of Barrie will be constructing the new road along Bryne Drive in 2021 with Alectra pole line construction anticipated in 2022.
	Alternative #1	Alectra Utilities' load forecast process considers the impact of CDM and distributed generation, which is accounted for as part of the load forecast underpinning the lines capacity projects. For this expansion projects these options have not been considered as new feeders are needed to connect the customers to grid.
	Alternative #2	Not Applicable.
	Justification for Recommended Alternative	The City of Barrie has identified 64 acres north of Harvie Road along Bryne Drive for development of industrial/commercial/residential. Another 34 acres south of Harvie Road along Bryne Drive has been identified for industrial/commercial development. The developable areas will result in 4MVA of new load north of Harvie Road and 2.2MVA of load south of Harvie Road. There is currently no existing 44kV or 13.8kV supply along Bryne Drive between P6231 and SC13487. The City of Barrie is scheduled for road works along the existing Bryne south section in 2019 and Bryne north section in 2020; any relocation of existing plant will be under road authority. The City of Barrie will be constructing the new road along Bryne Drive in 2021 with Alectra pole line construction anticipated in 2022. Constructing a new pole line along Bryne Drive from P6231 to Harvie Road with 44kV & 13.8kV circuits (approx. 700m) including new N/O 44kV automated switch to sectionalize 44kV feeder south of Harvie Road, and new pole line along Bryne Drive from Harvie Road to SC13487 (approx. 700m) with 13.8kV circuit and additional pole height for future treetop 44kV will provide circuits for supply to the proposed Bryne developments. In addition, the new circuits will provide interconnection with existing 13.8kV and 44kV circuits along Harvie Road, Mapleview Drive and Essa Road to accommodate load transfers and contingency transfers.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The greatest risk to completion is securing the required approvals from the city in the allotted timeframe. The ramping up of the proposed commercial developments in the area will also impact the timing of the project.

	Comparative Information on Equivalent Historical Projects (if any)	Some past projects for new circuits have taken 6-8 months to obtain the necessary approvals before proceeding with construction.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	The new pole line and circuits will provide a reliability benefit through interconnection to existing 13.8kV and 44kV circuits that will allow for additional transfer options during contingency conditions.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,061,652	$0	$0	$1,061,652	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	102455	
Project Name	Melbourne MS322 Land Purchase & TX Upgrade - Bradford	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Melbourne MS322 - Bradford
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Stations)
	Alectra Subcategory	Station Capacity Projects
4. Evaluation Criteria (OEB)	Project Summary	This alternative calls for the purchase of leased land from the Town of Bradford and the upgrade of the existing Melbourne MS322 transformer from 10MVA (13.3MVA normal max loading) to 10MVA (16MVA normal max loading). The project includes purchase of leased land, engineering design, purchase of station equipment, approvals, substation construction, equipment installation, and commissioning.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Alectra currently leases the land at Melbourne MS322 from the Town of Bradford. The lease agreement expires October 30, 2020. The Town of Bradford is expanding the existing fire hall adjacent to Melbourne MS322 to include a new police station and additional parking. The Town originally intended to terminate the Melbourne MS322 land lease agreement thereby forcing Alectra Utilities to decommission MS322 and purchase land in an alternate location; however, land availability in the immediate area is extremely limited and distant parcels would require extensive 13.8 kV integration work. Alectra Utilities met with Bradford Planning Staff to highlight the importance of maintaining the existing substation. Growth projections from the Town of Bradford indicate that 1,960 residential homes will be completed in the service area, along with industrial and commercial developments along 8th Line, Langford Blvd, and Professor Day, over the next 10 years. MS324 transformer exceeded its normal 10 MVA ONAN rating in 2018 and will exceed its maximum 13.3 MVA ONAF/ONAF rating in 2026 during the summer peak following the completion of the planned developments. The MS322 transformer will exceeds its normal 10 MVA ONAN rating in 2019. In addition, the 13.8kV system in Bradford will exceed the system contingency capacity across substation transformers in 2024 upon the loss of a transformer at any of the four 13.8kV substations. Alectra Utilities requires to prepare the distribution system to address the system capacity needs driven by these developments.
	Customer Attachment / Load (KVA)	Total of 6,600 kVA of new connected load by 2027.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo results in the existing land lease agreement with the Town of Bradford expiring October 30th 2020. The Town of Bradford will be expanding the existing fire hall and incorporating a police station with parking. If the Town of Bradford does not extend the Melbourne MS322 land lease Alectra will be forced to decommission MS322 and purchase land in an alternate location to construct a new substation with feeder integration outside of the immediate supply area. Growth projections from the Town of Bradford indicate that 1,960 residential homes will be completed in the service area, along with industrial and commercial developments along 8th Line, Langford Blvd, and Professor Day, over the next 10 years. MS324 transformer exceeded its normal 10 MVA ONAN rating in 2018 and will exceed its maximum 13.3 MVA ONAF/ONAF rating in 2026 during the summer peak following the completion of the planned developments. The MS322 transformer will exceeds its normal 10 MVA ONAN rating in 2019. In addition, the 13.8kV system in Bradford will exceed the system contingency capacity across substation transformers in 2024 upon the loss of a transformer at any of the four 13.8kV substations. Alectra Utilities requires to prepare the distribution system to address the system capacity needs driven by these developments. MS324 transformer exceeded its normal 10 MVA ONAN rating in 2018 and the status quo will result in MS324 exceeding its maximum 13.3 MVA ONAF/ONAF rating in 2026 during the summer peak following the completion of the planned developments. The MS322 transformer will exceeds its normal 10 MVA ONAN rating in 2019. Note that CDM is considered for all projects and the load forecast is net of CDM. In addition, the 13.8kV system in Bradford will exceed the system contingency capacity across substation transformers in 2024 upon the loss of a transformer at any of the four 13.8kV substations. In July 2015 an investigation was opened to determine if the existing equipment permits a retrofit, single-stage or dual-stage fans should be installed at MS322 to potentially defer the construction of a new substation by increasing the contingency transfer capacity. The resulting feasibility report from Brosz indicated that upgrading the existing transformer fans is not recommended because "the allowable temperature rise of the winding insulation (65C) remains unchanged with the addition of fans." Note that the 13.8kV conductor along Holland St. W. for transferring between MS324 and MS322 is currently a 1/0 conductor, thereby limiting contingency transfers to 250A (approx. 6MVA), while transfers to MS321 and MS322 are limited to 329A (approx. 7.8MVA) and 369A (approximately 8.8MVA) due to each respective egress cable rating. For these reasons the status quo is not being recommended.
	Alternative #1	Alternative 1 consists of purchasing the leased land at Melbourne MS and expand the substation from 10MVA to a 2x10MVA, 4-feeder substation for capacity relief of MS322 (Melbourne), MS321 (John) and MS324 (Reagans). This alternative consists of decommissioning the existing Melbourne MS322 10MVA transformer (vintage 1976) and constructing a new 2x10MVA substation. This alternative consists of five separate Projects, the estimated cost for each is shown below: 1) Land Purchase: [redacted] 2) Decommissioning existing station: $25,000 2) Eng. Design, Permits, Civil Works, Major Equipment: $2,477,089 3) Construct new 44-13.8 kV, 2x10MVA, 4-Feeder Station: $4,781,143 4) 13.8kV Feeder Integration: $346,944 5) 44kV Supply: $125,301 Estimated Total Cost is: $8,755,477 Due to the significant cost increase of decommissioning and constructing a dual 20 MVA substation, Alternative 1 is not being recommended.
	Alternative #2	Alternative 2 consists of large scale battery storage. At the cost of approximately USD $700/kWh for a 2 hour battery the option was found to not be feasible. Distributed solar storage was also considered; however, this option was deemed to not be economical for the capacity required based on the typical feeder loading. For these reasons Alternative 2 is not being recommended.
	Justification for Recommended Alternative	Currently, Bradford is supplied by four 13.8 kV MS: MS323 (8th Line), MS322 (Melbourne), MS321 (John) and MS324 (Reagans). Each substation has a 10 MVA single-stage fan transformer with a maximum transformer ONAF/ONAF rating of 13.3 MVA. Alectra currently leases the land at Melbourne MS322 from the Town of Bradford. The lease agreement expires October 30, 2020. The Town of Bradford is expanding the existing fire hall adjacent to Melbourne MS322 to include a new police station and additional parking. The Town originally intended to terminate the Melbourne MS322 land lease agreement thereby forcing Alectra Utilities to decommission MS322 and purchase land in an alternate location; however, land availability in the immediate area is extremely limited and distant parcels would require extensive 13.8 kV integration work. Alectra utilities met with Bradford Planning Staff to highlight the importance of maintaining the existing substation have established an understanding to negotiate a land purchase so as not to relocate the station and feeders which would include significant expenditures. The valuation for the land is based on analysis of similar properties in the area. Growth projections from the Town of Bradford indicate that 1,960 residential homes will be completed in the service area, along with industrial and commercial developments along 8th Line, Langford Blvd, and Professor Day, over the next 10 years. MS324 transformer exceeded its normal 10 MVA ONAN rating in 2018 and will exceed its maximum 13.3 MVA ONAF/ONAF rating in 2026 during the summer peak following the completion of the planned developments. The MS322 transformer will exceeds its normal 10 MVA ONAN rating in 2019. In addition, the 13.8kV system in Bradford will exceed the system contingency capacity across substation transformers in 2024 upon the loss of a transformer at any of the four 13.8kV substations. Purchasing the leased land from the Town of Bradford and upgrading the existing Melbourne MS322 transformer from 10MVA (13.3MVA normal max loading) to 10MVA (16MVA normal max loading) will ensure land is secured for MS322, provide supply to the residential developments in the area and provide contingency backup transfer capacity.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The greatest risk to completion is securing the required land in the vicinity of Melbourne MS322 in Bradford. The area surrounding the existing leased land is fast being developed and there is a risk that the property cost will rise and/or the preferred site will not be available which will mean additional line (44kV and 13.8kV) costs will be incurred.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.

	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	Purchasing the leased land at Melbourne MS322 mitigates the risk associated with land scarcity as the Town of Bradford continues to grow. Upgrading the existing Melbourne MS322 transformer from 10MVA (13.3MVA normal max loading) to 10MVA (16MVA normal max loading) ensures adequate capacity to supply the residential developments in the area and provide contingency backup transfer capacity.

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,422,954	[redacted]	$0	$0	$0	$436,920	$916,034
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	102545	
Project Name	Install a New 27.6kV Pole Line on 19th Ave from Leslie St to Woodbine Ave	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	On 19th Ave from Leslie St to Woodbine Ave in Markham and Richmond Hill
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project includes following constructions: • build double ccts 27.6kV pole line on 19th Ave between Leslie St in Richmond Hill and Woodbine Ave in Markham • connect the new pole line to the existing cct on Leslie St and Woodbine Ave • install LIS switches as per Alectra design standard This project will establish a tie between cct on Woodbine Ave and cct on Leslie St. remediate radial supply situation on Woodbine Ave in Markham and Leslie St in Richmond Hill.
	Main Driver - System Service	Reliability
	Priority and Reasons for Priority	High. Currently, there is one radial circuit on Woodbine Ave from Elgin Mills Rd to 19th Ave: 10M2 from MTS4. The peak loading in 2017 was 250A. This feeder is supplying all customers along Woodbine Ave including Honda Canada head office as well as future urban area in Markham. Currently, there is also one radial circuit on Leslie St from Elgin Mills Rd to 19th Ave: 12M7 from Buttonville TS. The peak loading in 2017 was 320A. This feeder is supplying all customers along Costco and Leslie North development. All existing and future customers on Woodbine Ave and on Leslie St north of Elgin Mills are on radial supplies. Faults on Woodbine Ave and Leslie St north of Elgin Mills will cause prolonged outages to customers including Honda Canada head office. Major future load growth areas in the area are summarized below: Hwy 404 North Town of Markham's Official Plan Amendment No. 113 (OPA 113) has been approved by the Region of York (ROPA46). The lands subject to ROPA 46 and OPA 113 comprise approximately 180 hectares (450 acres). The proposed land uses of OPA 113 are primarily "Industrial". The preliminary load estimate is 20 MW when the land is fully developed. North Leslie The North Leslie Secondary Plan area encompasses a land area of approximately 577 hectares and is bounded by Bayview Avenue, Highway 404, Elgin Mills Road and 19th Avenue in the Town of Richmond Hill. The Leslie North development may accommodate approximately 6,250 housing units with a population of approximately 19,300 people and employment of approximately 3,200 jobs. Based on 2.5kW per unit and 1.5 kW per job (based on 300 sq.ft per no-retail job and 5W/sq.ft), the total demand would be 20 MW. Markham Future Urban Area The city of Markham is working on an Official Planning Amendment which expands the urban area of the Town of Markham to both sides of Warden Ave to provide opportunities for urban growth to the year 2031. The north Markham Future Urban Area (FUA) covers about 1,288 hectares (3,183 acres bordered by Major Mackenzie Drive to the south, the Hydro Corridor and Woodbine Avenue to the west, the northerly City limits and Elgin Mills Road to the north, and the Robinson Creek to the east
	Customer Attachment / Load (KVA)	There are approx 1,400 customers will be impacted by this project: 1,000 in Richmond Hill and 400 in Markham. Additional 20MW is proposed in Markham and will be impacted by this project too.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	This provide 20 MVA capacity on 19th Ave between Woodbine Ave and Leslie St. It will supply commercial development in Hwy 404 North area.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)

Status Quo

The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in following aspects:

Reliability
Currently, customers on Woodbine n/o Elgin Mills Rd are on a radial supply of the cct on Woodbine Ave. There is no pole line on 19th Ave between Leslie St and Woodbine Ave. Without this project, any pole failure on Woodbine Ave between Elgin Mills Ed and 19th will cause prolonged outages to approx 400 customers in the Hwy 404 North development area.

The same applies to customers on Leslie St north of Elgin Mills Rd. They are on a radial supply of the cct on Leslie St. There is no pole line on 19th Ave between Leslie St and Woodbine Ave. Without this project, any pole failure on Leslie St between Elgin Mills Ed and 19th will cause prolonged outages to customers in the Leslie North development area. The development of subdivision in Leslie North has started since 2016. There will be new approx. 1,000 houses along Leslie St Ave between Elgin Mills Rd and 19th Ave.

Status Quo will jeopardize Alectra's "open grid (loop supply)" planning philosophy and good utility practice. The impact severity and timing will depend on the schedule of the Hwy 404 North and Leslie North development.

There are no specific costs with the status quo, there are financial risks that are detailed in the risk section.

Customers on Woodbine Ave between Elgin Mills and 19th Ave will also be on a radial supply.

Customers on Leslie St between Elgin Mills and 19th Ave will be on a radial supply.

Supplying large number of customers in new developments in radial violates Alectra's planning philosophy and good utility practice.

Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI.

Alectra will be at risk of compromising supply to new loads in Hwy 404 North and Leslie North areas that may have negative impacts on our corporate reputation and mission.

Alectra is obligated to service future growth within its service territory using "good utility practice". Failure to provide adequate levels of service could lead to regulatory sanctions, and customer damage claims.

Alternative #1

The existing customers on Woodbine Ave north of Elgin Mills are on a radial supply. The backup needs to come from Warden Ave (east) or Leslie St (West). However, there is only a single phase cct on Warden Ave between Elgin Mills and 19th Ave and therefore it cannot provide backup for customers on Woodbine Ave without being rebuilt into a 3-phase line. The backup can only come from Leslie St.

The existing customers on Leslie St north of Elgin Mills are on a radial supply. The backup needs to come from Woodbine Ave Ave (east), Bayview Ave (West) of Stuffville Sdrd (north). However, there is only a single phase cct on LelsieSt between Stoville Sdrd and 19th Ave and therefore it cannot provide backup for customers on Leslie St without being rebuilt into a 3-phase line. A 2 ccts pole line on 19th Ave was Bayview to Leslie was proposed in 2018 budget however was deferred due to York Region's road widening plan. Therefore, the backup can only come from Woodbine Ave.

Alternative #2

Non- wires

Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs .

Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 20 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected.

Justification for Recommended Alternative

Status quo was not chosen because it does not address risks to the reliability of customers in Leslie North and Hwy 404 North.

The recommended alternative (New 27.6kV Pole Line on 19th Ave from Leslie to Woodbine Ave) was chosen because it improves the reliability situation mentioned in the status quo option.

This project also increase power supply reliability for Markham and Richmond Hill, and increase supply capacity to future development in Markham north & Richmond Hill, and increase operational flexibility in Markham and Richmond Hill.

Funding this project will enable Alectra to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing coordinated protections between source and load and having adequate backup capacity in the event of an outage.

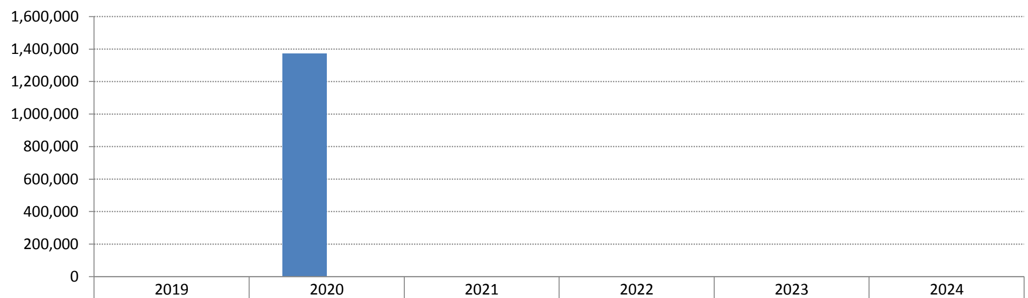
The two ccts on 19th Ave serve as ties between ccts on Leslie St from Buttonville TS and ccts on Woodbine Ave from MTS4. They will provide 60 MVA contingency capacity and will allow load transfer between transformer stations under contingency such as pole failures, TS failure, and transmission line outage.

Future Development- Markham
The city of Markham is working on an Official Planning Amendment which expands the urban area of the Town of Markham to both sides of Warden Ave to provide opportunities for urban growth to the year 2031. The north Markham Future Urban Area (FUA) covers about 1,288 hectares (3,183 acres bordered by Major Mackenzie Drive to the south, the Hydro Corridor and Woodbine Avenue to the west, the northerly City limits and Elgin Mills Road to the north, and the Robinson Creek to the east.

Approximately 675 hectares (1,668 acres) of developable lands are designated for future neighborhoods, located primarily between Major Mackenzie Drive and Elgin Mills Road. Approximately 300 hectares (741 acres) located north of Elgin Mills Road are designated for employment uses. See attached map for details. In total, the Future Urban Area is intended to accommodate approximately 12,000 residential units with a population of approximately 38,000 persons, and approximately 19,000 jobs. It is expected approx. 60 MW of new loads are expected on both sides of Warden Ave north of Major Mackenzie Drive when the area is fully developed.

Future Development- Richmond Hill

6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The main risk is to get approval from the Town of Richmond Hill and city of Markham as well MTO in time. Capital design will start the design of the project in advance and should get the approvals in place in time. Another risk the 19th widening work schedule may impact the pole line construction. Alectra will work with the town to coordinate the schedule.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	This project will increase power supply reliability and reduce risk of prolonged outages. The project will provide for incremental feeder tie points between Buttonville TS and MTS4. It will improve the operational efficiency and effectiveness of these stations.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,373,168	$0	$1,373,168	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

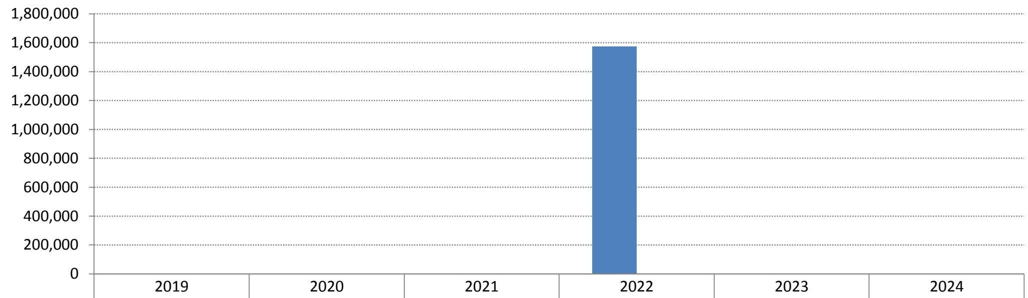
OEB Multi-Project Report

Project Code	102547	
Project Name	Two Ccts on Birchmount Rd from ROW to 14th Ave	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	On Birchmount Rd from ROW to 14th Ave in Markham - 0.8 km
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	The primary driver for this investment is to increase supply reliability to the 14th Ave and Warden Ave area. This project is to build 2 ccts pole line on Birchmount Rd from the Right of Way (ROW) to 14th Ave. This will extend 2 feeders 26M17 and 26M18 to 14th Ave to tie with feeder 22M7/22M8 for reliability.
	Main Driver - System Service	Reliability
	Priority and Reasons for Priority	High. The primary driver for this investment is to increase supply reliability to the 14th Ave and Warden Ave area and Mitigate the outage impacts due to increasing effect of adverse weather events. A few data center projects are underway and the peak demand is expected to increase by 20MVA.The existing feeders will not have sufficient capacity for the new load and new feeders are required. One data center at 371 Gough Rd has been in service in 2014. The initial load is 2 MW and the ultimate load will be 7 MW eventually. Another data center at 4175-14th Ave has been in service in 2015. The initial load will be 2MW and the ultimate load will be 10 MW by 2020. In addition there are many sensitive larger user along 14th Ave that have two supplies to their facilities; however, they are fed from the same pole line on the south side of 14th Ave. The customers will lose both supplies in case of pole failures on 14th Ave and the auto transfer scheme that they have installed on the secondary side of their transformers will not spare them from power outages. A new pole line has been built on the north side of 14th Ave from Warden Ave to Kennedy Rd. However, three feeders from MTS3 (26M13, 26M15, and 26M16) supplies customers on 14th Ave from Warden Ave, if a pole fails on Warden Ave between Hwy 407 and 14th Ave , it will take these three feeders out of service and cause significant outages to customers in the area. If a pole fails near intersection of Warden Ave and 14th Ave , it will take these three feeders (22M7, 22M8 and 26M16) out of service and cause significant outages to data center customers along 14th Ave.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Reliability There is a two ccts pole line on the south side of 14th Ave between Warden Ave and Kennedy. There is also another two ccts on the north side of 14th Ave between Warden Ave and the railway track. These two pole lines allow three feeders (22M8/26M16 on the south side, 22M7/22M8 on the north side) to supply customers on 14th Ave between Warden Ave and Kennedy Rd. A number of customers with high reliability needs on both sides of 14th Ave between Warden Ave and Kennedy Rd are currently supplied by the existing three feeders on 14th Ave. If a pole fails on Warden Ave between the right of way (ROW) and 14th Ave, it will take all three feeders out of service and cause significant outages to customers in the area. This impacts power supply reliability and related customer satisfaction. There have been sever pole line failure incidents in the past that on Warden Ave and caused significant outages to customers in the area. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. Ccustomers on 14th Ave between Warden Ave and Kennedy Rd will be impact if any pole failure near Warden Ave and 14th Ave. There will be more complaints about reliability in the future. Customers will be at risk of lengthier and more impactive outages. This will negatively impact SAIDI and SAIFI. Alectra Utilities will be at risk of compromising supply reliability to customers along 14th Ave that may have negative impacts on our corporate reputation and mission.
	Alternative #1	Alectra has considered the solar and storage option and based requirement of 15-20MW to be backed the cost will be multiples of times based on wires solution hence this option has been rejected.
	Alternative #2	Not Applicable.
	Justification for Recommended Alternative	Status Quo does not address risks to the reliability of customers in 14th Ave and Warden Ave. The recommended alternative was chosen for the following reasons: • To increase supply reliability to the area. This project will create two supply paths for customers on 14th Ave between Warden and Kennedy. There are a few big customers along 14th Ave that have two supplies to their facilities; however, they are from the same pole line on Warden Ave/14th Ave. The customers will lose both supplies in case of pole failures near Warden Ave/14th Ave intersection and the auto transfer scheme on the secondary side of their transformers will not spare them from power outages. This project will enable customers to have alternate supply from Birchmount Rd so that pole failure on Warden Ave will not cause outages to these customers since the customers have auto transfer scheme on the secondary side of their transformers. • To increase supply capacity to the area. This project is going to reroute two feeders (26M17/26M18) into 14th Ave area between Warden Ave and Kennedy Rd via Birchmount Rd. This could increase 30 MVA capacity .
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Markham in time. Capital design will start the design of the project in advance and should get the approvals in place the prior year. Customers load ramping up schedule will impact the timing and priority. Customers at both data centers are putting significant additional electrical load into service in the near future that will require additional load capacity for that area.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	This project will also provide supply reliability to new customers and existing customers on 14th Ave. This project will also provide an alternate supply path for the existing customers. Supply to customers will be maintained in case of pole failures on the existing path.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,574,610	$0	$0	$0	$1,574,610	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

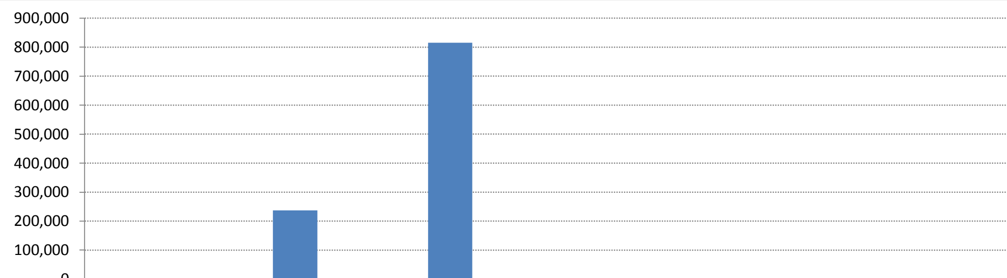
Currency scale is in literal

OEB Multi-Project Report

Project Code	102728	
Project Name	Station Switchgear Replacement - Big Bay Point MS304	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Big Bay Point MS in Barrie
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Substation Renewal
	Alectra Subcategory	Switchgear Replacement
4. Evaluation Criteria (OEB)	Project Summary	The major power equipment at Big Bay Point MS (44 kV-to-13.8 kV) consists of one obsolete conventional low voltage switchgear lineup, one 20 MVA transformer and a 44 kV circuit switcher. The equipment details at Big Bay Point MS are as follows: Low Voltage (13.8 kV) metal-clad switchgear (not arc-resistant) and circuit breakers (4 units) • Manufacturer – Federal Pioneer • Circuit Breaker Type – SFA17, SF6 gas • Year of Manufacture – 1994 Circuit Switcher (44 kV) • Manufacturer - S&C • Year of Manufacture – 1994 Power transformer (44 kV-to-13.8 kV) • Manufacturer – Federal Pioneer • Rating –20 MVA • Year of Manufacture – 1990 This substation project consists of replacing the low voltage switchgear and associated breakers, protections and ancillary equipment, as well as the primary circuit switcher at Big Bay Point MS304. The existing line-up is to be replaced with a new metal-clad 15 kV switchgear line-up with arc-resistant construction that meets Alectra Utilities' standards
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Municipal substation assets are integral to the performance of the Alectra Utilities distribution system. They are used to step down sub-transmission voltages to lower distribution voltages. The municipal substation equipment are considered critical and some of the most significant assets to the sustainability of the organization. As such, Alectra Utilities utilizes a replacement strategy to proactively replace their substation assets before they fail or if they are no longer supported by the manufacturer, hence technically obsolescent, approaching end of life or displaying failures. This can help to avoid a major failure which would have a significant impact on customer outage frequency and duration, the environment, safety, and Alectra Utilities' reputation. Priority for replacing the LV switchgear is high for the following reasons. • This equipment is in poor condition. • A failure could affect a large number of customers and potentially result in complete loss of supply from the station, requiring load transfer to another station. • This equipment is obsolete and spare parts can be difficult to come by. • The lack of arc-resistant capability is a safety hazard to employees and imposes maintenance and operational constraints. Replacing existing non-arc-resistant switchgear with modern arc-resistant switchgear will serve to facilitate maintenance and repair practices. With the existing equipment, the switchgear must be offloaded prior to racking breakers in or out.
	Customer Attachment / Load (KVA)	Station peak load at Big Point MS was about 12.6 MVA in 2018 and is forecast to increase to about 15 MVA by 2024.
	Safety	Existing switchgear does not meet current safety criteria. An explosive failure of the existing switchgear could seriously injure personnel in the proximity. The proposed new metal-clad 15kV switchgear line-up with arc-resistant construction meets Alectra's current standards.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	The replacement of obsolete switchgear with new equipment will help modernize the system and facilitate Control Room operations in managing the system.
	Economic Development	Not applicable.
	Environmental Benefits	Existing switchgear uses SF6 gas as an insulating medium. With the replacement of this switchgear, the risk of leaks of SF6 gas into the environment will be eliminated. SF6 is a potent greenhouse gas.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	An alternative is to do nothing, allowing for random failure-related issues with the end-of-life equipment and replacing under emergency situations. Doing nothing is not recommended. An increasing risk of equipment failure will have a negative impact on Alectra Utilities customers, safety and its reputation. Big Bay Point MS is a 44 kV to 13.8 kV station. Voltage conversion is not applicable on the 13.8 kV system in Barrie and there is an ongoing need for supply from this facility. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Alectra Utilities would be forced to purchase new equipment at a premium cost in the event of a failure. System reliability would be affected and restoration of the system to normal conditions could take 8-10 months due to long equipment lead times. These risks are not acceptable to Alectra Utilities. Impact on customers can be minimized with proactive replacement.
	Alternative #1	Refurbish existing equipment. This alternative is not considered as feasible since this equipment is obsolete and no longer supported by the manufacturer, and parts are not readily available.
	Alternative #2	Replace circuit breakers and associated protections in the existing legacy switchgear: This alternative has been rejected because it does not meet Alectra Utilities' current safety, design and operational standards. The existing switchgear is not arc-resistant, posing a safety concern. While safety risk can be mitigated, in part, by wearing appropriate PPE and following operational protocols, safety concerns remain. Should there be a breaker failure while someone is even present in the station, that person could be seriously injured or killed. Also, an explosive failure may blow out building doors and windows and flying debris may pose a risk to the general public. Such risks are inconsistent with Alectra Utilities' target of maintaining a safe work environment and not replacing the switchgear along with the circuit breakers is a missed opportunity. Operational protocol for non-arc-resistant switchgear involves removing the entire bus, or even the entire station, from service when racking in or out circuit breakers for service or inspection. This would not be required for modern arc-resistant switchgear; hence equipment outage durations and costs associated with maintenance and inspection would be reduced. Moreover, this alternative is not considered to be cost effective. • Replacing breakers and protections and installing into existing non-arc-resistant switchgear can involve considerable customization and can cost a significant portion of the cost to replace the entire switchgear lineup, but does not provide all the advantages of modern equipment. • There may be ongoing issues with the legacy switchgear, requiring maintenance that would not have been required had it been replaced along with the circuit breakers. • Circuit breaker replacement into existing non-arc-resistant switchgear has been performed by the predecessors that formed Alectra Utilities, but with less than favorable outcomes, resulting in the need to prematurely replace breakers and protections when the switchgear performance has proved inadequate. Aside from the safety and operational concerns, issues that have been encountered with retrofitting switchgear with new breakers include: - Obsolescence of the switchgear in that it is no longer supported by the manufacture and parts become difficult to obtain - Instances of corona discharge, which can cause insulation damage, power loss and electromagnetic interference - Requirements for ongoing maintenance of aging components
	Justification for Recommended Alternative	The recommended solution is to replace the LV1 15 kV switchgear at Big Bay Point MS with a new 15 kV metal-clad switchgear lineup with arc-resistant construction that meets Alectra Utilities' standards. It is also recommended that the switchgear replacement be combined with ancillary equipment upgrades and any egress cable replacements required to bring the station up to current standards, improve overall reliability and result in cost savings through bundling of work. The main advantages of installing arc-resistant metal-clad switchgear are as follows: • In the case of a breaker failure, there is minimal damage to adjacent equipment. Thus fewer customers are affected by a failure. • Enhanced safety for personnel and equipment. • The switchgear will be equipped with microprocessor based relays, which can be used in future smart grid projects since they have peer-to-peer communication capability. • The new microprocessor based relays can provide additional useful information not available in the electromechanical or electronic relays such as: - Number of operations of the circuit breakers - Fault magnitude - Event recorder The relay data and the transformer on-line temperature monitoring information can be imported into a computerized maintenance management system (CMMS) that will help in the future to provide a real time picture of equipment status. Execution of this project will serve to extend the useful life of this station and improve the overall reliability of supply to Barrie. The recommended alternative is to replace the low voltage switchgear at Big Bay Point MS. The circuit breakers are considered "obsolete" in that they are no longer built or supported by the manufacturer. Spare parts are not commercially available but can be recovered through the cannibalization of stock that is on hand.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Equipment has a long lead time. This risk would be mitigated by starting preliminary engineering and ordering the equipment in the year prior to replacement. Standard materials are used and field crews have the required experience.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacements have been executed a number of times in recent years. Examples include: - Saunders MS in Barrie - Anne Street North MS in Barrie Standard materials are used and field crews have the required experience.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0

7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	From a configuration perspective, this is a like-for-like replacement, however, the proposed replacement equipment is technologically enhanced as compared with the existing equipment. The new equipment is designed to require less maintenance and meets current safety standards.
	Condition of Asset vs. Typical Life Cycle and Performance Record	At the time of replacement, the existing switchgear will be nearly 31 years old. Existing switchgear has a history of performance issues and is considered to be in poor condition.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	7400
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	The replacement of obsolete equipment at Big Bay Point MS will improve reliability in the service area. Assumed failure frequencies and outage durations follow. • Frequency is for breakers of this vintage/condition, assuming spare parts are available. • Frequency of a breaker failure to operate is assumed to be 0.05 per year per breaker. • Frequency of catastrophic breaker failure is assumed to be 0.02 per year per breaker. • Any breaker failure would result is loss of supply to the entire bus. • It can take 2 to 3 hours to transfer load to another bus or station following a breaker mal-operation or to isolate a breaker that has mal-operated. (Average 2.5 hours) • It is estimated to take two days to restore a breaker that has failed to operate. • It can take a week or so to restore a bus following an explosive breaker failure. • A critically damaged breaker can be replaced in a week or so, assuming a spare is available.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Failure of this equipment would negatively impact the electricity supply to many residential, commercial and industrial customers in the area.
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	1) Equipment delivery times from suppliers 2) Several MS switchgear replacement projects in Alectra East are scheduled over about a ten to fifteen year period. Although all are considered to be of high or very high priority, priorities among these projects may shift.
	Consequences for O&M System Costs Including Implications of Not Implementing	Existing switchgear has higher maintenance costs than the proposed replacement equipment. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Replacement of failed equipment is expected to be more costly than proactive replacement. Also, leaving until emergency replacement is required would not allow for efficiencies gained in bundling with other work at this station.
	Reliability and Safety Factors	The proposed replacement equipment is more reliable and safer due to arc-resistant construction.
	Analysis for "Like for Like" Renewal Project	From a configuration perspective, this is a like-for-like replacement but the replacement equipment is more technologically advanced, requiring reduced maintenance and has improved safety features.



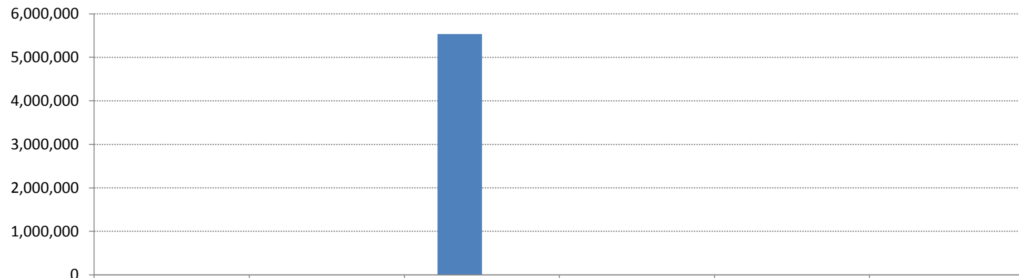
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,051,537	$0	$236,677	$814,860	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	103633	
Project Name	Install Two 27.6kV Ccts on 16th Ave from Hwy 404 to Woodbine Ave	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	On 16th Ave from Hwy 404 to Woodbine Ave in Markham
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is to reroute two 27.6kV feeders from Markham to supply new load in Richmond Hill. This project has been designed under WO#311308, but deferred since 2014 due to delay in the closure of Buttonville Airport and York Region's 16th Ave widening project. This project is to install two additional 27.6kV ccts on 16th Ave from Hwy 404 to Woodbine Ave by rebuilding the existing pole line into a 4 ccts pole line or installing a new 2 ccts pole line on 16th Ave where permitted, or underground, or combination. It will be determined in the design stage and coordinated with the road design. Cadillac Fairview, along with Armadale Co. Limited and Torontoair Ltd. announced on Friday, April 27, 2018 that they would continue operations at the Buttonville airport until at least the spring of 2023 and possibly longer. The design of this project will be based on the Buttonville airport continues to operate.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	High Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by green field expansion, intensification and redevelopment. This project is to reroute two 27.6kV feeders along 16th Ave from Woodbine Ave in Markham to Leslie St Richmond Hill to supply new load in Richmond Hill. This project has been approved in 2014 capital budget, and the first part (Leslie St to Hwy 404) has been built in 2014. The second part (Hwy 404 to Woodbine Ave) has been deferred many times due to issue with Buttonville Airport closure schedule and MTO's Hwy 404 widening schedule. A large data center compound has being developed in Leslie St/Elgin Mills Rd area in Richmond Hill 2016. One building with forecasted peak demand of 16MW has been built in 2016. Another building with forecasted peak demand of 16MW will be built in 2019. The estimated demand for the data center compound is expected to be 60MW when the data center compound is fully developed and utilized. The existing feeders on Leslie St don't have sufficient capacity to supply this new load and new feeder capacity is required. CDM is considered and load forecast is net of CDM. The massive 175-acre long-planned Buttonville Airport development could be in jeopardy. The $4-billion project which would have created 15,000 to 24,000 jobs and housed 6,000 to 7,000 residents would have been home to such amenities as a cinema, office and retail space and possibly even a 60-storey tower. Cadillac Fairview, the chief developer of the Buttonville Airport property, and the Region of York have been locked in disputes at the Ontario Municipal Board for the last five years over various issues and could not agree on several issues. Cadillac Fairview, along with Armadale Co. Limited and Torontoair Ltd. announced on Friday, April 27, 2018 that they would continue operations at the Buttonville airport until at least the spring of 2023 and possibly longer. York Region is proceeding with 16th Ave widening project based on Buttonville airport will continue to operate.
	Customer Attachment / Load (KVA)	Not Applicable. The two 27.6kV feeders can supply up to 40MVA capacity.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	This project will project 40 MVA capacity for development along Leslie St in Richmond Hill, including data centers in Via Renzo area.
	Environmental Benefits	Not Applicable.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra's distribution system capacity. The customers on Leslie St north of 16th Ave in Richmond Hill are supplied by feeder 12M5, 12M7, and 12M12. The peak in 2017 was 388A on 12M5, 320A on 12M7 and 203A on 12M12. There is only 290A or 14 MVA capacity left on these feeders for future development. A large data center compound has being developed in Leslie St/Elgin Mills Rd area in Richmond Hill 2016. One building with forecasted peak demand of 16MW has been built in 2016. Another building with forecasted peak demand of 16MW will be built in 2018. The estimated demand for the data center compound is expected to be 60MW when the data center compound is fully developed and utilized. The existing feeders on Leslie St don't have sufficient capacity to supply this new load and new feeder capacity is required. This project is needed to provide 40 MVA capacity from Buttonville TS to the Richmond Hill area. It will also increase supply reliability. This is the least cost alternative. The "do nothing" alternative is not viable as it does nothing to provide the required load capacity. Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner. The feeders are already loaded and nearing their capacity limits, taking no action will result in feeders becoming overloaded and exceeding their carrying capacity. Once feeders are at full utilization, load shedding will need to be executed during the summer peak period or during contingency conditions to mitigate the risk of failure from overloaded equipment. Supplying customers through highly loaded feeders may impact power quality.
	Alternative #1	Battery energy storage and solar generation in lieu of conventional supply was studied by Alectra for capacity needs in Richmond Hill and Markham. The cost of Battery energy storage and solar generation is much higher (15 times) than conventional supply. Hence this option has been rejected.
	Alternative #2	Not applicable
	Justification for Recommended Alternative	The objective of this project is to re-route two 27.6kV feeders from Markham to Richmond Hill as part of MTS4 feeder integration plan. This project is to provide additional 40 MVA capacity to Richmond Hill. The major future developments in Richmond Hill will be the Beaver Creek Business Park, Headford Business Park, Barker Business Park and Leslie North. Data Center According to Town of Richmond Hill's "Vacant Employment Land Inventory", there are approx. 209 hectares of vacant employment land in these three business parks that are bounded by Hwy 404/Leslie St/Elgin Mills Rd/16th Ave. One data center has been built in the vacant land, the peak demand is expect to reach 30 MW in 2020, and 50MW ultimately as per the data center owner. The total estimated new load is approx. 60MW, so two to three new feeders are required for the proposed development. Leslie North The North Leslie planning area is bounded by 19th Avenue to the North, Hwy 404 to the east, Elgin Mills Road to the south and Bayview Avenue to the west. There are 2 -27.6kV circuits on Bayview Ave and one radial feeder on Leslie St. The Leslie North development is projected to accommodate approximately 6,250 housing units with a population of approximately 19,300 people and employment of approximately 3,200 jobs. Based on 2.5kW per unit and 1.5 kW per job (based on 300 sq.ft per no-retail job and 5W/sq.ft), the total demand would be 20 MW. In total, four new feeders are required to supply these developments in Richmond Hill. Customers on Leslie St north of 16th Ave in Richmond Hill are supplied by feeder 12M5, 12M7, and 12M12. The peak in 2017 was 388A on 12M5, 320A on 12M7 and 203A on 12M12. There is only 290A or 14 MVA capacity left on these feeders for future development. Richmond Hill is supplied by Richmond Hill TS1, TS2 and Buttonville TS. Richmond Hill TS1 and TS2 have been loaded to their summer LTRs in 2016, but the peak demand was lower 40MW below the LTRs due to cooler than normal summer weather and abnormal feeder configuration as results of YRT's Yonge St widening project. On the other hand, in 2017, Buttonville TS has 40MW capacity available to supply future load in the area in Richmond Hill and Markham. Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Markham, York Region, Transport Canada as well MTO in time.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	This project will provide 40 MVA capacity from Buttonville TS to the Richmond Hill area. It will also increase supply reliability. This project will also provide alternate supply and reliability for customers in Leslie/Hwy 7 area that are mainly supplied by feeders from Richmond Hill TS1/TS2. It will increase load transfer capability between Buttonville TS and Richmond Hill TS1/TS2.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $5,527,251	$0	$0	$5,527,251	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	103659
Project Name	Storm Hardening - Four-Circuit Poles
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information

Service Territory	Legacy PowerStream North & South
Location	Various locations in Alectra East
Units	70
Project Class	Regular
Project Includes R&D	No
Technology Project or has Technololgy Component	No
Project Will Generate Ongoing IT OM&A Costs	No

3. General Project Information (OEB)

Contributed Capital	Contributed Capital 0%
Expenditure Type	Controllable
Rates ID	Rate Base Funded
Alectra Grouping	Overhead Asset Renewal
Alectra Subcategory	Storm Hardening

4. Evaluation Criteria (OEB)

Project Summary

This project is necessary to decrease the outage impacts due to major ice storms causing pole line failures affecting customer service and public safety. This project is a part of Alectra's long-term storm hardening plan to address the existing pole lines that carry four circuits (four feeders) that have inadequate strength to withstand storm and ice wind loading. These pole lines are prone to catastrophic failures under adverse weather conditions.
The project scope includes implementing solutions to address approximately 1,063 poles at a rate of 70 poles per year over a period of 15 years (from 2016 to 2031).
Depending on the design details and city permit at each location, Alectra will use one or more of the following three remediation options to address the poles at each location:

1. Option 1 - Split four circuits into two pole lines: Under this option, a new pole line across the street from the existing 4-circuit pole line will be constructed, two circuits will be installed on the new pole line, and two circuits will be removed from the existing pole line.
The design details will be carried out such that after making the transfer, both pole lines will meet the current CSA Standards.
This is the preferred option where space is available and city permit is obtainable. The benefit of this option is that each pole line would carry only two circuits (instead of four). This would reduce the number of feeders to be out of service in the case one pole line falling down (two feeders instead of four feeders).

2. Option 2 - Install mid-span poles: Under this option, a new pole will be installed in mid-span between two existing poles. It is estimated that in a typical case, one new pole is required to be installed for every second span (every other span). This will reduce the wind span and storm and ice wind loading for every pole, thus making the poles conforming to CSA Standards.
The design details will be carried out such that after installing the new mid-span poles, the pole lines will meet the current CSA Standards.

3. Option 3 - Replace under-class poles with new poles: Under this option, the under-classed 4-circuit poles will be replaced with higher class of poles that conform to the current CSA Standards.

Background:
It is estimated that there are approx. 1063 under-classed 4-circuit poles in the system. It is recommended to address this pole population at a rate of 70 poles per year over 15 years (from 2016 to 2031).

The annual pole locations are selected and prioritized for remediation based on the following criteria:
- Pole strength (with respect to benchmark requirement for storm and ice wind loading)

Main Driver - System Renewal

Mitigate Failure Risks

Priority and Reasons for Priority

The priority of this project is high.

Reasons for Priority:
It is estimated that there are approx. 1,603 poles that carry four circuits (four feeders) and are under-classed (below the required standard strength for proper class of pole). These poles are under-classed with respect to CSA Standards for storm and ice wind loading capability. In comparison to the general pole population, the four-circuit poles are considered higher importance and higher risk because they carry more feeders and more customer load. If these poles collapse under storm, restoration will be more difficult, many customers will encounter power outage, and public safety will be at risk. It is proposed to carry out the remediation plan with the above 3 Options so that the pole lines meet current CSA Standards and capable to withstand storm and ice wind loading.

Customer Attachment / Load (KVA)

Not Applicable

Safety

The targeted 4-Circuit Pole lines may fail during storms, posing public safety hazards.
Recent Events:

On June 17, 2014, there were 12 poles came down on Warden Ave in Markham during an intense thunderstorm. Four 27.6kV circuits were brought to the ground during the event and the broken poles and wires caused damage to approximately 20 cars on the roadway.

On October 15, 2017, there were a total of 10 pole failures caused by intense wind gusts at three locations in Vaughan (Islington Ave, Hwy 27, and Huntington Road). The incidents caused power outages to 33,693 customers, resulting in 3,649,926 Customer Minutes of Interruption (CMI).

Cyber-Security, Privacy

Not Applicable.

	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	In the case that transformers are on the pole, a pole falling down may also cause the transformers to fall down on to the street below, resulting in transformer tank rupturing, and oil being spilled onto the ground.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	3. Option 3 - Replace under-class poles with new poles: Under this option, the under-classed 4-circuit poles will be replaced with higher class of poles that conform to the current CSA Standards.
	Alternative #1	1. Option 1 - Split four circuits into two pole lines: Under this option, a new pole line across the street from the existing 4-circuit pole line will be constructed, two circuits will be installed on the new pole line, and two circuits will be removed from the existing pole line. The design details will be carried out such that after making the transfer, both pole lines will meet the current CSA Standards. This is the preferred option where space is available and city permit is obtainable. The benefit of this option is that each pole line would carry only two circuits (instead of four). This would reduce the number of feeders to be out of service in the case one pole line falling down (two feeders instead of four feeders).
	Alternative #2	2. Option 2 - Install mid-span poles: Under this option, a new pole will be installed in mid-span between two existing poles. It is estimated that in a typical case, one new pole is required to be installed for every second span (every other span). This will reduce the wind span and storm and ice wind loading for every pole, thus making the poles conforming to CSA Standards. The design details will be carried out such that after installing the new mid-span poles, the pole lines will meet the current CSA Standards.
	Justification for Recommended Alternative	This project is part of Alectra's long-term Storm Hardening plan. During the December 2013 ice storm in Ontario, Alectra East experienced many prolonged outages due to the various factors, including the heavy weight of the ice on various distribution components and on trees in close proximity of the distribution system. Subsequent to the ice storm event, Alectra East has retained CIMA to review the distribution system and produce the Ice Storm Hardening Report with recommendations to make the distribution system stronger and withstand the storm better in the future. The Ice Storm Hardening Report was discussed among various departments within Alectra East. Some of the recommendations from the report were adopted for implementation. Alectra Utilities determined that option four presented the best value. Under this approach, Alectra Utilities will replace the identified poles with new standardized poles. The new poles would retain the existing four-circuit configuration, but would have additional strength that Alectra Utilities expects will be sufficient to withstand the storms and other adverse weather conditions that may occur. This approach retains some risk. If the new poles were to fail, they would still create a public safety risk, and would still create an effective outage across all four feeders on the pole line. However, this option is the most cost-effective to implement. This option is also the most aesthetically pleasing with every pole being of the same height and standard.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	The 4-Circuit Pole Storm Hardening program has started in 2016. It is expected that the work volume will stay at the same level of 70 poles per year for 15 years (from 2016 to 2031).
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0

7. Category-Specific Requirements for Each Project/Activity (OEB)

Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:

In comparison to the general pole population, the 4-circuit poles are considered higher importance and higher risk because they carry more feeders and more customer load. If these poles collapse under storm, restoration will be more difficult, many customers will encounter power outage, and public safety will be at risk. It is proposed to carry out the remediation plan with the above 3 Options so that the pole lines meet current CSA Standards and capable to withstand storm and ice wind loading.

Recent Events:

On June 17, 2014, there were 12 poles came down on Warden Ave in Markham during an intense thunderstorm. Four 27.6kV circuits were brought to the ground during the event and the broken poles and wires caused damage to approximately 20 cars on the roadway.

On October 15, 2017, there were a total of 10 pole failures caused by intense wind gusts at three locations in Vaughan (Islington Ave, Hwy 27 and Huntington Road). The incidents caused power outages to 33,693 customers, resulting in 3,649,926 Customer Minutes of Interruption (CMI).

Condition of Asset vs. Typical Life Cycle and Performance Record

4-Circuit pole lines are critical part of the distribution system because they carry more circuits than does a typical pole line (e.g. 3 circuits, 2 circuits. 1 circuit). If the pole collapses, 4 feeders are out of service and more customers will encounter power outage.

Recent Events:

On June 17, 2014, there were 12 poles came down on Warden Ave in Markham during an intense thunderstorm. Four 27.6kV circuits were brought to the ground during the event and the broken poles and wires caused damage to approximately 20 cars on the roadway.

On October 15, 2017, there were a total of 10 pole failures caused by intense wind gusts at three locations in Vaughan (Islington Ave, Hwy 27 and Huntington Road). The incidents caused power outages to 33,693 customers, resulting in 3,649,926 Customer Minutes of Interruption (CMI).

Number of Customers in Each Customer Class Potentially Affected by Asset Failure

4000

Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)

• Frequency of Failure (applicable to under-classed poles):
Probability of major storm, microburst or intense wind gust: 0.2 (one every 5 years)
Probability of an under-classed pole to fail under major storm with ice: 0.1 (10%)
Frequency of Failure per pole (under-classed pole): 0.2 x 0.1 = 0.02 failure/year
Frequency of Failure per 70 poles (under-classed poles): 0.02 x 70 = 1.4 failure per year.
• Estimated number of customers affected by 1 failure is: 4,000 customers
Out of 4,000 customers affected: 500 customers are affected for 8 hours, 500 customers are affected for 4 hours and 3,000 are affected for 2 hour.
For calculations in C55, it is estimated that 4,000 customers are affected for 3 hours.
• Duration of interruption is: 3 hours per interruption.
• CMI per 1 failure is: 4000 x 3 hours x 60 min = 720,000 CMI
• CMI per 1.4 failure: 720,000 x 1.4 = 1,008,000 CMI per year

Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)

Power outages cause inconvenience and financial loss to customers (office closing, production stoppage). Poles and lines failure poses safety hazards to the public.

Value of Customer Impact

High

Factors Affecting Project Timing, if any

Not Applicable.

Consequences for O&M System Costs Including Implications of Not Implementing

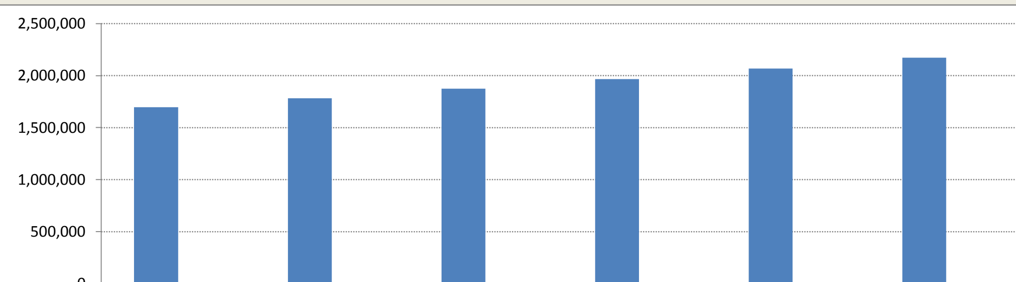
Not Applicable.

Reliability and Safety Factors

This project is part of the long-term 4-Circuit Pole Storm Hardening Program. The project will help avoid a total of 1.4 potential failures and 1,008,000 potential CMI. In addition, this project will also help reduce safety risk due to pole lines collapsing under major storm.

Analysis for "Like for Like" Renewal Project

Not Applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $11,560,130	$1,696,656	$1,782,813	$1,873,207	$1,968,040	$2,067,526	$2,171,888
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150007
Project Name	Extend 153M10 to Transfer MS322
Major Category	System Service
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Holland Street from Bridge Street , south along Morris Road, west along Centre Street to Thomas Street, north on Drury Street, west along Holland Street to Miller Park Avenue.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	Back-up capability lines project extending the 153M10 circuit along Holland Street from Bridge Street , south along Morris Road, west along Centre Street to Thomas Street, north on Drury Street, west along Holland Street to Miller Park Avenue (approximately 2 km's) and open LT-B1051 to transfer MS322 from 153M4 to 153M10 for capacity relief of 153M4.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Numerous residential, commercial and industrial developments within Bradford are nearing completion, beginning construction, or being considered in the near future. These developments will result in the 153M4 feeder exceeding the 400A planning limit in 2021 and surpassing 500A in 2025. Existing feeder interconnections in Bradford limit the transfer of substations to accommodate load growth and provide contingency capacity. Large 44kV developments including a medicinal marijuana facility are proposed in the industrial area of Bradford and will require capacity on the 153M3 & 153M4. Alectra Utilities requires to prepare the distributions system to address these system capacity needs driven by new developments and provide back-up capability.
	Customer Attachment / Load (KVA)	31,512 kVA total connected load on MS322
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner. The status quo would result in 153M4 exceeding its planned loading limits of 400A in 2021. Currently the only available transfer for capacity relief of the 153M4 is to the 153M3, however, the 153M3 along Barrie Street is supplied from a PME that does not permit the transfer of 153M3 load to the 153M10 by operating the interconnection at LT-B1057, thereby resulting in an unbalanced load transfer to the 153M3 with no capacity relief from the 153M10. Large 44kV developments including a medicinal marijuana facility are proposed in the industrial area of Bradford and will require capacity on the 153M3 & 153M4. The area has limited back up options. In case of an outage approximately 2,877 customers could be without power until repairs are completed.
	Alternative #1	Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs assessment. Alectra Utilities considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on a typical capacity of 30 MW per feeder the cost of non-wire alternatives would be 15 times that of traditional solution and hence this option has been rejected.
	Alternative #2	Not Applicable.
	Justification for Recommended Alternative	Numerous residential, commercial and industrial developments within Bradford are nearing completion, beginning construction, or being considered in the near future. These developments will result in the 153M4 feeder exceeding the 400A planning limit in 2021 and surpassing 500A in 2025. Existing feeder interconnections in Bradford limit the transfer of substations to accommodate load growth and provide contingency capacity. Extending the 153M10 circuit along Holland Street from Bridge Street , south along Morris Road, west along Centre Street to Thomas Street, north on Drury Street, west along Holland Street to Miller Park Avenue (approximately 2 km's) and opening LT-B1051 to transfer MS322 from 153M4 to 153M10 will provide capacity relief for 153M4. The extended circuit will also permit proactive load balancing and increasing transfer capability in the Bradford area. Execution of this investment will alleviate capacity constraints and ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable.

	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.
	Identify any reliability, efficiency, safety or coordination benefits	Extending the 153M10 would provide capacity relief to the 153M4, while also providing increased transfer capability in the Bradford area.

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,689,734	$0	$1,689,734	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150025	
Project Name	Cable Injection Project - (V18) - Major Mackenzie and Keele, Vaughan	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V18) - Major Mackenzie and Keele (Vaughan)
	Units	26497
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults..
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $83/m in 2019, $84/m in 2020..
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 31 years old (installed in 1988), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	2026
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 26497 m of cable in the whole area: Frequency of Failure is: 0.25 x 26497 /1000 = 6.6 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 6.6 failures: 307 x 6.6 = 2026 customers affected and 43,131 x 6.6 = 284665 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 6.6 potential cable failures and 284665 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,206,224	$1,093,540	$1,112,684	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150026	
Project Name	Cable Injection Project - (M43) - John and Woodbine, Markham	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(M43) - John and Woodbine, Markham
	Units	12294
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technolgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Not Applicable

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $83/m in 2020.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 35 years old (installed in 1984), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	936
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 12294 m of cable in the whole area: Frequency of Failure is: 0.25 x 12294 /1000 = 3.1 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 3.1 failures: 307 x 3.1 = 952 customers affected and 43,131 x 3.1 = 133706 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 3.1 potential cable failures and 133706 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,029,650	$0	$1,029,650	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

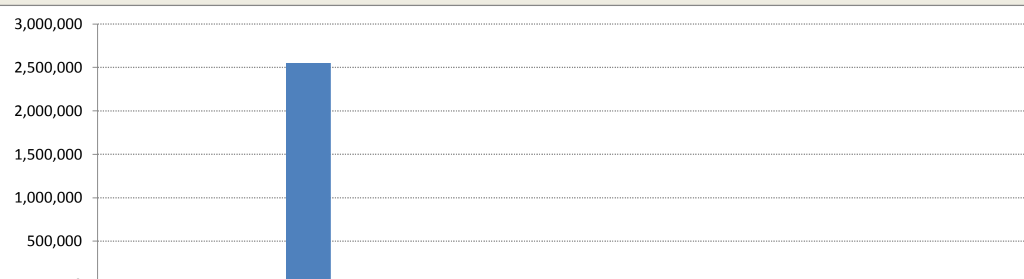
Currency scale is in literal

OEB Multi-Project Report

Project Code	150043	
Project Name	Rear Lot Renewal Project - East of Queen St. to Eastern Ave./North of Greenway St.	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Tottenham - East of Queen St. to Eastern Ave./North of Greenway St.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Rear Lot Conversion
	Alectra Subcategory	Rear Lot Conversion
4. Evaluation Criteria (OEB)	Project Summary	Convert the East of Queen Street to Eastern Avenue – North of Greenway Street (Tottenham) area from rear lot overhead supply to front lot underground supply (primary and secondary). This will reduce number of outages and power restoration time. The project is proposed to be completed over two years. The existing rear lot location East of Queen Street to Eastern Avenue – North of Greenway Street (Tottenham) will be 38 and 39 years old in 2019 and 2020 respectively. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2012 and 2013, where a majority of the poles were found to be in poor condition. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The priority of this project is high. This project is to decrease the outage impacts due to deteriorating distribution system assets and mitigate the outage impacts due to increasing effect of adverse weather events. Reasons for Priority: The electrical system is deteriorating and poses many operations, safety, and customer service concerns that must be addressed. If not addressed, the system will deteriorate further and failures and safety hazards will increase. In December 2013, an ice storm came in across Ontario including Alectra (East) service territory. During the storm, many trees, including trees in rear lot areas, fell onto power lines and created prolonged power outages to customers. Power restoration in rear lot areas was very difficult due to accessibility. The December 2013 ice storm caused 29,831,573 CMI within the rear lot grids, which accounted for 16.68% of the total system CMI due to the ice storm. The existing rear lot location East of Queen Street to Eastern Avenue – North of Greenway Street (Tottenham) will be 38 and 39 years old in 2019 and 2020 respectively. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2012 and 2013, where a majority of the poles were found to be in poor condition. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Customer Attachment / Load (KVA)	Total connected load of 576 kVA.
	Safety	Safety risk associated with close proximity to power line in the backyard: Although the Electrical Safety Code and easement terms specify minimum clearance between customer facilities and power line, there are cases that customers do not follow the safety rules and install facilities too close to power line. Examples are shed, storage, playground, trampoline, swimming pool, patio deck, landscape, house extension, etc. This encroachment creates a safety hazard for both customers and crews. Safety risk associated with reduced clearance due to encroachment of power line: Over time, growth of vegetation and obstruction due to customer facilities may jeopardize the minimum clearance requirements and restrict crew mobility. Occasionally dogs may also be a safety hazard to the crews.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Because overhead transformers are installed on the pole in rear lot area, a pole falling down may also cause the transformers to fall down, resulting in transformer tank rupturing, and oil being spilled onto the ground.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under this option, no proactive investments would be executed to replace either existing rear lot infrastructure and these assets would only be intervened upon in reactive scenarios, when the assets have reached their end-of-life. Under this approach, customers would be exposed to prolonged reliability impacts, due to the accessibility issues associated with rear lot infrastructure, as well as the complex restoration procedures that would be required for a four-feeder outage event. As standardized equipment (e.g. bucket trucks) cannot be used to service rear lot plant, wood poles, transformers and overhead switches would have to be replaced manually, with field crews accessing private customer properties in order to execute the work. Customers and field crews would continue to be exposed to elevated safety risks, due to the minimal proximity between customer plant and the rear lot overhead lines, as well as the non-standard and non-ergonomic work procedures that field crews would have to continue to execute to sufficiently maintain, inspect and service the plant. Finally, as assets are replaced reactively, new assets would need to be installed according to the rear lot configuration. By its design, rear lot can only be converted if the entire line is replaced at once as part of an overall project. Therefore, the legacy design will continue to be maintained under this scenario. This will include the continued operation of the legacy voltage system, along with continuing the associated inefficiencies, such as line losses.
	Alternative #1	Rear Lot Overhead Option: Under this Option, the existing rear lot plant is replaced with new overhead plant in the rear lot. When the replacement project is implemented, the following design parameters should be considered: • Install critical components such as fuse, switch, and transformer as close to the accessible street as possible This Option is not acceptable because it does not resolve the major operations and customer reliability concerns related to the distribution assets located at rear lot at this location. Partial Underground Option This scenario involves the replacement of existing rear lot infrastructure with a new hybrid solution, where primary voltage infrastructure, including transformers, switches and lines would be installed as per an underground configuration within the front right-of-way, following standard Alectra Utilities installation practices. Under this approach, secondary infrastructure, including wood poles and secondary conductor, would remain in the rear lot in overhead configuration. This approach would not fully address the reliability and safety concerns associated with rear lot distribution, as secondary connections will remain in the rear lot. However, future outage impacts will be reduced and contained to only those customers connected to the associated transformer. Lower voltage classes will also be converted up to the standardized 27.6kV voltage standard as per this investment option. Under this option, reliability and safety issues would continue to persist due some infrastructure remaining overhead. The cost of partial underground renewal is higher than the renewal of the rear lot overhead and further more does not result in mitigating the risks associated with the existing system. This partial underground approach has been adopted where feasible.
	Alternative #2	Replace with Full Underground Infrastructure This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure. All existing primary and secondary distribution assets within the rear lot corridor will be removed and replaced with new underground primary and secondary infrastructure that is installed within the front lot corridor as per current standard design practices. Underground secondary cables will run from the front lot underground transformers to the individual meter bases in order to supply the customers. Under this approach, existing under-classed legacy wood poles that support four feeders will be replaced with higher-class poles that are better suited to withstand major weather events. Through this investment scenario, these high impact assets will be better secured and weather-hardened against future outage events. This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated and line losses associated with the legacy voltage classes can be eliminated.
	Justification for Recommended Alternative	It is recommended to convert the East of Queen Street to Eastern Avenue – North of Greenway Street (Tottenham) area from rear lot overhead supply to front lot underground supply (primary and secondary). Under this Option, the existing rear lot plant is removed and new underground plant is installed in front lot. This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated and line losses associated with the legacy voltage classes can be eliminated. For these reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Fluctuation in cost and staff resource (internal and external) to complete high annual volume of work. Risk Management: Alectra has retained external contractor working at different work sites throughout the year under a multi-year EPC (Engineering Procurement Construction) Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track.
	Comparative Information on Equivalent Historical Projects (if any)	Alectra has completed and is completing similar rear lot remediation project since 2013. Alectra has experience on executing several rear lot remediation project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0

7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	The scope involves converting the area east of Queen Street to Eastern Avenue – North of Greenway from rear lot overhead supply to front lot underground supply (primary and secondary). There are a total of 139 customers affected by the existing rear lot supply. Rear lot infrastructure is functionally obsolete for the following key reasons: • The rear lot configuration is generally unsafe to the public due to the large trees growing near energized power lines. In tandem with such an unsafe configuration, there are also line clearing hazards and related additional costs to do this work. • Alectra Utilities is unable to use labour saving tools and devices such as bucket trucks to efficiently maintain and repair the distribution system due to assets located in customer backyards. • Rear lot wood poles are generally congested, due to multiple service attachments and communication drops, which generally make it impossible to sufficiently climb poles. Crews must, therefore, use ladders to access these poles. • Alectra Utilities is limited in utilizing ladders to access the overhead system due to Ministry of Labour restrictions for congested areas. • Due to the presence of legacy porcelain top tie insulators, rear lot lines must be fully isolated before any maintenance or repair work on the overhead system can commence. • Porcelain insulators are far more susceptible to contamination and flashover when compared to present-day standard polymer insulators. • Rear lot infrastructure typically contains undersized #4 aluminum conductor steel-reinforced cable and aluminum conductor, along with #4 and #6 copper conductor, which are undersized and generally have a greater probability of annealing due to their reduced carrying capacity. These conductors must be fully isolated before any work can commence.
	Condition of Asset vs. Typical Life Cycle and Performance Record	It is extremely difficult to gain access to the backyard to maintain, repair, and restore power. As a result there are prolonged outages to customers. This is especially more difficult in the event of ice storm. Many of the Rear Lot Supply distribution systems were built in 1950s, 1960s, and 1970s (40-68 years old in 2016). The rear lot equipment is older than typical useful life and the asset condition is deteriorating. According to the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board", typical useful life of overhead transformers and wood poles are 40 and 45 years respectively. Many of the installations are not in compliance to today's standards. The existing rear lot location East of Queen Street to Eastern Avenue – North of Greenway Street (Tottenham) will be 38 and 39 years old in 2019 and 2020 respectively. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2012 and 2013, where a majority of the poles were found to be in poor condition.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	139
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Number of failures and duration based on historical outage data for specific north-east corner of Mill/Queen Street north of Greenaway Street and south of Eastern Avenue rear lot area: May 2015; 2 hour outage (Incident # 730294) September 2015; 12 hour outage (Incident # 735524) March 2016; 3 hour outage (Incident # 741955) March 2016; 29 hour outage (Incident # 742187) November 2016; 2.4 hour outage (Incident # 749684) Based on three year average (2015-2017) assume 1.7 outages at 9.7 hours for north-east corner of Mill/Queen Street rear lot area.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Rear lot supply failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Rear lot system also poses safety hazards to the customers because live electrical components are in proximity of customer's backyard and proper clearance may be violated due to customer's installations (examples: trees, garden, swimming pool, storage shed, deck, house extension).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	In case of not implementing the project the OM&A cost will continue to occur due to tree trimming activities as well as increase in responding to outages since the assets are deteriorated and prone to failure.
	Reliability and Safety Factors	This project is part of the long-term rear lot supply remediation program. The project will help avoid potential rear lot failures. In addition, this project also eliminates safety hazards associated with ageing and deteriorating rear lot system. This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure.
	Analysis for "Like for Like" Renewal Project	The selected option is not a like for like replacement. This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,552,356	$0	$2,552,356	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150047	
Project Name	Rear Lot Renewal Project - Royal Orchard - North	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	Markham: Royal Orchard - North
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Rear Lot Conversion
	Alectra Subcategory	Rear Lot Conversion
4. Evaluation Criteria (OEB)	Project Summary	Convert the Royal Orchard – North (Markham) area from rear lot overhead supply to front lot underground supply (primary and secondary). This will reduce number of outages and power restoration time. The project is proposed to be completed over three years in 2019, 2020, and 2021. The existing rear lot location Royal Orchard – North (Markham) will be 52, 53, and 54 years old in 2019, 2020, and 2021 respectively. The asset is deteriorated and requires remediation. In addition, the poles in this rear lot location were inspected and majority of the poles are in poor or very poor condition. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The priority of this project is high. This project is to decrease the outage impacts due to deteriorating distribution system assets and mitigate the outage impacts due to increasing effect of adverse weather events. Reasons for Priority: The electrical system is deteriorating and poses many operations, safety, and customer service concerns that must be addressed. If not addressed, the system will deteriorate further and failures and safety hazards will increase. In December 2013, an ice storm came in across Ontario including Alectra (East) service territory. During the storm, many trees, including trees in rear lot areas, fell onto power lines and created prolonged power outages to customers. Power restoration in rear lot areas was very difficult due to accessibility. The December 2013 ice storm caused 29,831,573 CMI within the rear lot grids, which accounted for 16.68% of the total system CMI due to the ice storm. The existing rear lot location Royal Orchard – North (Markham) will be 52, 53, and 54 years old in 2019, 2020, and 2021 respectively. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2013 where a majority of the poles are in poor or very poor condition. The average SAIDI (2015-2017) for this location was 243.60 min and SAIFI was 3.21 while the system SAIDI 85.8 min and SAIFI is 1.44 which represents a 2.8 fold difference in SAIDI and 2.2 fold difference in SAIFI. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Safety risk associated with close proximity to power line in the backyard: Although the Electrical Safety Code and easement terms specify minimum clearance between customer facilities and power line, there are cases that customers do not follow the safety rules and install facilities too close to power line. Examples are shed, storage, playground, trampoline, swimming pool, patio deck, landscape, house extension, etc. This encroachment creates a safety hazard for both customers and crews. Safety risk associated with reduced clearance due to encroachment of power line: Over time, growth of vegetation and obstruction due to customer facilities may jeopardize the minimum clearance requirements and restrict crew mobility. Occasionally dogs may also be a safety hazard to the crews.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable

Environmental Benefits

Because overhead transformers are installed on the pole in rear lot area, a pole falling down may also cause the transformers to fall down, resulting in transformer tank rupturing, and oil being spilled onto the ground.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)

Status Quo

Under this option, no proactive investments would be executed to replace either existing rear lot infrastructure and these assets would only be intervened upon in reactive scenarios, when the assets have reached their end-of-life. Under this approach, customers would be exposed to prolonged reliability impacts, due to the accessibility issues associated with rear lot infrastructure, as well as the complex restoration procedures that would be required for a four-feeder outage event.

As standardized equipment (e.g. bucket trucks) cannot be used to service rear lot plant, wood poles, transformers and overhead switches would have to be replaced manually, with field crews accessing private customer properties in order to execute the work. Customers and field crews would continue to be exposed to elevated safety risks, due to the minimal proximity between customer plant and the rear lot overhead lines, as well as the non-standard and non-ergonomic work procedures that field crews would have to continue to execute to sufficiently maintain, inspect and service the plant.

Finally, as assets are replaced reactively, new assets would need to be installed according to the rear lot configuration. By its design, rear lot can only be converted if the entire line is replaced at once as part of an overall project. Therefore, the legacy design will continue to be maintained under this scenario. This will include the continued operation of the legacy voltage system, along with continuing the associated inefficiencies, such as line losses.

Alternative #1

Remediate the existing rear lot plant with other design options .
The other design options considered are described below.

Rear Lot Overhead Option:

Under this Option, the existing rear lot plant is replaced with new overhead plant in the rear lot.
When the replacement project is implemented, the following design parameters should be considered:
- Convert from 8.32 kV to 27.6 kV
- Install critical components such as fuse, switch, and transformer as close to the accessible street as possible

This Option is not acceptable because it does not resolve the major operations and customer reliability concerns related to the distribution assets located at rear lot at this location. In addition, this portion is part of the Royal Orchard Rear Lot area which is divided into smaller portions named Royal Orchard – East, Royal Orchard – North, Royal Orchard – South, and Royal Orchard – Baythorn. The Royal Orchard – East portion has already been remediated with Front Lot Underground in 2015 and 2016. The Royal Orchard – Baythorn portion was remediated with Front Lot Underground in 2017.

Replace with Partial Underground Infrastructure
This scenario involves the replacement of existing rear lot infrastructure with a new hybrid solution, where primary voltage infrastructure, including transformers, switches and lines would be installed as per an underground configuration within the front right-of-way, following standard Alectra Utilities installation practices. Under this approach, secondary infrastructure, including wood poles and secondary conductor, would remain in the rear lot in overhead configuration.
This approach would not fully address the reliability and safety concerns associated with rear lot distribution, as secondary connections will remain in the rear lot. However, future outage impacts will be reduced and contained to only those customers connected to the associated transformer. Lower voltage classes will also be converted up to the standardized 27.6kV voltage standard as per this investment option.
Under this option, reliability and safety issues would continue to persist due some infrastructure remaining overhead. The cost of partial underground renewal is higher than the renewal of the rear lot overhead and further more does not result in mitigating the risks associated with the existing system. This partial underground approach has been adopted where feasible.

Alternative #2

Replace with Full Underground Infrastructure
This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure. All existing primary and secondary distribution assets within the rear lot corridor will be removed and replaced with new underground primary and secondary infrastructure that is installed within the front lot corridor as per current standard design practices. Underground secondary cables will run from the front lot underground transformers to the individual meter bases in order to supply the customers.

Under this approach, existing under-classed legacy wood poles that support four feeders will be replaced with higher-class poles that are better suited to withstand major weather events. Through this investment scenario, these high impact assets will be better secured and weather-hardened against future outage events.
This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated and line losses associated with the legacy voltage classes can be eliminated.

Justification for Recommended Alternative

It is recommended to convert the Royal Orchard – North (Markham) area from rear lot overhead supply to front lot underground supply (primary and secondary). Under this Option, the existing rear lot plant is removed and new underground plant is installed in front lot.

This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated and line losses associated with the legacy voltage classes can be eliminated. For these reasons, Alectra Utilities selected this approach.

In addition, this portion is part of the Royal Orchard Rear Lot area which is divided into smaller portions named Royal Orchard – East, Royal Orchard – North, Royal Orchard – South, and Royal Orchard – Baythorn. The Royal Orchard – East portion has already been remediated with Front Lot Underground in 2015 and 2016. The Royal Orchard – Baythorn portion was remediated with Front Lot Underground in 2017.

6. General Information on the Project/Activity (OEB)

Risks to Completion and Risk Management

Risk: Fluctuation in cost and staff resource (internal and external) to complete high annual volume of work.

Risk Management: Alectra has retained external contractor working at different work sites throughout the year under a multi-year EPC (Engineering Procurement Construction) Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track.

Comparative Information on Equivalent Historical Projects (if any)

Alectra has completed and is completing similar rear lot remediation project since 2013. Alectra has experience on executing several rear lot remediation project.

Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)

0

7. Category-Specific Requirements for Each Project/Activity (OEB)

Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:

The scope involves converting the Royal Orchard – North (Markham) area from rear lot overhead supply to front lot underground supply (primary and secondary). There are a total of 164 customers affected by the existing rear lot supply.

Rear lot infrastructure is functionally obsolete for the following key reasons:
• The rear lot configuration is generally unsafe to the public due to the large trees growing near energized power lines. In tandem with such an unsafe configuration, there are also line clearing hazards and related additional costs to do this work.
• Alectra Utilities is unable to use labour saving tools and devices such as bucket trucks to efficiently maintain and repair the distribution system due to assets located in customer backyards.
• Rear lot wood poles are generally congested, due to multiple service attachments and communication drops, which generally make it impossible to sufficiently climb poles. Crews must, therefore, use ladders to access these poles.
• Alectra Utilities is limited in utilizing ladders to access the overhead system due to Ministry of Labour restrictions for congested areas.
• Due to the presence of legacy porcelain top tie insulators, rear lot lines must be fully isolated before any maintenance or repair work on the overhead system can commence.
• Porcelain insulators are far more susceptible to contamination and flashover when compared to present-day standard polymer insulators.
• Rear lot infrastructure typically contains undersized #4 aluminum conductor steel-reinforced cable and aluminum conductor, along with #4 and #6 copper conductor, which are undersized and generally have a greater probability of annealing due to their reduced carrying capacity. These conductors must be fully isolated before any work can commence.

Condition of Asset vs. Typical Life Cycle and Performance Record

It is extremely difficult to gain access to the backyard to maintain, repair, and restore power. As a result there are prolonged outages to customers. This is especially more difficult in the event of ice storm.

Many of the Rear Lot Supply distribution systems were built in 1950s, 1960s, and 1970s (40-68 years old in 2016). The rear lot equipment is older than typical useful life and the asset condition is deteriorating. According to the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board", typical useful life of overhead transformers and wood poles are 40 and 45 years respectively. Many of the installations are not in compliance to today's standards.

The existing rear lot location Royal Orchard – North (Markham) will be 52, 53, and 54 years old in 2019, 2020, and 2021 respectively. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2013 where a majority of the poles are in poor or very poor condition.

Number of Customers in Each Customer Class Potentially Affected by Asset Failure

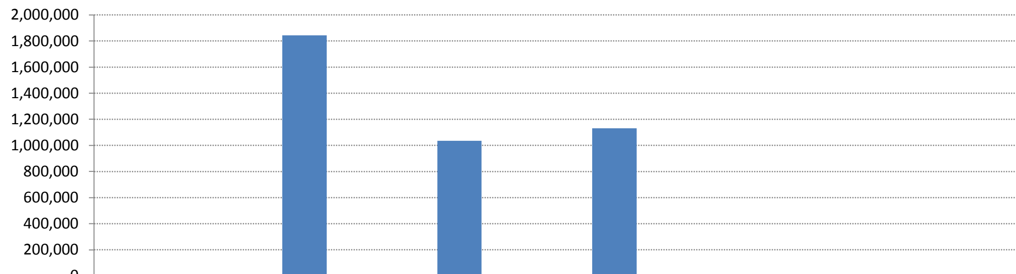
528

Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)

Assuming frequency of Failure: 2 failures per year
Assuming additional customers affected by outages in rear lot area: 100

• Estimated number of customers affected by 1 failure: 164 customers inside rear lot area + 100 customers outside rear lot area. Total = 164 + 100 = 264 customers. Assuming 264 residential and 0 commercial
• Estimated number of customers affected by 2 failures: 264 x 2 = 528 customers
• Frequency of interruption: 2 failures per year
• Duration of interruption: for 164 customers inside rear lot area duration is 5 hours; for 100 customers outside rear lot area duration is 1 hour. Weighted average is 3.5 hours per customer per interruption.
• Customers affected per failure: 264 residential + 0 commercial = 264 customers
• CMI per 1 failure: 264 x 3.5 hour x 60 min = 55,440 CMI
• CMI per 2 failures: 55,440 x 2 = 110,880 CMI

Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Rear lot supply failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Rear lot system also poses safety hazards to the customers because live electrical components are in proximity of customer's backyard and proper clearance may be violated due to customer's installations (examples: trees, garden, swimming pool, storage shed, deck, house extension).
Value of Customer Impact	High
Factors Affecting Project Timing, if any	Not Applicable
Consequences for O&M System Costs Including Implications of Not Implementing	In case of not implementing the project the OM&A cost will continue to occur due to tree trimming activities as well as increase in responding to outages since the assets are deteriorated and prone to failure.
Reliability and Safety Factors	This project is part of the long-term rear lot supply remediation program. The project will help avoid a total of 2 potential rear lot failures and 110,880 potential CMI. In addition, this project also eliminates safety hazards associated with ageing and deteriorating rear lot system. This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure.
Analysis for "Like for Like" Renewal Project	The selected option is not a like for like replacement. This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,009,063	$0	$1,843,336	$1,035,043	$1,130,684	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

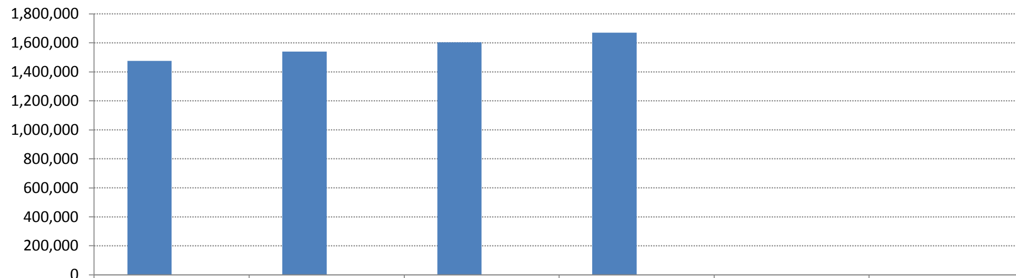
OEB Multi-Project Report

Project Code	150134
Project Name	Cable Injection Project - (V37) - Langstaff and Weston, Vaughan
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V37) - Langstaff and Weston (Vaughan)
	Units	71724
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $82/m.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 20 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 34 years old (installed in 1985), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	5526
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 71724 m of cable in the whole area: Frequency of Failure is: 0.25 x 71724 /1000 = 18 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 18 failures: 307 x 18 = 5526 customers affected and 43,131 x 18 = 776358 CMI "
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 18 potential cable failures and 776358 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable



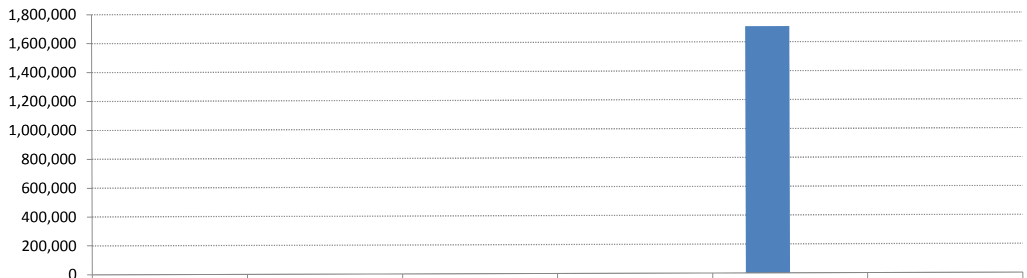
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $6,289,181	$1,474,888	$1,538,943	$1,604,322	$1,671,028	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150138	
Project Name	Cable Replacement Project – (BA23-BA24) - Cook St and Steel St, Barrie	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	(Barrie) - Cook St and Steel St
	Units	2399
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Cable Injection: Cable Injection was considered, but was rejected because the cable is very old (47 years old) and is at end-of-life stage. In addition, the cable is rated at 5 kV and therefore not suitable when the area is converted from 4.16 kV systems to 13.8 kV systems. If the cable is injected now, the injected cables will require replacement in a few years when the area is converted to 13.8 kV.
	Alternative #2	Perform the replacement in this area.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $712/m. The difference is based on the assumption that this project is more complicated (more obstruction, short clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 45 years old (installed in 1971), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	184
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 2399 m of cable in the whole area: Frequency of Failure is: 0.25 x 2399 /1000 = 0.6 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 0.6 failures: 307 x 0.6 = 184 customers affected and 43,131 x 0.6 = 25879 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 0.6 potential cable failures and 25879 potential CMI.
	Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,706,968	$0	$0	$0	$0	$1,706,968	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150141
Project Name	Cable Replacement Project – (M49) - Steeles and Fairway Heights, Markham
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(M49) - Steeles and Fairway Heights , Markham
	Units	3762
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Carry out cable replacement in the (M49) – Steeles and Fairway Height area to maintain system reliability and customer service. The total cable quantity for replacement is approx. 3,762 m. In addition, convert the supply from 13.8 kV to 27.6 kV. It is proposed to complete this project in 2019. The underground cable in the (M49) – Steeles and Fairway Height (Markham) area is supplied from John MS 13.8 kV feeder which has poor reliability performance. The cable is 37 years old and direct buried. There was 1 failure in 2014 (Total of 1 failure from 2012 to 2017). The cable is proposed to be replaced (as opposed to injection) because it is rated at 15 kV cable and therefore is unsuitable with future voltage conversion to 27.6 kV. John MS has two feeders, John-F5 and John-F6. They supply area bounded by John Street in the North, Hwy 404 in the East, Steeles Avenue in the South, and Bayview Avenue in the West. Most of the 13.8 kV load has already been converted to 27.6 kV with the exception of a few pockets. This project area is one of the last pockets of 13.8 kV load remaining on John MS. When all of the 13.8 kV load are converted to 27.6 kV, John MS can be decommissioned. The combined peak of the two feeders was less than 2 MVA whereas the station capacity is 20 MVA. It is therefore inefficient and uneconomical to maintain a large MS for such a small load. The average FAIFI in the past three years is 2.937 for John-F5, and 1.745 for John-F6. These are much worse than system SAIFI of 1.155. John-F5 is the 9th worst and John-F6 is the 46th worst among all 322 feeders in terms of FAIFI. The average FAIDI in the past three years is 7.2 hours for John-F5, and 4 hours for John-F6. These are much worse than system SAIDI of 1.077. John-F5 is the 5th worst and John-F6 is the 24th worst among all 322 feeders in terms of FAIDI. There are three subdivisions on John-F6 feeder: • Apricot Street • Fairway Heights • Quail Valley Townhouse compound Apricot Street and Fairway Heights are covered under the scope of the Cable Replacement – (M49) - Steeles and Fairway Heights project. Quail Valley is covered under the scope of the Cable Replacement – (M43) – Quail Valley.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The priority of this project is high. Reason for Priority: The underground cable in the (M49) – Steeles and Fairway Height (Markham) area is supplied from John MS 13.8 kV feeder which has poor reliability performance. The cable is 37 years old and direct buried. There was 1 failure in 2014 (Total of 1 failure from 2012 to 2017). Alectra East (legacy PowerStream) has a very large quantity of underground primary cable in service (8,388 km). A portion of the cable population is at end-of-life and requires rehabilitation in order to maintain system integrity and reliable service to the customers. Cable and splice failures are the leading cause of Customer Minutes of Interruption (CMI) at Alectra East and contributed to 9.8 minutes of SAIDI out of a total of 52.65 SAIDI minutes.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were \$389/m. This project is forecasted to be \$778/m. The difference is based on the assumption that this project is more complicated (more obstruction, short clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 36 years old (installed in 1983), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	276
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 3762 m of cable in the whole area: Frequency of Failure is: 0.25 x 3762 /1000 = 0.9 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 0.9 failures: 307 x 0.9 = 276 customers affected and 43,131 x 0.9 = 38818 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable

Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 0.9 potential cable failures and 38818 potential CMI.
Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,925,454	$0	$2,925,454	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150217
Project Name	Build double 27.6kV ccts on Teston Rd and Pine Valley Dr to supply Block 40/47
Major Category	System Service
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	Phase 1: Rebuild 16kV single phase pole line on PVD (Major Mack Dr to Teston Rd 2km) into 2 ccts 27.6kV pole line to supply Block 40 and Block 47 in 2017, but string one cct only in 2017. Phase 2: Re-build existing 8.32kV pole line on Teston Rd (PVD to Weston Rd) into 4 ccts 27.6kV pole line to supply Block 40 and Block 47 in 2020 . This will become part 3 of VTS4 feeder integration plan. York Region is planning to widen Teston Rd from 2 lanes to 4 lanes between PVD and Weston Rd in 2021. A consultant has just been retained by York Region for the design. The existing pole line will have to be relocated in 2020. A new 4 ccts pole line in 2020, and all existing 8.32kV customers will be transferred to the new 27.6kV pole line.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by green field expansion. Phase 1: Rebuild 16kV single phase pole line on PVD (Major Mack to Teston Rd 2km) into 2 ccts 27.6kV pole line to supply Block 40 and Block 47 in 2017, but string one cct only in 2017. Phase 2: Re-build existing 8.32kV pole line on Teston Rd (PVD to Weston Rd 2km) into 4 ccts 27.6kV pole line to supply Block 40 and Block 47 in 2020, and it will be constructed in conjunction with the road widening work and existing pole line relocation work. A new transformer station Vaughan Transformer Station 4 (VTS#4) has been built in Vaughan and the associated Feeder Integration Master plan had identified a need for four 27.6kV circuits on Teston Road and two 27.6kV circuits on Pine Valley Dr. This project is integral to the Feeder Integration Master plan (Part 3)
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	High. Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by intensification and redevelopment. The development of properties in this area started in 2017. Without new feeders, the ability to supply new loads will be significantly constrained. The primary driver for this Investment is to support capacity delivery for the new development in the Block 40 & Block 47 Area. As of June 2017, developers have submitted service applications for 566 detached homes, so the phase 1 has to be completed in 2017. (completed) The City of Vaughan is being supplied by eight 230/27.6 KV stations and 54-27.6KV feeders. The York Region recently issued the growth plans which account for approximately 613,900 new residents and 305,100 new jobs between 2016 and 2041.This growth is distributed throughout the York region. The Block 40/47 Secondary Plan supports 1,242 single detached units and approximately 59 townhouse units with the potential of the medium density/commercial block containing an additional 87 townhouse units to accommodate a population of approximately 4,893. See the attachment for more details. Based on 2.5kW per unit, the total demand would be 3.5 MW. CDM is considered and load forecast is net of CDM. There is one 8.32kV feeder on Teston Rd that is supplied by a 3x100 kVA 27.6/8.32kV step down transformer bank, so it does not have sufficient capacity to supply the new development. A new pole line is required. The customer requested that power should be ready by June 2019 however York Region is going to widen Teston Re from Pine Valley to Weston Rd in 2021, and existing pole line has to be relocated in 2020. To coordinate with York Region’s road work schedule, the new subdivision along Teston Rd will be supplied by the 8.32kV feeder temporarily. The distribution transformers in the new subdivision will be 16kV/4.8kV dual voltage transformers. There is one 16kV single phase feeder on Pine Valley Drive (PVD) between Major Mack Dr and Teston Rd, so it can not supply the three phase load in the new development. A new three phase pole line is required on PVD.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.

	Coordination, Interoperability	Not Applicable.
	Economic Development	This project will supply 1,400 new homes in Block 40 and Block 47.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, (i.e., not build project as proposed), but to supply load growth from existing facilities. It will impact Alectra distribution system in two following aspects: Capacity Based on 2.5kW per unit, the total demand would be 3.5 MW. There is one 8.32kV feeder on Teston Rd that is supplied by a 3x100 kVA 27.6/8.32kV step down transformer bank, so it does not have sufficient capacity to supply the new development. A new pole line is required. There is one 16kV single phase feeder on Pine Valley Drive (PVD) between Major Mack Dr and Teston Rd, so it can not supply the three phase load in the new development. A new three phase pole line is required on PVD. Status Quo will jeopardize Alectra's obligation to supply new customers in Block 40/47. The impact severity and timing will depend on the schedule of the Block 40 and Block 47 development. There are no specific costs with the status quo, there are financial risks that are detailed in the risk section. Alectra will be at risk of compromising supply to new loads in Block 40/47 areas that may have negative impacts on our corporate reputation and mission. Alectra is obligated to service future growth within its service territory using "good utility practice". Failure to provide adequate levels of service could lead to regulatory sanctions, and customer damage claims. Reliability The 16kV single phase on PVD can supply some single phase load, but it is a radial feeder. Customers in Block 40/47 will experience if any pole failure between Major Mack and Teston Rd. The 8.32kV feeder on Teston Rd can supply customers too, but the pole line is over 40 years old. Customers in Block 40/47 will experience if any pole failure on Teston Rd. Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner
	Alternative #1	Non- wires Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs. For this project these options have not been considered as new feeders are needed to connect the customers to grid.
	Alternative #2	Not applicable
	Justification for Recommended Alternative	This project includes following constructions: • Rebuild 16kV single phase pole line on PVD (Major Mack to Teston Rd 2km) into double 27.6kV pole line in 2017 • Re-build existing 8.32kV pole line on Teston Rd (PVD to Weston Rd 2km) into 4 ccts in 2020. • install one re-closer on PVD north of Major Mack Dr. • install other LIS switches as per Alectra design standard. Status quo 1 was not chosen for the following reasons: • Status Quo does not meet system needs for supply capacity The recommended alternative was chosen for the following reasons: • It improves the reliability situation mentioned in the status quo option • It will increase supply capacity to Block 40/47. • It will meet the immediate need for supply capacity. Funding this project will enable Alectra to meet its regulatory duty to supply the customers in our service area. Additionally it will allow us to operate the system in an efficient and effective manner by providing coordinated protections between source and load and having adequate backup capacity in the event of an outage. Double ccts on Teston Rd and PVD will increase supply capacity by 80 MVA when Vaughan TS4 feeder integration plan Part 3 is implemented in 2023. Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk is to get approval from the City of Vaughan in time. Capital design will work with the municipality and obtain approvals in a timely manner.
	Comparative Information on Equivalent Historical Projects (if any)	Alectra has been building 4 ccts pole line for long time and has extensive experience.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not Applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable.

Identify any reliability, efficiency, safety or coordination benefits	One cct on Teston Rd and PVD will provide supply capacity for Block 40 & 47. Double ccts on Teston Rd and PVD will become Vaughan TS4 feeder integration plan Part 3 that is to be implemented in 2023. Vaughan TS4 feeder integration plan Part 3 will integrate 4 new 27.6kV feeders from VTS4 into PowerStream and increase supply capacity by 80 MVA.

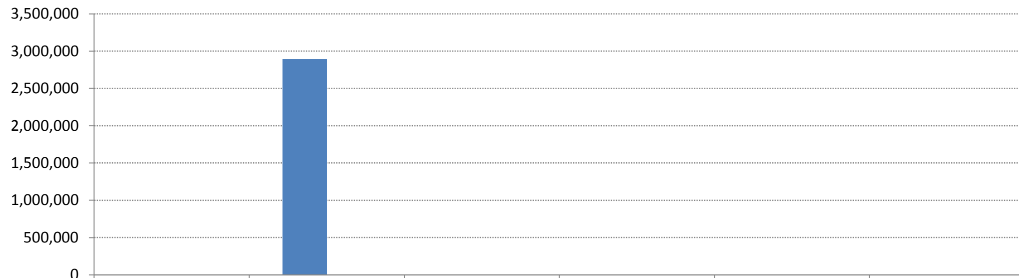
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,445,538	$0	$1,445,538	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150254	
Project Name	Cable Replacement Project - (A02) - Steeplechase Ave, Aurora	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(A02) - Steeplechase Ave (Aurora)
	Units	7560
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $383/m.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 45 years old (installed in 1974), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	583
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 7560 m of cable in the whole area: Frequency of Failure is: 0.25 x 7560 /1000 = 1.9 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.9 failures: 307 x 1.9 = 583 customers affected and 43,131 x 1.9 = 81949 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.9 potential cable failures and 81949 potential CMI.
	Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,891,956	$0	$2,891,956	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150255	
Project Name	Cable Replacement Project - (B23) - Cundles Rd and Janine St, Barrie	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	(Barrie) - Cundles Rd and Janine St
	Units	1389
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Cable Injection: Cable Injection was considered, but was rejected because the cable is very old (44 years old) and is at end-of-life stage. In addition, the cable is rated at 5 kV and therefore not suitable when the area is converted from 4.16 kV systems to 13.8 kV systems. If the cable is injected now, the injected cables will require replacement in a few years when the area is converted to 13.8 kV.

	Alternative #2	Perform the replacement in this area.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $760/m. The difference is based on the assumption that this project is more complicated (more obstruction, short clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 45 years old (installed in 1974), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	92
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 1389 m of cable in the whole area: Frequency of Failure is: 0.25 x 1389 /1000 = 0.3 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 0.3 failures: 307 x 0.3 = 92 customers affected and 43,131 x 0.3 = 12939 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 0.3 potential cable failures and 12939 potential CMI.

Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

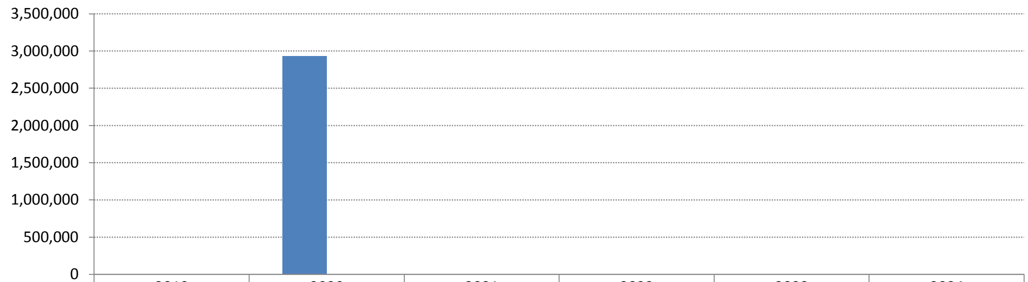
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,056,218	$0	$0	$0	$0	$1,056,218	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150257	
Project Name	Cable Replacement Project - (V15) - Jardin Dr, Vaughan	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V15) - Jardin Dr (Vaughan)
	Units	7456
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $389/m.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 37 years old (installed in 1982), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	583
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 7546 m of cable in the whole area: Frequency of Failure is: 0.25 x 7546 /1000 = 1.9 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.9 failures: 307 x 1.9 = 583 customers affected and 43,131 x 1.9 = 81949 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.9 potential cable failures and 81949 potential CMI.
	Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



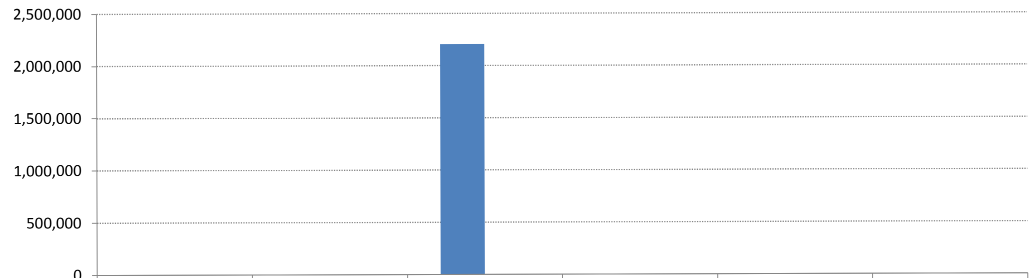
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,933,729	$0	$2,933,729	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150259	
Project Name	Barrie TS Upgrade Feeders and Metering	
Major Category	System Access	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Barrie TS - 304 Tiffin Street
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Transmitter Related Upgrades
	Alectra Subcategory	Transmitter Related Upgrades
4. Evaluation Criteria (OEB)	Project Summary	The project consists of: 1) Relocating the Midhurst 23M24 feeder; 2) Constructing Barrie TS feeder integration for 13M3 through to 13M8; 3) Installing new station metering. The Midhurst 23M24 feeder needs to be relocated from the west side of Barrie TS to accommodate the westward expansion of the upgraded station. The 23M24 should be relocated to the east side of Barrie TS for integration on Tiffin Street. Hydro One will be moving the station egress westward and feeder designations will shift to 13M1-13M2 InnPower and 13M3-13M8 Alectra; the feeder integration will have the two InnPower circuits going west from the station along Tiffin. Alectra to design 13M3 to 13M8 feeder integration to avoid crossing with InnPower westerly circuits 13M1 and 13M2. Note: The 13M3 is currently supplying InnPower through a PME, the 13M3 PME will need to be deregistered and the renamed 13M1 and 13M2 will need to be registered with the IESO for settlement purposes in 2019. Alectra GIS and SCADA will need to be updated accordingly. Alectra Metering to specify PME's for upgraded Barrie TS and coordinate with design of feeder integration.
	Main Driver - System Access	Service Requests
	Priority and Reasons for Priority	Barrie TS is nearing capacity and reaching end-of-life. As a result Hydro One is rebuilding the existing Barrie TS and uprating its existing supply from 115 kV to 230 kV, thereby increasing supply capacity to the area. Construction will begin in February 2019 with the upgraded station in-service by November 2020. Hydro One will be expanding the fenced areas westward to accommodate the upgraded station. As a result, Alectra will need to relocate the Midhurst 23M24 feeder currently routed along the west side of Barrie TS. Hydro One will also be moving the station egress westward and feeder designations will shift to 13M1-13M2 InnPower and 13M3-13M8 Alectra. Alectra will need to design the 13M3-13M8 feeder integration to avoid crossing the westerly InnPower circuits. Alectra is responsible for upgrading the revenue metering equipment at Barrie TS as per Schedule 4 of the Hydro One Customer Wholesale Revenue Metering Agreement.
	Customer Attachment / Load (KVA)	Barrie TS serves 7,600 customers with 334 MVA of connected load.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.

	Coordination, Interoperability	In 2014 Hydro One Transmission initiated a Needs Screening process for the South Georgian Bay/Muskoka planning region. The South Georgian Bay/Muskoka Needs Screening study team determined that there was a need for coordinated regional planning, resulting in the initiation of the Scoping Assessment process. The South Georgian Bay/Muskoka Scoping Assessment Outcome Report was finalized in 2015 and identified two sub-regions for coordinated regional planning: Barrie/Innisfil and Parry Sound/Muskoka. The process to develop the Barrie/Innisfil IRRP was initiated in 2015. A subsequent Scoping Assessment Report produced by the IESO recommended that the needs identified for the Barrie/Innisfil Sub-region should be further pursued owing to the potential for coordinated solutions and significant assets reaching end-of-life. Hydro One Transmission identified existing sustainment initiatives at Barrie TS driven by the 115/44 kV station transformers reaching end-of-life, along with the 44 kV switchgear, circuit breakers, disconnect switches and other station equipment. Barrie TS was placed in-service in 1962. The 44 kV switchyard assets at Barrie TS have been identified by Hydro One as being in need of replacement in the near term. Barrie TS is currently supplied by the 230/115 kV autotransformers at Essa TS via the Essa 115 kV switchyard and 115 kV circuits E3/4B. These assets were built in the 1950s, with many of them already exceeding their expected life and in need of replacement in the near and medium term. The timing and replacement options for Barrie TS were discussed among the IRRP Working Group members. It was agreed that based on the existing and forecast station demand, that Barrie TS and E3/4B should be rebuilt to 230 kV, with 75/125 Mega Volt Amp (“MVA”) 44/230 kV transformers. This means that the end-of-life replacement of Barrie TS will add approximately 50 MW of incremental supply capacity in the south Barrie and Innisfil area. The Working Group issued a hand-off letter in December 2015 to request that Hydro One begin development work on the Barrie TS upgrade. Construction on Barrie TS will begin in February 2019 with the upgraded station in-service by November 2020. Alectra will coordinate with Hydro One and InnPower to accommodate the Barrie TS upgrade initiated by IESO regional planning.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing. Hydro One must expand the fenced area westward to accommodate the upgraded Barrie TS footprint; therefore, the status quo is not possible as it will not allow upgrade of the transformer station as required by Hydro One and IESO regional planning. The status quo will not address the addition of a new 44kV feeder and change in feeder designation for the new feeder egress. Lastly, the status quo will not meet the requirements of Schedule 4 of the Hydro One Customer Wholesale Revenue Metering Agreement which dictates that Alectra is responsible for upgrading the revenue metering equipment at Barrie TS.
	Alternative #1	Alectra met with Hydro One on-site to discuss a temporary pole line along the west side of the upgraded station to accommodate the expanded fenced area during construction. Hydro One noted that the heavily forested area west of the station would require clearing and would result in a pole line very close to the residential property west of the station. Alectra agreed with Hydro One that routing the 23M24 along the east side of the upgraded station would ensure a permanent solution while maintaining a forested area with the neighboring residential property.
	Alternative #2	As per Schedule 4 of the Hydro One Customer Wholesale Revenue Metering Agreement, Alectra is responsible for upgrading the revenue metering equipment at Barrie TS. Station bus metering was considered as a potential option; however, Alectra Metering noted safety concerns and accessibility issues with the existing station bus metering at Barrie TS. The cost of station bus metering was assumed as $1,250,000 based on a recently completed primary metering installation by Hydro One at Buttonville TS.
	Justification for Recommended Alternative	The recommended alternative allows for the westward expansion of the upgraded transformer station by relocating the existing Midhurst 23M24 feeder from the west side of the station to the east side of Barrie TS for integration on Tiffin Street. The recommended alternative also ensures Alectra 13M3–13M8 feeders avoid crossing InnPower westerly circuits 13M1-13M2 when Hydro One moves the station egress westward and changes the feeder designation. The recommended alternative specifies PME’s for revenue metering equipment at the upgraded Barrie TS, thereby satisfying Schedule 4 of the Hydro One Customer Wholesale Revenue Metering Agreement while addressing safety concerns and accessibility issues experienced with the existing station bus metering.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The greatest risk to completion is securing the required approvals and coordinating construction in the allotted timeframe.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Factors Relating to Customer Preferences or Input	The preference has been selected after consultation with IESO/HONI and other LDC through the regional planning process.
	Factors Affecting the Final Cost of the Project	The final cost of the project will depend on final egress location and actual conditions encountered in the field.
	How Controlled Costs have been Minimized	The primary metering option chosen is lower than the existing bus metering on the station.
	Identify if Other Planning Objectives are Met by the Project, if so, which ones	This projects support the long term regional planning and the will meet the electrical needs of the Barrie-Innisfil area.
	Results of Final Economic Evaluation, if applicable	Not applicable
	System Impacts (Nature, Magnitude and Costs)	This project will increase the transformation capacity of up to 50MW to meet the growing demands in the Barrie and Innisfil area.



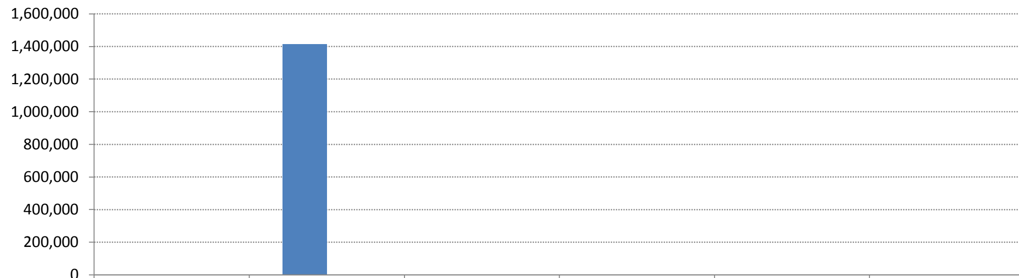
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,205,185	$0	$0	$2,205,185	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150261	
Project Name	Cable Injection Project - (V38) - Rutherford and Weston, Vaughan	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V38) – Rutherford and Weston (Vaughan)
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $ 78/m. This project is forecasted to be $83/m in 2020.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 36 years old (installed in 1983), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1289
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 16908 m of cable in the whole area: Frequency of Failure is: 0.25 x 16908 /1000 = 4.2 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 4.2 failures: 307 x 4.2 = 1289 customers affected and 43,131 x 4.2 = 181150 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 4.2 potential cable failures and 181150 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable



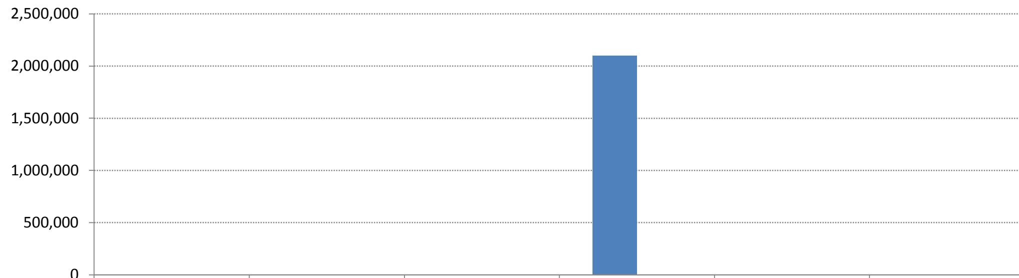
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,413,869	$0	$1,413,869	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150262	
Project Name	Cable Replacement Project - (M33) - 16th Avenue and Village Parkway, Markham	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(M33) - 16th Avenue and Village Parkway (Markham)
	Units	3781
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $555/m. The difference is based on the assumption that this project is more complicated (more obstruction, short clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 42 years old (installed in 1977), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	276
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 3781 m of cable in the whole area: Frequency of Failure is: 0.25 x 3781 /1000 = 0.9 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 0.9 failures: 307 x 0.9 = 276 customers affected and 43,131 x 0.9 = 38818 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 0.9 potential cable failures and 38818 potential CMI.
	Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,098,659	$0	$0	$0	$2,098,659	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

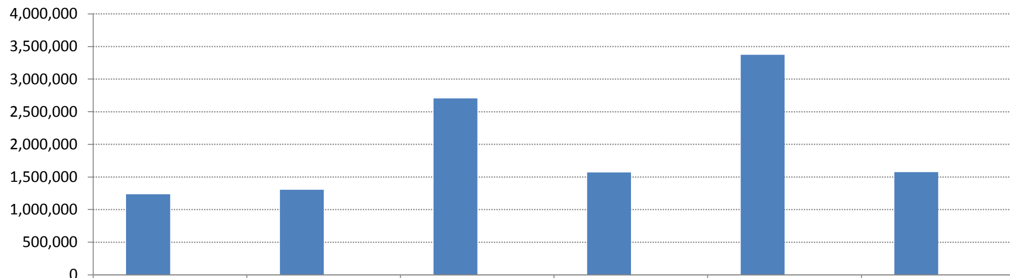
OEB Multi-Project Report

Project Code	150263
Project Name	Cable Replacement Project - East Left Behind Cable
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream North & South
	Location	Various locations in Alectra East (legacy PowerStream)
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segements are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Alectra East has budgeted and completed the same level of cable replacement work load in 2014, 2015, 2016, 2017 and 2018. Therefore the proposed annual budget for 2019 onward is a continuation of the cable replacement program at the same level.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this project exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1842
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 24000 m of cable in the whole area: Frequency of Failure is: 0.25 x 24000 /1000 = 6 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 6 failures: 307 x 6 = 1842 customers affected and 43,131 x 6 = 258786 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 6 potential cable failures and 258786 potential CMI.
	Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $11,758,778	$1,234,223	$1,304,394	$2,703,182	$1,567,248	$3,374,731	$1,575,000
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code: 150317

Project Name: Voltage Conversion - Deerhurst MS, Hamilton

Major Category: System Renewal

Scenario: 2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information

Service Territory	Hamilton
Location	Hamilton, Stoney Creek area
Units	
Project Class	No Burden
Project Includes R&D	No
Technology Project or has Technololgy Component	No
Project Will Generate Ongoing IT OM&A Costs	No

3. General Project Information (OEB)

Contributed Capital	Contributed Capital 0%
Expenditure Type	Controllable
Rates ID	Rate Base Funded
Alectra Grouping	Overhead Asset Renewal
Alectra Subcategory	Voltage Conversion

4. Evaluation Criteria (OEB)

Project Summary

This project is addressing the renewal of assets served by Deerhurst MS in Stoney Creek. Currently the station supplies customers at a primary voltage of 8kV from an outdoor municipal substation. As part of the renewal of feeder assets, the equipment will be replaced with similar equipment rated for 27.6kV. This will allow the municipal substation assets to be bypassed, thereby avoiding the cost to refurbish station assets in the future. This station is one of 3 in Stoney Creek that inter-tie to each other forming a 'triad', and therefore construction work must occur simultaneously at each of the station service territories to ensure reliable supply during the conversion.

Main Driver - System Renewal

Mitigate Failure Risks

Priority and Reasons for Priority

This project mainly addresses aging assets at the station and on the feeders by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the municipal substation and associated equipment.

The asset condition assessment indicates that the reclosers are in Poor condition. The priority assets determining the voltage conversion are the substation assets as failure of a critical component, such as the switchgear bus, can cause a major outage for an extensive timeframe impacting a large number of customers. Furthermore due to system design and construction in the 1950’s, feeder redundancy is minimal and loss of a station would result in stranded load and increased cost as generators would be required

The legacy substation equipment is

- No longer supported by the manufacturer;
- Parts are difficult to come by or must be custom made;
- Difficult or costly to maintain;
- Functional and Operational Obsolesces; (e.g. safety restrictions on operation circuit breakers)
- Unable to meet current safety standards (e.g., switchgears that are not arc resistance);
- Unable to meet current performance standards

Feeder Assets

Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment.

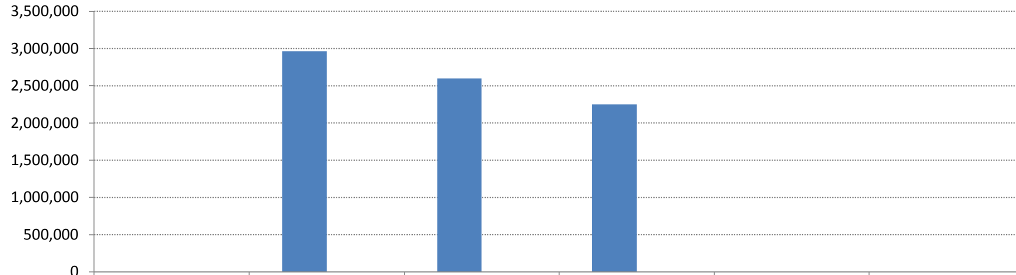
Customer Attachment / Load (KVA)	7657 kVA and 1525 customers.
Safety	Not applicable.
Cyber-Security, Privacy	Not applicable.
Coordination, Interoperability	New construction built to current standards, coordination with joint-use tenants, coordination with the municipality.
Economic Development	Not applicable.
Environmental Benefits	Lower line losses due to conversion to higher voltage class.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)

Status Quo

Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as the breaker assets have reached functional obsolescence and there are no parts available.

	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings. Under the like-for-like replacement option, existing 8.32 kV infrastructure would be replaced with 8.32 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels.
	Alternative #2	Full conversion of the lines to new 27.6 kV primary system voltages This alternative proposes to renew the assets in the area while also proceeding with voltage conversion to a higher voltage class for the equipment. Other benefits include taking the opportunity to redesign the feeder configuration to provide improved reliability where possible by creating loops where none exist today as well as converting rear lot supply to front lot. This alternative also provides value in the form of avoided costs to rebuild the existing 8kV substation assets.
	Justification for Recommended Alternative	Like-for-like or reactive replacement does not prove to be as economical on a large scale renewal project with numerous assets affected. 13.8kV and 27.6kV are standard stock items in many cases and can result in savings over the 8kV equivalent. Reduced O&M costs and lower line losses due to the elimination of substation assets, improvements to the system configuration for greater operability and reliability are considered some of the incremental benefits. The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers. For those reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable.
	Comparative Information on Equivalent Historical Projects (if any)	Historical projects that compare would be from other similar voltage conversion projects undertaken as part of the 4kV/8kV Renewal Program. These projects typically fall within a range of $2MM - $2.5MM per year for the life of the project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	The substations in Stoney Creek account for the last remaining 8kV feeder and station assets in an otherwise 27kV class system and nearly 3000 customers. There is a large amount of direct buried XLPE as part of URD subdivisions for these projects, and had been flagged for action due to the vintage of the cable (late '70's). By bundling the voltage conversion along with the renewal of URD assets, greater cost efficiencies can be gained. These URD areas have seen cable faults in recent years, as well as there being faults at the substation level at Dewitt MS.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Generally the 4kV and 8kV assets are of the oldest vintage in the system. The asset condition assessment indicate that the reclosers are in Poor condition.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1525
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Deerhurst station 3 year stats: 6 outages, 101,889 customer minutes (22.3 minutes/customer/year)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets with inadequate backup. Aging assets represent an increased risk of service interruption to customers and inadequate backup would result in long duration service interruptions upon occurrence. These factors would lead to customer dissatisfaction in this area.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not implementing the project would negate any O&M benefit gained by removing a substation from service. Considered a critical component of the distribution system, a typical substation requires monthly inspections and upkeep to ensure reliable operation.
	Reliability and Safety Factors	The benefits to reliability are in the renewal of the aging assets, as well as an opportunity to reconfigure any parts of the feeder that carry a higher risk for an outage (i.e. rear lot supply). There is also an opportunity to implement remote-operable devices to assist in operability of the system in the area affected. Safety benefits are captured in the renewal work being built to current construction standards, providing better working clearances and ergonomics.
	Analysis for "Like for Like" Renewal Project	The like-for-like renewal of these assets (i.e. same system configuration and same distribution voltage) will perpetuate the existing operating constraints and require capital investment to renew substation assets. Renewal of the distribution assets at a higher voltage does not involve any material incremental costs over renewal at the existing voltage. Operating constraints (e.g. undersized conductor, radial feeds) are addressed on a case by case basis where appropriate.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $7,812,081	$0	$2,964,540	$2,598,540	$2,249,001	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150319	
Project Name	New MS - Duke MS 20 MVA Substation, Mississauga	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	North-west of Rathburn and Living arts intersection.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Stations)
	Alectra Subcategory	Station Capacity Projects
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities determined that a new MS would be required in the northwestern region of Mississauga's downtown core. Alectra Utilities has determined that the optimal site for that MS would be the proposed Duke MS site at Centre View Drive and Duke of York Boulevard. Alectra Utilities forecasts expenditures of $6.2M on the Duke MS during the DSP period. Currently, there are approximately 65 buildings in the downtown core and three substations: Woods MS, Confederation MS, and City Centre MS. These substations are equipped with either two or three power transformers, and most of their capacity is dedicated to supplying the existing load in the downtown core. Also, John MS, located on Hurontario Street near John Street, also provides power to Mississauga Valley and Sussex districts. The current capacity available for the downtown core is approximately 140 MVA ONAN rating. Based on growth projected and the land parcels available, Alectra estimates that, upon completion of Downtown21 in 2035, the combined transformation load requirement will increase approximately by 300 MVA. Alectra Utilities will have to expand its infrastructure in the downtown core and increase the number of substations to reliably supply additional load. At least eight substation transformers will need to be dedicated to meet this significant future demand, including in contingency conditions.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	There are two known large developments planned for Mississauga that drive some of the need for stations capacity expenditures during the DSP period. Both are summarized below. Block 8 and Office Towers along Centre View Drive Block 8 is bounded by Rathburn road to the North, Confederation to the west, Living Arts to the East and Square One Drive to the South. The parcel will consists of 6 buildings in total ranging from 40 stories to 54 stories with total 18MW of load which includes 3MW of electric vehicle charging load by 2026. Alectra Utilities is currently working on the design for Phase 1 which consists of 2 towers (896 units) with total load of 6 MVA. In addition, there are planned office towers along Centre view drive and Rathburn which will another 10 MW of load. Alectra Utilities has received application for development of Office tower which will add another 3 MW of load on Centreview and Station Gate. Rogers (M-City) The Rogers M-City will transform a vacant 15-acre lot at the South West corner of Burnhamthorpe road. This development is projected to house some 6,000 residents and will consist of 10 towers 60-75 stories and will add another 30 MW of load. Phase 1 which is designed consists of 2 building with total of 5MW. Alectra Utilities has been notified of the Phase 2 which is of similar size.
	Customer Attachment / Load (KVA)	20MW New Capacity
	Safety	Alectra Utilities will utilize internal and external contractors to complete the design and construction of the stations. The Execution phase will follow Alectra Utilities' internal project management methodology which provides specific guidelines, procedures, work instructions, and industry best practices that allow the project work to be performed in an economically efficient, cost-effective, and safe manner.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Coordination must be done with road extension of Living Arts Drive.
	Economic Development	The proposed land swap arrangement with the builder is the most economical option which ensures that site is secured for Duke MS and station to be constructed in 2023/2024 to supply the loads between Rathburn Road and Centre View Drive.
	Environmental Benefits	Not Applicable

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / “Do Nothing” There is insufficient capacity on the system to meet the load growth and the contingency requirement in each of the project areas identified herein, and therefore the Status Quo option is not recommended. Alectra Utilities has also examined the risk of not securing land for the relevant stations and determined that the pace of rapid development and increasing scarcity of suitable parcels (both regarding size and location) favour the timely acquisition of land in the DSP period. If this investment is deferred into the future, Alectra Utilities is likely to incur higher costs associated with the land purchase as well as significant 44 kV and 13.8 kV feeder integration costs. Utilizing Non-Wire Alternatives Alectra Utilities’ load forecast process considers the impact of CDM and distribution generation, which is accounted for as part of the load forecast underpinning the Stations Capacity portfolio. Alectra Utilities has also considered other options, such as battery storage, and determined that these options are not economical for the capacity that is required to meet the load growth and contingency conditions. Neither of these are the recommended alternative.
	Alternative #1	Non Wires Alternative Alectra Utilities’ load forecast process considers the impact of CDM and distribution generation, which is accounted for as part of the load forecast underpinning the Stations Capacity portfolio. Alectra Utilities has also considered other options, such as battery storage, and determined that these options will not meet the load growth and contingency conditions for the stations to be upgraded during this DSP period Wires Alternative Confederation MS Expansion Confederation MS has two transformers supplies the northern part of Mississauga’s downtown core. The current property allows for the installation of a transformer and breaker lineup to increase the capacity at Confederation MS. However, the City of Mississauga has proposed an extension of Square One Drive to Rathburn Road, which will require a portion of the land to be used for the new road. The remaining substation property will then be too small to accommodate an additional transformer and the high voltage equipment associated with it. City Centre MS Expansion There are three 20 MVA transformers installed at the City Centre MS site where the existing infrastructure, including duct banks and switchgear, is fully utilized. The installation of any additional transformers and feeders will require a major reconstruction of the substation and the associated civil infrastructure. Also, new feeders coming out of the substation will have de-rated capacity due to main feeder cable congestion and restricted duct bank configuration. As a result, the installation of an additional transformer is not economical and does not meet the technical requirements needed to supply load in the downtown core efficiently. John MS Expansion Alternative The John MS site has sufficient space for the installation of an additional transformer. However, the new feeders coming out of the substation cannot be extended north to the downtown core unless a new, second pole line with four feeders is constructed along the west side of Hurontario Street from John MS to Burnhamthorpe Road. Considering future projects, including the LRT along Hurontario Street, Alectra Utilities determined that it not be able to install a new pole line on the west side of Hurontario Street in addition to existing pole line on the east side. Neither of these are the recommended alternative.
	Alternative #2	New Duke MS - 20MVA Municipal Station To satisfy the expected demand resulting from the growth and intensification of the downtown core, Alectra Utilities determined that it must install new transformers at two new substations in the northern and southern parts of the downtown core. Based on careful review and consideration of the existing feeder locations, future development and locations of the existing substations, Alectra Utilities determined that the optimal location for the northern substation is near the intersection of Centre View Drive and Duke of York Boulevard. (Duke MS). This is the recommended alternative.
	Justification for Recommended Alternative	Based on the reasons listed above Alectra recommends construction of a new Duke MS.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Land must be obtained and guaranteed. The original "Downtown 21" city plan on which load estimation is based may not materialize within the time constraints proposed of 2021. This aggressive plan is still used as a guide, and is forecast for 2024.
	Comparative Information on Equivalent Historical Projects (if any)	Mini Orlando was created in order to convert existing 44kV capacity into needed 27.6kV capacity north-east of Britannia Rd. and Mavis Rd.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Extra cable capacity to supply future residential and commercial buildings in City Centre.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	This project results from growth in the City Centre.
	Description of Incorporation of Advanced Technology, if applicable	No advanced technology
	Identify any reliability, efficiency, safety or coordination benefits	Old 750kcmil cables are replaced with 1000kcmil standard, thus increasing reliability of supply.

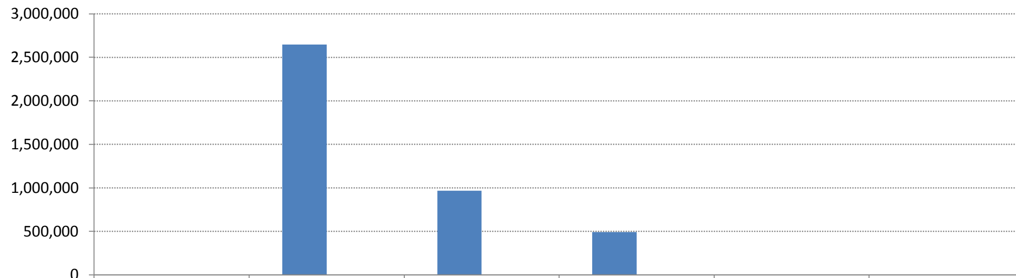
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $6,152,794	$0	$0	$0	$0	$1,952,794	$4,200,000
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150320	
Project Name	Voltage Conversion - Dewitt MS , Hamilton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Hamilton, Stoney Creek area
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is addressing the renewal of assets served by Dewitt MS in Stoney Creek. Currently the station supplies customers at a primary voltage of 8kV from an outdoor municipal substation. As part of the renewal of feeder assets, the equipment will be replaced with similar equipment rated for 27.6kV. This will allow the municipal substation assets to be bypassed, thereby avoiding the cost to refurbish station assets in the future. This station is one of 3 in Stoney Creek that inter-tie to each other forming a 'triad', and therefore construction work must occur simultaneously at each of the station service territories to ensure reliable supply during the conversion.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	This project mainly addresses aging assets at the station and on the feeders by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the municipal substation and associated equipment. The asset condition assessment indicate that the reclosers and transformer are in Poor condition. The priority assets determining the voltage conversion are the substation assets as failure of a critical component, such as the switchgear bus, can cause a major outage for an extensive timeframe impacting a large number of customers. Furthermore due to system design and construction in the 1950's, feeder redundancy is minimal and loss of a station would result in stranded load and increased cost as generators would be required The legacy substation equipment is • No longer supported by the manufacturer; • Parts are difficult to come by or must be custom made; • Difficult or costly to maintain; • Functional and Operational Obsolesces; (e.g. safety restrictions on operation circuit breakers) • Unable to meet current safety standards (e.g., switchgears that are not arc resistance); • Unable to meet current performance standards Feeder Assets Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment.
	Customer Attachment / Load (KVA)	5000 kVA and 612 customers.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	New construction built to current standards, coordination with joint-use tenants, coordination with the municipality.
	Economic Development	Not applicable.
	Environmental Benefits	Lower line losses due to conversion to higher voltage class.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as the breaker assets have reached functional obsolescence and there are no parts available.

	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings. Under the like-for-like replacement option, existing 8.32 kV infrastructure would be replaced with 8.32 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels.
	Alternative #2	Full conversion of the lines to new 27.6 kV primary system voltages This alternative proposes to renew the assets in the area while also proceeding with voltage conversion to a higher voltage class for the equipment. Other benefits include taking the opportunity to redesign the feeder configuration to provide improved reliability where possible by creating loops where none exist today as well as converting rear lot supply to front lot. This alternative also provides value in the form of avoided costs to rebuild the existing 8kV substation assets.
	Justification for Recommended Alternative	Like-for-like or reactive replacement does not prove to be as economical on a large scale renewal project with numerous assets affected. 27.6kV rated equipment are standard stock items in many cases and can result in savings over the 8kV equivalent. Reduced O&M costs and lower line losses due to the elimination of substation assets, improvements to the system configuration for greater operability and reliability are considered some of the incremental benefits. The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers. For those reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable.
	Comparative Information on Equivalent Historical Projects (if any)	Historical projects that compare would be from other similar voltage conversion projects undertaken as part of the 4kV/8kV Renewal Program. These projects typically fall within a range of $2MM - $2.5MM per year for the life of the project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	The substations in Stoney Creek account for the last remaining 8kV feeder and station assets in an otherwise 27kV class system and nearly 3000 customers. There is a large amount of direct buried XLPE as part of URD subdivisions for these projects, and had been flagged for action due to the vintage of the cable (late '70's). By bundling the voltage conversion along with the renewal of URD assets, greater cost efficiencies can be gained. These URD areas have seen cable faults in recent years, as well as there being faults at the substation level at Dewitt MS.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Generally the 4kV and 8kV assets are of the oldest vintage in the system. The asset condition assessment indicate that the reclosers and transformer are in Poor condition. Two of the reclosers at the station have recently been taken out of service and are not able to be repaired, leaving the entire station supplying customers through one remaining recloser.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	612
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Dewitt station 3 year stats (2014-2017): 12 outages, 714,117 customer minutes (388 minutes/customer/year)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets with inadequate backup. Aging assets represent an increased risk of service interruption to customers and inadequate backup would result in long duration service interruptions upon occurrence. These factors would lead to customer dissatisfaction in this area.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not implementing the project would negate any O&M benefit gained by removing a substation from service. Considered a critical component of the distribution system, a typical substation requires monthly inspections and upkeep to ensure reliable operation.
	Reliability and Safety Factors	The benefits to reliability are in the renewal of the aging assets, as well as an opportunity to reconfigure any parts of the feeder that carry a higher risk for an outage (i.e. rear lot supply). There is also an opportunity to implement remote-operable devices to assist in operability of the system in the area affected. Safety benefits are captured in the renewal work being built to current construction standards, providing better working clearances and ergonomics.
	Analysis for "Like for Like" Renewal Project	The like-for-like renewal of these assets (i.e. same system configuration and same distribution voltage) will perpetuate the existing operating constraints and require capital investment to renew substation assets. Renewal of the distribution assets at a higher voltage does not involve any material incremental costs over renewal at the existing voltage. Operating constraints (e.g. undersized conductor, radial feeds) are addressed on a case by case basis where appropriate.



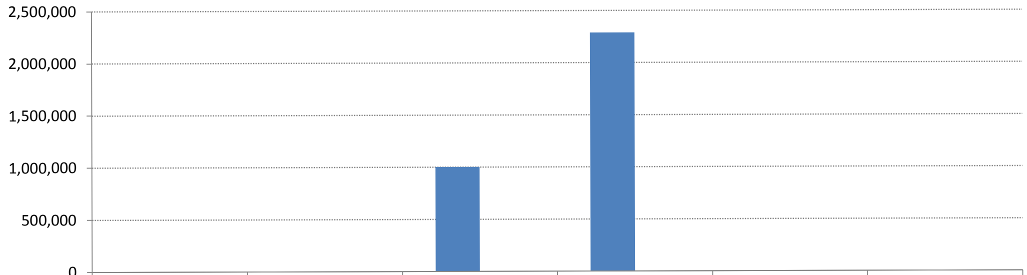
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,106,620	$0	$2,646,726	$966,406	$493,488	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150321	
Project Name	Voltage Conversion - Galbraith MS, Hamilton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Hamilton, Stoney Creek area
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is addressing the renewal of assets served by Galbraith MS in Stoney Creek. Currently the station supplies customers at a primary voltage of 8kV from an outdoor municipal substation. As part of the renewal of feeder assets, the equipment will be replaced with similar equipment rated for 27.6kV. This will allow the municipal substation assets to be bypassed, thereby avoiding the cost to refurbish station assets in the future. This station is one of 3 in Stoney Creek that inter-tie to each other forming a 'triad', and therefore construction work must occur simultaneously at each of the station service territories to ensure reliable supply during the conversion.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	This project mainly addresses aging assets at the station and on the feeders by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the municipal substation and associated equipment. The asset condition assessment indicate that the Switchgear and breakers are in Poor condition. The priority assets determining the voltage conversion are the substation assets as failure of a critical component, such as the switchgear bus, can cause a major outage for an extensive timeframe impacting a large number of customers. Furthermore due to system design and construction in the 1950's, feeder redundancy is minimal and loss of a station would result in stranded load and increased cost as generators would be required The legacy substation equipment is •No longer supported by the manufacturer; •Parts are difficult to come by or must be custom made; •Difficult or costly to maintain; •Functional and Operational Obsolesces; (e.g. safety restrictions on operation circuit breakers) •Unable to meet current safety standards (e.g., switchgears that are not arc resistance); •Unable to meet current performance standards Feeder Assets Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment.
	Customer Attachment / Load (KVA)	4244 kVA and 784 customers.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	New construction built to current standards, coordination with joint-use tenants, coordination with the municipality.
	Economic Development	Not applicable.
	Environmental Benefits	Lower line losses due to conversion to higher voltage class.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as the breaker assets have reached functional obsolescence and there are no parts available.

	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings. Under the like-for-like replacement option, existing 8.32 kV infrastructure would be replaced with 8.32 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels.
	Alternative #2	Full conversion of the lines to new 27.6 kV primary system voltages This alternative proposes to renew the assets in the area while also proceeding with voltage conversion to a higher voltage class for the equipment. Other benefits include taking the opportunity to redesign the feeder configuration to provide improved reliability where possible by creating loops where none exist today as well as converting rear lot supply to front lot. This alternative also provides value in the form of avoided costs to rebuild the existing 4kV or 8kV substation assets.
	Justification for Recommended Alternative	Like-for-like or reactive replacement does not prove to be as economical on a large scale renewal project with numerous assets affected. 27.6kV are standard stock items in many cases and can result in savings over the 8kV equivalent equipment. Reduced O&M costs and lower line losses due to the elimination of substation assets, improvements to the system configuration for greater operability and reliability are considered some of the incremental benefits. T he full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers. For those reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable.
	Comparative Information on Equivalent Historical Projects (if any)	Historical projects that compare would be from other similar voltage conversion projects undertaken as part of the 4kV/8kV Renewal Program. These projects typically fall within a range of $2MM - $2.5MM per year for the life of the project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	The substations in Stoney Creek account for the last remaining 8kV feeder and station assets in an otherwise 27kV class system and nearly 3000 customers. There is a large amount of direct buried XLPE as part of URD subdivisions for these projects, and had been flagged for action due to the vintage of the cable (late '70's). By bundling the voltage conversion along with the renewal of URD assets, greater cost efficiencies can be gained. These URD areas have seen cable faults in recent years, as well as there being faults at the substation level at Dewitt MS.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Generally the 4/8kV assets are of the oldest vintage in the system. The asset condition assessment indicate that the Switchgear and breakers are in Poor condition. The transformer had to be repaired recently. The circuit breaker is 1962 vintage Oil circuit breaker and is obsolete.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	784
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	3 year stats (2014 - 2017) for Galbraith MS: 5 outages, 92,857 customer minutes (39.4 minutes/customer/year)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets with inadequate backup. Aging assets represent an increased risk of service interruption to customers and inadequate backup would result in long duration service interruptions upon occurrence. These factors would lead to customer dissatisfaction in this area.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not implementing the project would negate any O&M benefit gained by removing a substation from service. Considered a critical component of the distribution system, a typical substation requires monthly inspections and upkeep to ensure reliable operation.
	Reliability and Safety Factors	The benefits to reliability are in the renewal of the aging assets, as well as an opportunity to reconfigure any parts of the feeder that carry a higher risk for an outage (i.e. rear lot supply). There is also an opportunity to implement remote-operable devices to assist in operability of the system in the area affected. Safety benefits are captured in the renewal work being built to current construction standards, providing better working clearances and ergonomics.
	Analysis for "Like for Like" Renewal Project	The like-for-like renewal of these assets (i.e. same system configuration and same distribution voltage) will perpetuate the existing operating constraints and require capital investment to renew substation assets. Renewal of the distribution assets at a higher voltage does not involve any material incremental costs over renewal at the existing voltage. Operating constraints (e.g. undersized conductor, radial feeds) are addressed on a case by case basis where appropriate.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,292,636	$0	$0	$1,003,598	$2,289,038	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

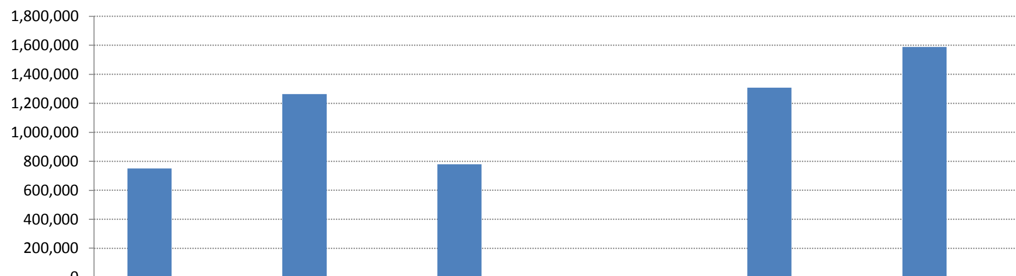
OEB Multi-Project Report

Project Code	150325	
Project Name	CIS CC&B Enhancements	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Undefined
	Location	all locations
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	Yes
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Information Technology Systems
	Alectra Subcategory	IT Upgrades & Enhancements
4. Evaluation Criteria (OEB)	Project Summary	As the CIS (CC&B) system is one of the core applications of the organization, operational enhancements come in from a number of venues and thereby feed back into the other downstream systems. These enhancements are considered for the overall customer and organizational benefit in order to operate efficiently and meet customer and business needs. Upgrades to meter-to-cash framework that are part of this program introduce additional process enhancements as well as customer experience and efficiency improvements. For instance, the added functionality from smart meters such as loading information, remote disconnection enables the utility to deliver enhanced customer service by providing a higher degree of data accuracy and data integrity (little to no estimation of reads), and increasing overall system reliability. Other benefits associated with program include quicker responses to customers, improved phone call metrics, an enhanced end user experience (e.g. easier system navigation), as well as reduction to IT support costs.
	Main Driver - General Plant	Customer Service
	Priority and Reasons for Priority	Enhancements maximize benefits of the systems and pacing of projects depends on Business needs and customer benefits in order to provide improved access and retrieval of information.Enhancements introduce process optimization and enhanced customer experience. For example, added functionality includes Smart Meter systems which provide better data accuracy and integrity, quicker responses to customers evidenced by improved phone call metrics.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	By maintaining the status quo in the CC&B System, the organization is at risk of missing process improvements and enhancements that drive efficiencies and meet new business demands, as well as serve customer needs and expectations. Without making changes to address any enhancements, the lack in operational efficiencies of the system will impede the ability to meet customer requirements. Not attending to enhancements to the CIS system would compromise Alectra's ability to improve the customer experience as well as compromise the security of customer billing, usage and personal information.
	Alternative #1	Implement necessary system enhancements and changes to deliver the business drivers, enhanced customer experience, and process efficiency. Enhancements will ensure continued compatibility with other systems that are being maintained and upgraded.
	Alternative #2	An alternative option would be to outsource the implementation of the enhancements, however this option introduces additional challenges as, -Introduces one-off, standalone solutions which are not harmonize within the main CIS system. -Introduces greater chance of errors and handoffs between the different siloed standalone solutions -Introduces a compete business process changes, and redesign -Introduces another entity and integration point -Our front staff won't have the complete info when servicing and responding to our customers

	Justification for Recommended Alternative	Select Alternative 1 : To allocate capital dollars to ensure Alectra's Customer Information System continues to operate efficiently and meet customer and business requirements. The enhancements introduce process optimization and enhanced customer experience. For example, added functionality includes Smart Meter systems which provide better data accuracy and integrity, quicker responses to customers evidenced by improved phone call metrics and user experience enhancements.Enhancements will ensure continued compatibility with other systems.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Ensure proper project management and solftware development lifecycle processes are adhered, along with a steering commitee, vendor management, evaluation criteria & priority.
	Comparative Information on Equivalent Historical Projects (if any)	not applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $5,688,133	$750,000	$1,264,233	$778,627	$0	$1,307,910	$1,587,363
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150329	
Project Name	Rear Lot Renewal Project - Main Street / Unionville / Carlton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	Markham: Main Street / Unionville / Carlton
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Rear Lot Conversion
	Alectra Subcategory	Rear Lot Conversion
4. Evaluation Criteria (OEB)	Project Summary	Convert the Main Street / Unionville / Carlton (Markham) area from rear lot overhead supply to front lot underground supply (primary and secondary). This will reduce number of outages and power restoration time. The project is proposed to be completed over three years . The existing rear lot location Main Street / Unionville / Carlton (Markham)) will be over 35 years old in 2021. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2013 where a majority of the poles are in poor or very poor condition. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The priority of this project is high. This project is to decrease the outage impacts due to deteriorating distribution system assets and mitigate the outage impacts due to increasing effect of adverse weather events. Reasons for Priority: The electrical system is deteriorating and poses many operations, safety, and customer service concerns that must be addressed. If not addressed, the system will deteriorate further and failures and safety hazards will increase. In December 2013, an ice storm came in across Ontario including Alectra (PowerStream) service territory. During the storm, many trees, including trees in rear lot areas, fell onto power lines and created prolonged power outages to customers. Power restoration in rear lot areas was very difficult due to accessibility. The December 2013 ice storm caused 29,831,573 CMI within the rear lot grids, which accounted for 16.68% of the total system CMI due to the ice storm. The existing rear lot location Main Street / Unionville / Carlton (Markham)) will be over 35 years old in 2021. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2013 where a majority of the poles are in poor or very poor condition. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Safety risk associated with close proximity to power line in the backyard: Although the Electrical Safety Code and easement terms specify minimum clearance between customer facilities and power line, there are cases that customers do not follow the safety rules and install facilities too close to power line. Examples are shed, storage, playground, trampoline, swimming pool, patio deck, landscape, house extension, etc. This encroachment creates a safety hazard for both customers and crews. Safety risk associated with reduced clearance due to encroachment of power line: Over time, growth of vegetation and obstruction due to customer facilities may jeopardize the minimum clearance requirements and restrict crew mobility. Occasionally dogs may also be a safety hazard to the crews.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Because overhead transformers are installed on the pole in rear lot area, a pole falling down may also cause the transformers to fall down, resulting in transformer tank rupturing, and oil being spilled onto the ground.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under this option, no proactive investments would be executed to replace either existing rear lot infrastructure and these assets would only be intervened upon in reactive scenarios, when the assets have reached their end-of-life. Under this approach, customers would be exposed to prolonged reliability impacts, due to the accessibility issues associated with rear lot infrastructure, as well as the complex restoration procedures that would be required for a four-feeder outage event. As standardized equipment (e.g. bucket trucks) cannot be used to service rear lot plant, wood poles, transformers and overhead switches would have to be replaced manually, with field crews accessing private customer properties in order to execute the work. Customers and field crews would continue to be exposed to elevated safety risks, due to the minimal proximity between customer plant and the rear lot overhead lines, as well as the non-standard and non-ergonomic work procedures that field crews would have to continue to execute to sufficiently maintain, inspect and service the plant. Finally, as assets are replaced reactively, new assets would need to be installed according to the rear lot configuration. By its design, rear lot can only be converted if the entire line is replaced at once as part of an overall project. Therefore, the legacy design will continue to be maintained under this scenario. This will include the continued operation of the legacy voltage system, along with continuing the associated inefficiencies, such as line losses.
	Alternative #1	Remediate the existing rear lot plant with other design options . The other design options considered are described below. Rear Lot Overhead Option: Under this Option, the existing rear lot plant is replaced with new overhead plant in the rear lot. When the replacement project is implemented, the following design parameters should be considered: •Install critical components such as fuse, switch, and transformer as close to the accessible street as possible This Option is not acceptable because it does not resolve the major operations and customer reliability concerns related to the distribution assets located at rear lot at this location. Partial Underground Option This scenario involves the replacement of existing rear lot infrastructure with a new hybrid solution, where primary voltage infrastructure, including transformers, switches and lines would be installed as per an underground configuration within the front right-of-way, following standard Alectra Utilities installation practices. Under this approach, secondary infrastructure, including wood poles and secondary conductor, would remain in the rear lot in overhead configuration. This approach would not fully address the reliability and safety concerns associated with rear lot distribution, as secondary connections will remain in the rear lot. However, future outage impacts will be reduced and contained to only those customers connected to the associated transformer. Lower voltage classes will also be converted up to the standardized 27.6kV voltage standard as per this investment option. Under this option, reliability and safety issues would continue to persist due some infrastructure remaining overhead. The cost of partial underground renewal is higher than the renewal of the rear lot overhead and further more does not result in mitigating the risks associated
	Alternative #2	Replace with Full Underground Infrastructure This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure. All existing primary and secondary distribution assets within the rear lot corridor will be removed and replaced with new underground primary and secondary infrastructure that is installed within the front lot corridor as per current standard design practices. Underground secondary cables will run from the front lot underground transformers to the individual meter bases in order to supply the customers. Under this approach, existing under-classed legacy wood poles that support four feeders will be replaced with higher-class poles that are better suited to withstand major weather events. Through this investment scenario, these high impact assets will be better secured and weather-hardened against future outage events. This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated and line losses associated with the legacy voltage classes can be eliminated.
	Justification for Recommended Alternative	It is recommended to replace the rear lot overhead Main Street / Unionville / Carlton (Markham) infrastructure to a full underground infrastructure (primary and secondary). Under this Option, the existing rear lot plant is removed and new underground plant is installed in front lot. This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated and line losses associated with the legacy voltage classes can be eliminated. For these reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Fluctuation in cost and staff resource (internal and external) to complete high annual volume of work. Risk Management: PowerStream has retained external contractor working at different work sites throughout the year under a multi-year EPC (Engineering Procurement Construction) Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track.
	Comparative Information on Equivalent Historical Projects (if any)	Alectra has completed and is completing similar rear lot remediation project since 2013. Alectra has experience on executing several rear lot remediation project.

	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	The scope involves converting the Main Street / Unionville / Carlton (Markham) area from rear lot overhead supply to front lot underground supply (primary and secondary). There are a total of 164 customers affected by the existing rear lot supply. Rear lot infrastructure is functionally obsolete for the following key reasons: • The rear lot configuration is generally unsafe to the public due to the large trees growing near energized power lines. In tandem with such an unsafe configuration, there are also line clearing hazards and related additional costs to do this work. • Alectra Utilities is unable to use labour saving tools and devices such as bucket trucks to efficiently maintain and repair the distribution system due to assets located in customer backyards. • Rear lot wood poles are generally congested, due to multiple service attachments and communication drops, which generally make it impossible to sufficiently climb poles. Crews must, therefore, use ladders to access these poles. • Alectra Utilities is limited in utilizing ladders to access the overhead system due to Ministry of Labour restrictions for congested areas. • Due to the presence of legacy porcelain top tie insulators, rear lot lines must be fully isolated before any maintenance or repair work on the overhead system can commence. • Porcelain insulators are far more susceptible to contamination and flashover when compared to present-day standard polymer insulators. • Rear lot infrastructure typically contains undersized #4 aluminum conductor steel-reinforced cable and aluminum conductor, along with #4 and #6 copper conductor, which are undersized and generally have a greater probability of annealing due to their reduced carrying capacity. These conductors must be fully isolated before any work can commence.
	Condition of Asset vs. Typical Life Cycle and Performance Record	It is extremely difficult to gain access to the backyard to maintain, repair, and restore power. As a result there are prolonged outages to customers. This is especially more difficult in the event of ice storm. Many of the Rear Lot Supply distribution systems were built in 1950s, 1960s, and 1970s (40-68 years old in 2016). The rear lot equipment is older than typical useful life and the asset condition is deteriorating. According to the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board", typical useful life of overhead transformers and wood poles are 40 and 45 years respectively. Many of the installations are not in compliance to today’s standards. The existing rear lot location Royal Orchard – North (Markham) will be 35 years in 2021. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2013 where a majority of the poles are in fair or very poor condition. See attachments for demographic and condition data and photos of the rear lot location in the Main Street / Unionville / Carlton (Markham) area.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	528
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Frequency of Failure: 0.5 failures per year • Estimated number of customers affected by 1 failure: 414 customers inside rear lot area + 100 customers outside rear lot area. Total = 414 + 100 = 514 customers. Assuming 500 residential and 14 commercial • Estimated number of customers affected by 0.5 failures: 514x 0.5 = 257 customers • Frequency of interruption: 0.5 failures per year • Duration of interruption: for 414 customers inside rear lot area duration is 1.7 hours; for 100 customers outside rear lot area duration is 1 hour. Weighted average is 1.6 hours per customer per interruption. • Customers affected per failure: 500 residential + 14 commercial = 514 customers • CMI per 1 failure: 514 x 1.6 hour x 60 min = 49,344 CMI • CMI per 2 failures: 49,344 x 2 = 98,688 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Rear lot supply failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Rear lot system also poses safety hazards to the customers because live electrical components are in proximity of customer’s backyard and proper clearance may be violated due to customer’s installations (examples: trees, garden, swimming pool, storage shed, deck, house extension).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	In case of not implementing the project the OM&A cost will continue to occur due to tree trimming activities as well as increase in responding to outages since the assets are deteriorated and prone to failure.
	Reliability and Safety Factors	This project is part of the long-term rear lot supply remediation program. The project will help avoid a total of 2 potential rear lot failures and 260,400 potential CMI. In addition, this project also eliminates safety hazards associated with ageing and deteriorating rear lot system. This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure.
	Analysis for "Like for Like" Renewal Project	The selected option is not a like for like replacement. This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure.

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,485,994	$0	$0	$0	$0	$0	$2,485,994
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150330	
Project Name	Rear Lot Renewal Project - Marsdale, St.Catharines	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	St. Catherines
	Location	St.Catharines, south end
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Rear Lot Conversion
	Alectra Subcategory	Rear Lot Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is to convert existing rear lot primary distribution to a front lot supply. Rear lot primary poses a problem for both reliability and safety. Due to the reduced access to the distribution assets, restoration of power to customers is significantly impacted by not having access to powered equipment, while also presenting risks to workers .
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Alectra has many pockets of customers being supplied by rear lot construction. The electrical system is ageing and deteriorating and poses many operations, safety, and customer service concerns that must be addressed. If not addressed, the system will deteriorate further and failures and safety hazards will increase to a level that is not manageable and not tolerable by the customers.
	Customer Attachment / Load (KVA)	4177 KVA and 1001 customers
	Safety	Although the Electrical Safety Code and easement terms specify minimum clearance between customer facilities and power line, there are cases that customers do not follow the safety rules and install facilities too close to power line. Examples are shed, storage, playground, trampoline, swimming pool, patio deck, landscape, house extension, etc. This encroachment creates a safety hazard for both customers and crews. Safety risk associated with reduced clearance due to encroachment of power line: Over time, growth of vegetation and obstruction due to customer facilities may jeopardize the minimum clearance requirements and restrict crew mobility. Occasionally dogs may also be a safety hazard to the crews.
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicalbe
	Economic Development	Not applicable
	Environmental Benefits	Because overhead transformers are installed on the pole in rear lot area, a pole falling down may also cause the transformers to fall down, resulting in transformer tank rupturing, and oil being spilled onto the ground.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under this option, no proactive investments would be executed to replace either existing rear lot infrastructure and these assets would only be intervened upon in reactive scenarios, when the assets have reached their end-of-life. Under this approach, customers would be exposed to prolonged reliability impacts, due to the accessibility issues associated with rear lot infrastructure, as well as the complex restoration procedures that would be required for a four-feeder outage event. As standardized equipment (e.g. bucket trucks) cannot be used to service rear lot plant, wood poles, transformers and overhead switches would have to be replaced manually, with field crews accessing private customer properties in order to execute the work. Customers and field crews would continue to be exposed to elevated safety risks, due to the minimal proximity between customer plant and the rear lot overhead lines, as well as the non-standard and non-ergonomic work procedures that field crews would have to continue to execute to sufficiently maintain, inspect and service the plant. Finally, as assets are replaced reactively, new assets would need to be installed according to the rear lot configuration. By its design, rear lot can only be converted if the entire line is replaced at once as part of an overall project. Therefore, the legacy design will continue to be maintained under this scenario. This will include the continued operation of the legacy voltage system, along with continuing the associated inefficiencies, such as line losses.

	Alternative #1	Remediate the existing rear lot plant with other design options . The other design options considered are described below. Rear Lot Overhead Option: Under this Option, the existing rear lot plant is replaced with new overhead plant in the rear lot. When the replacement project is implemented, the following design parameters should be considered: • Install critical components such as fuse, switch, and transformer as close to the accessible street as possible This Option is not acceptable because it does not resolve the major operations and customer reliability concerns related to the distribution assets located at rear lot at this location. Partial Underground Option This scenario involves the replacement of existing rear lot infrastructure with a new hybrid solution, where primary voltage infrastructure, including transformers, switches and lines would be installed as per an underground configuration within the front right-of-way, following standard Alectra Utilities installation practices. Under this approach, secondary infrastructure, including wood poles and secondary conductor, would remain in the rear lot in overhead configuration. This approach would not fully address the reliability and safety concerns associated with rear lot distribution, as secondary connections will remain in the rear lot. However, future outage impacts will be reduced and contained to only those customers connected to the associated transformer. Lower voltage classes will also be converted up to the standardized 27.6kV voltage standard as per this investment option. Under this option, reliability and safety issues would continue to persist due some infrastructure remaining overhead. The cost of partial underground renewal is higher than the renewal of the rear lot overhead and further more does not result in mitigating the risks associated with the existing system. This partial underground approach has been adopted where feasible.
	Alternative #2	Replace with Full Underground Infrastructure This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure. All existing primary and secondary distribution assets within the rear lot corridor will be removed and replaced with new underground primary and secondary infrastructure that is installed within the front lot corridor as per current standard design practices. Underground secondary cables will run from the front lot underground transformers to the individual meter bases in order to supply the customers. Under this approach, existing under-classed legacy wood poles will be replaced with higher-class poles that are better suited to withstand major weather events. Through this investment scenario, these high impact assets will be better secured and weather-hardened against future outage events. This approach would completely mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated.
	Justification for Recommended Alternative	It is recommended to convert the area to partial underground. Under this Option, the existing rear lot plant is removed and partially underground plant is installed in front lot. This approach would mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. For these reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Customer expectation for what the new distribution will look like is a risk, especially if the customer is pushing for a more aesthetically-pleasing but more expensive alternative by going fully underground. Customer consultation will be an important step in mitigating this risk and ensure the public and the utility are aligned in addressing this renewal.
	Comparative Information on Equivalent Historical Projects (if any)	Similar rear lot projects have been budgeted between $1.25MM - $2MM per year, depending on whether a full underground solution or only partial underground solution is chosen.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Rear lot infrastructure is functionally obsolete for the following key reasons: • The rear lot configuration is generally unsafe to the public due to the large trees growing near energized power lines. In tandem with such an unsafe configuration, there are also line clearing hazards and related additional costs to do this work. • Alectra Utilities is unable to use labour saving tools and devices such as bucket trucks to efficiently maintain and repair the distribution system due to assets located in customer backyards. • Rear lot wood poles are generally congested, due to multiple service attachments and communication drops, which generally make it impossible to sufficiently climb poles. Crews must, therefore, use ladders to access these poles. • Alectra Utilities is limited in utilizing ladders to access the overhead system due to Ministry of Labour restrictions for congested areas. • Due to the presence of legacy porcelain top tie insulators, rear lot lines must be fully isolated before any maintenance or repair work on the overhead system can commence. • Porcelain insulators are far more susceptible to contamination and flashover when compared to present-day standard polymer insulators. • Rear lot infrastructure typically contains undersized #4 aluminum conductor steel-reinforced cable and aluminum conductor, along with #4 and #6 copper conductor, which are undersized and generally have a greater probability of annealing due to their reduced carrying capacity. These conductors must be fully isolated before any work can commence.

Condition of Asset vs. Typical Life Cycle and Performance Record	It is extremely difficult to gain access to the backyard to maintain, repair, and restore power. As a result there are prolonged outages to customers. This is especially more difficult in the event of ice storm. Many of the Rear Lot Supply distribution systems were built in 1950s, 1960s, and 1970s . The rear lot equipment is older than typical useful life and the asset condition is deteriorating. According to the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board", typical useful life of overhead transformers and wood poles are 40 and 45 years respectively. Many of the installations are not in compliance to today's standards. This project has many overhead assets that are 1950's vintage, as well as some sections built in the 1980's. There are also some replacement poles where failures have already occurred from the 2000's. However, a large proportion of the poles are Bell-owned, and we are not provided with condition-based information on the health of these assets.
Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1001
Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Large area with multiple rear lot laterals. Area is supplied by VSM41 and VSM52, in an 80/20 split. The area amounts to about 20% of the feeder's connected kVA and about 30% of the customers. 3 year stats (2014-2017) for VSM41 and VSM52 which supply the area; VSM41: 65 outages, 539,581 customer minutes (64.8 minutes/customer/year) VSM52: 29 outages, 125,186 customer minutes (77.9 minutes/customer/year) Total score: VSM41 * 0.8 + VSM52 * 0.2 = 51.8 + 15.6 = 67.4 minutes/customer/year Total outage score: 21.6 * 0.8 + 9.7 * 0.2 = 17.3 + 1.9 = 19.2 outages/year
Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Rear lot supply failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Rear lot system also poses safety hazards to the customers because live electrical components are in proximity of customer's backyard and proper clearance may be violated due to customer's installations (examples: trees, garden, swimming pool, storage shed, deck, house extension).
Value of Customer Impact	High
Factors Affecting Project Timing, if any	Not applicable
Consequences for O&M System Costs Including Implications of Not Implementing	In case of not implementing the project the OM&A cost will continue to occur due to tree trimming activities as well as increase in responding to outages since the assets are deteriorated and prone to failure.
Reliability and Safety Factors	This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure.
Analysis for "Like for Like" Renewal Project	The selected option is not a like for like replacement. This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure.

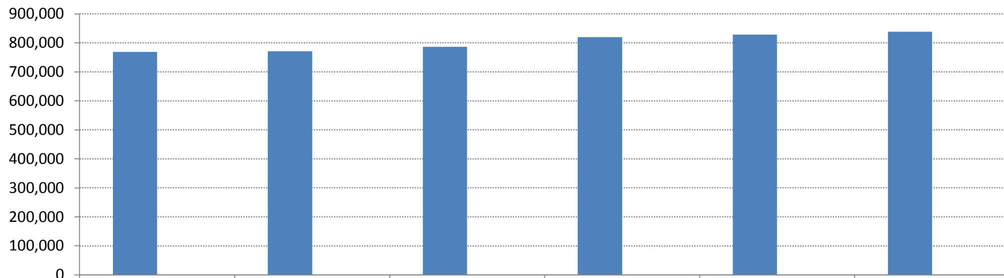
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,089,674	$0	$0	$0	$0	$1,069,275	$2,020,399
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150332	
Project Name	Non-Wires Alternative Pilot	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	
	Units	
	Project Class	Regular
	Project Includes R&D	Yes
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Stations)
	Alectra Subcategory	Station Capacity Projects
4. Evaluation Criteria (OEB)	Project Summary	This project expands the Power.House program to approximately 300 residential solar PV and battery storage units, and integrates these units into control by SCADA/ADMS through a DERMS platform. This will allow our operators to aggregate, monitor and control the units to reduce peak loading on distribution assets, reduce power factor, and provide other power quality services to the grid. While this number of DERs is not great enough to defer traditional distribution expenditure, it provides the scale necessary to demonstrate their effectiveness, and allows us to develop the technical and organizational capability to do so in the future.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Due to the long planning and construction lead times for traditional distribution infrastructure, the decision to invest is made several years ahead of commissioning. Furthermore, to use DERs to provide mission-critical distribution services in place of firm and highly reliable assets, Alectra needs to develop and demonstrate technical and operational capability in advance of DERs being used for this purpose in a real-world environment. Waiting to develop this capability risks missing the opportunity to influence and reduce distribution investment for many years into the future.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not applicable
	Cyber-Security, Privacy	Security will be designed into every aspect of the DERMS platform as it will be fully integrated into Alectra's network, complete with lasting security through ongoing diligence and maintenance. The DERMS platform will be surrounded by complete unified APIs for integration with asset, market, utility and other 3rd party systems. Detailed key technology decisions on cyber-security features and providing for end-to-end security will be made as part of the procurement process. As a minimum requirement, all authentication will be required to be done via JSON web tokens over an HTTPS channel. Enforcement will be done at API boundary for all access to systems. All access to the network should be logged using role- and identity-based access control and logging systems. The level of access to any entity should be defined and limited to the minimum required by the role/identity. A cloud-based solution with data center and network architecture built to meet the requirements of the most security-sensitive organizations, including ISO 27001 and SOC 2 certification should be procured. To ensure customer information remains private, Alectra will be seeking a technology/platform provider that will conform to industrial automation security requirements, guidelines, and best practices, such as the ISA99 standard, to protect personal data.
	Coordination, Interoperability	Alectra is taking a proactive position on evaluating the benefits of non-wires alternatives within their network. It is Alectra's hope that this project will drive the incorporation of DER's into utility's existing planning and operations framework. • Interoperability Standards – DERs currently operate on certain communication protocol standards such as Modbus or DNP3, however there is currently no set standard for the object or information model to define how DER functionality should be uniformly defined. Alectra would like to contribute to development of DER standards for interoperability and play a major role in lowering future utility costs by establishing a more competitive market through which to procure DER services. • Established Processes to Manage Market Services – A key proponent of the new technology will involve defining the protocols and requirements that govern the market services that Alectra will be attempting to model. The dispatch and confirmation protocols will need to be defined through the SCADA/ADMS, which this project will play a critical role in defining. The ideal outcome within 5 years will be that Alectra has a developed approach toward procuring market services to meet local distribution level needs, allowing planners to view DERs as any other transmission or distribution asset. • The technical interface between the aggregate fleet of assets and our control room will be providing extremely valuable learning in how to quantify the technical capabilities of customer sited DERs. This project aims to eventually provide the roadmap for integrating these disparate systems in order perform complex co-optimization tasks.

	Economic Development	The project will have positive economic benefits in the community, primarily by reducing electricity costs for participating households, to be achieved by: -Reducing net electricity consumption with solar PV -Operating the units for TOU arbitrage when not required to reduce peak demand on distribution assets or for power factor compensation -Developing a market and compensation mechanism for providing peak demand shaving and power factor compensation services The innovative integration of DERs into Alectra's operations centre will advance the technology readiness of DERMS software towards commercialisation, with the following economic benefits for Canada: -Advance the market for DERMS, providing ongoing jobs for DERMS providers -Increasing private investment in DERs due to new incentives and decreased barriers to market provided through DER aggregation with DERMS -Establish and disseminate DERMS operating procedures for distribution system operators, reducing the cost of implantation for other LDCs in Canada -Contributing to Ontario and Canada's reputation as an innovation hub in the energy industry The project will result in sustained public education and awareness campaign regarding project participation and benefits, addressing barriers to widespread and successful deployment of battery storage. Additional benefits will result from improvements in skills for Ontario's battery storage market. The project will inform how trades can improve the installation of battery storage and integration of other technologies such as solar and EV charging equipment.
	Environmental Benefits	The project will produce GHG emissions reduction through the displacement of GHG intensive grid scale electricity generation with solar PV generation, and reducing GHGs on the grid by shifting household electricity load from peak periods to less GHG-intensive off-peak periods. Furthermore, we expect this project to provide emissions reductions benefits to Canada as a result of the project's contribution to advancements in DERMS technology and distribution ancillary services markets. We expect this contribution to drive uptake of both private and LDC owned solar-storage units throughout Canada.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Do nothing. See priority.
	Alternative #1	Not applicable
	Alternative #2	Not applicable
	Justification for Recommended Alternative	Not applicable
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The storage technologies fail to work as intended or the integration with the ADMS/SCADA fails to meet expectations. Mitigation measures include developing a backup plan in terms of technology/service providers should the battery technology and integration not perform as required for the demonstration project. There are also a combination of manual and automated processes that could be used should fully integrated interfaces among systems prove too difficult. Customer appetite for homes with the proposed technology is lower than anticipated. Research by our project partners has already indicated a strong likelihood that demand for these units will be high. Nonetheless, the team has assumed no financial contribution from the customers thus far for the technologies proposed in the project. As a result, it is very flexible in the kinds of offerings it can provide to customers to incentivize them to purchase homes that are equipped with these measures. If the consortium is required to own the assets outright without customer contributions it will be prepared to do so.
	Comparative Information on Equivalent Historical Projects (if any)	The project builds on the Power.House pilot project launched by an Alectra legacy company, PowerStream, in 2015. This pilot enabled the deployment of 20 Power.House units – an integrated home power plant of rooftop solar panels, energy storage, two-way smart meter and cloud-based energy management system. The pilot resulted in customer savings and Alectra gaining key insights from the integration of usage data.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not applicable
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable
	Description of Incorporation of Advanced Technology, if applicable	The truly innovative part of this smart grid demonstration project is the integration of information technology (IT) systems that manage both site level energy requirements and DER aggregation with operational technology (OT control platforms used by Alectra to monitor and manage the grid), allowing for dispatch of DER assets from the control room.
	Identify any reliability, efficiency, safety or coordination benefits	This demonstration project will develop the capability of distributed solar-storage units to reduce loading on distribution assets (e.g. feeders, distribution substation transformers). Preliminary modelling has identified significant potential economic benefits from power factor correction, for example. The solar-storage units provide back-up to customer's critical loads during grid outages, vastly improving the reliability of electricity supply for these customers.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,812,471	$769,000	$770,676	$786,612	$819,363	$828,692	$838,128
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150342	
Project Name	HaLRT_New Stirton Feeder for TPSS#4 and 8852X load shedding, Hamilton	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	As part of the HaLRT project in Hamilton, some early-works projects were identified where utility infrastructure needed to be modified to accommodate the LRT. This project identifies a new 13.8kV feeder required from Stirton TS to supply TPSS#4 along the LRT corridor, as the existing 13.8kV feeder in the area is unable to accommodate the additional load. The new feeder will also have load transferred to it from the existing 13.8kV feeder in the area, to alleviate the capacity constraint on the 8852X. Contributed capital is estimated for this project at 20% (1.5 MVA/7.2 MVA) due to the amount of load the customer is expected to use as part of the new feeder. This will be updated once an OTC and model run are completed for the customer.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This project addresses a shortfall in capacity available on the 13.8kV system near the TPSS#4 location. An additional benefit to Alectra is the ability to transfer load from the 8852X to the new feeder proposed to supply the TPSS, thereby improving capacity on this feeder for future development along the LRT corridor.
	Customer Attachment / Load (KVA)	1500kVA for TPSS#4 and additional load transferred from 8852X.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	Coordination with Metrolinx, City of Hamilton, and other utilities as part of the HaLRT project.
	Economic Development	By improving capacity in the area near the LRT TPSS, future development and intensification that is likely to be attracted to the LRT corridor can be more adequately supplied with existing infrastructure, mitigating cost barriers to attracting new customers/growth.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status quo isn't an option as the existing feeder is already exceeding its planning limit and cannot accommodate the new TPSS#4 load requirement.
	Alternative #1	Alternative #1 is to build the new feeder from Stirton TS to the TPSS location as an overhead pole line construction. This is the least cost alternative. The risk associated with going with this alternative is high, due to minimal space available along the right-of-way along Wilson St. With buildings encroaching on the property line, any pole line with multiple circuits will have to be constructed with tall poles, whose circumference at the base could pose an obstruction to foot traffic along the congested sidewalk. As such, permission from the City of Hamilton may not be granted as this would be in violation of the Accessibility for Ontarians with Disabilities act (AODA), requiring a meter clearance for mobility around obstructions.
	Alternative #2	Alternative #2 is to build the new feeder from Stirton TS to the TPSS location by installing underground infrastructure. This would provide additional value in improved reliability of the feeder and also improve the underground infrastructure for future underground supply to the area, for anticipated loading requests due to intensification of development along the LRT corridor. A variation on this alternative, presented as Alternative #3 is to build underground along Wilson St to Victoria Ave, and then rising up for the last portion to the customer to be supplied overhead, to reduce the cost of the project.
	Justification for Recommended Alternative	The risk associated with going with the overhead construction alternative is high, due to minimal space available along the right-of-way along Wilson St. With buildings encroaching on the property line, any pole line with multiple circuits will have to be constructed with tall poles, whose circumference at the base could pose an obstruction to foot traffic along the sidewalk. As such, permission from the City of Hamilton may not be granted as this would be in violation of the Accessibility for Ontarians with Disabilities act (AODA), requiring a meter clearance for mobility around obstructions. Furthermore, with intensification expected due to the LRT, having additional duct space to serve new customers from Wilson St will enable Alectra to connect new customers as economic development continues along this stretch of the LRT. Therefore the recommended alternative is to proceed with an all underground solution.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The risk associated with going with the overhead construction alternative is high, due to minimal space available along the right-of-way along Wilson St. With buildings encroaching on the property line, any pole line with multiple circuits will have to be constructed with tall poles, whose circumference at the base could pose an obstruction to foot traffic along the sidewalk. As such, permission from the City of Hamilton may not be granted as this would be in violation of the Accessibility for Ontarians with Disabilities act (AODA), requiring a meter clearance for mobility around obstructions.
	Comparative Information on Equivalent Historical Projects (if any)	A similar customer-driven project was scoped out and designed in 2018, but ultimately cancelled. However discussions regarding restoration costs for concrete-base roads held with the City of Hamilton as well as contractor estimates to perform the underground work on a per unit cost were used in deriving the costs estimated for this project.

	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not applicable.
	Identify any reliability, efficiency, safety or coordination benefits	By proceeding with one of the recommended underground alternatives, enhanced reliability can be expected over the overhead construction alternative due to the elimination of weather-, animal contact-, and vehicular-related outages.

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,847,614	$0	$4,847,614	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150343	
Project Name	Bathurst Street Widening	
Major Category	System Access	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital Road Authority
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Road Authority
	Alectra Subcategory	Road Authority
4. Evaluation Criteria (OEB)	Project Summary	The Region requires PowerStream to relocate the distribution system to accomodate road works.
	Main Driver - System Access	Service Requests
	Priority and Reasons for Priority	These projects are non-controllable and are a requirement of the Public Service Works on Highways Act R.S.O. 1990, CHAPTER P.49
	Customer Attachment / Load (KVA)	Not applicable
	Safety	The relocation of the distribution system needs to be done in advance of the road work. PS Crews cannot safely work in the same time and space as the Road Crews.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	These projects are non-controllable and are a requirement of the Public Service Works on Highways Act R.S.O. 1990, Chapter. 49
	Alternative #1	Not applicable
	Alternative #2	Not Applicable
	Justification for Recommended Alternative	The Region's and local Municipalities requires PowerStream to relocate the distribution system to accomodate road works. These projects are non-controllable and the scope is defined and determined by the limits and amount of road work / road widening being done by the Municipality.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The timing and schedule of the road projects is non-controllable and based on the road projects being advanced by the Municipalities. The scope and timing of the projects are driven by the Municipalities. Planned road projects may be advanced or deferred within a calendar year based on various constraints such as budget, or based on political pressures, economic development, traffic flow, etc.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Factors Relating to Customer Preferences or Input	The scope and timing of the projects are driven by the Municipalities. Planned road projects may be advanced or deferred within a calendar year based on various constraints such as budget, or based on political pressures, economic development, traffic flow, etc.
	Factors Affecting the Final Cost of the Project	These projects are non-controllable and the scope is defined and determined by the limits and amount of road work / road widening being done by the Municipality.
	How Controlled Costs have been Minimized	Construction service is provided by PowerStream and its contractor. PowerStream's contractor was selected through a competitive RFP process which provides best costs and cost certainty.
	Identify if Other Planning Objectives are Met by the Project, if so, which ones	Not Applicable
	Results of Final Economic Evaluation, if applicable	Not Applicable.
	System Impacts (Nature, Magnitude and Costs)	These projects are non-controllable and the scope is defined and determined by the limits and amount of road work / road widening being done by the Municipality.

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $8,431,920	$5,025,805	$3,406,115	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

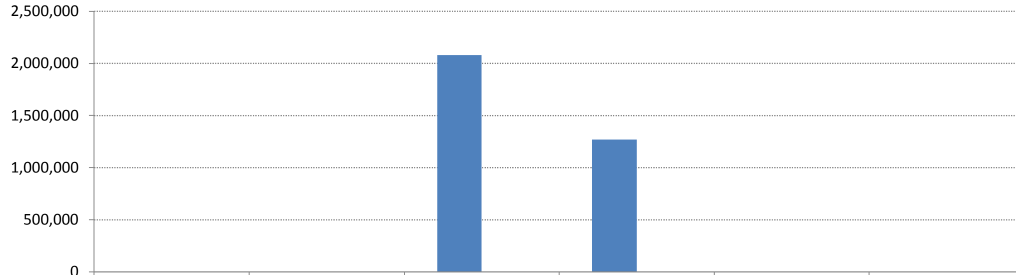
OEB Multi-Project Report

Project Code	150351	
Project Name	Voltage Conversion - Aberdeen MS_2020 to 2022, Hamilton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Hamilton
	Location	Hamilton
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is addressing the renewal of assets served by Aberdeen MS in Hamilton. Currently the station supplies customers at a primary voltage of 4kV from an indoor municipal substation. As part of the renewal of feeder assets, the equipment will be replaced with similar equipment rated for 13.8kV. This will allow the municipal substation assets to be bypassed, thereby avoiding the cost to refurbish station assets in the future. Aberdeen MS and Central MS share inter-ties and have been scheduled to undergo voltage conversion together to sustain operational capability. This project is a continuation of an ongoing conversion at Aberdeen MS started in 2016.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	This project mainly addresses aging assets at the station and on the feeders by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the municipal substation and associated equipment. The asset condition assessment indicate that the breakers are in Poor or Very Poor condition. The priority assets determining the voltage conversion are the substation assets as failure of a critical component, such as the switchgear bus, can cause a major outage for an extensive timeframe impacting a large number of customers. Furthermore due to system design and construction in the 1950's, feeder redundancy is minimal and loss of a station would result in stranded load and increased cost as generators would be required The legacy substation equipment is • No longer supported by the manufacturer; • Parts are difficult to come by or must be custom made; • Difficult or costly to maintain; • Functional and Operational Obsolesces; (e.g. safety restrictions on operation circuit breakers) • Unable to meet current safety standards (e.g., switchgears that are not arc resistance); • Unable to meet current performance standards Feeder Assets Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment.
	Customer Attachment / Load (KVA)	5000 kVA and 3100 customers.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	New construction built to current standards, coordination with joint-use tenants, coordination with the municipality.
	Economic Development	Not applicable.
	Environmental Benefits	Lower line losses due to conversion to higher voltage class.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as the breaker assets have reached functional obsolescence and there are no parts available.

	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings. Under the like-for-like replacement option, existing 4 kV infrastructure would be replaced with 4 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels.
	Alternative #2	Full conversion of the lines to new 13 kV primary system voltages This alternative proposes to renew the assets in the area while also proceeding with voltage conversion to a higher voltage class for the equipment. Other benefits include taking the opportunity to redesign the feeder configuration to provide improved reliability where possible by creating loops where none exist today as well as converting rear lot supply to front lot. This alternative also provides value in the form of avoided costs to rebuild the existing 4kV substation assets.
	Justification for Recommended Alternative	Like-for-like or reactive replacement does not prove to be as economical on a large scale renewal project with numerous assets affected. 13.8kV equipment are standard stock items in many cases and can result in savings over the 4kV equivalent. Reduced O&M costs and lower line losses due to the elimination of substation assets, improvements to the system configuration for greater operability and reliability are considered some of the incremental benefits. The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers. For those reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable.
	Comparative Information on Equivalent Historical Projects (if any)	2019 project spending budgeted for Aberdeen MS is ~$1.9 MM. Typically voltage conversion project phases have been budgeted for $2MM-$2.5MM depending on how urbanized the area impacted is composed.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	The two substations servicing the downtown Hamilton operating area service a total of 7,400 customers and were constructed in 1950 and 1960. The overall Station Health Index for Aberdeen and Central substations is 53% and 56% respectively. The switchgear at the Aberdeen substation is 40 years old; Kinectrics determined its effective age is 54 years old. Kinectrics analysis determined that the failure for this switchgear will likely occur within five years. Aberdeen substation, which services 2,600 customers, has inadequate backup for all feeders. The failure of the switchgear at this substation will leave customers without power or subject them to rotating blackouts.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Generally the 4kV assets are of the oldest vintage in the system. The asset condition assessment indicate that the breakers are in Poor or Very Poor condition.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	3100
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Aberdeen MS 3 year stats (2014 - 2017): 16 outages, 498,235 customer minutes (54 minutes/customer/year)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets with inadequate backup. Aging assets represent an increased risk of service interruption to customers and inadequate backup would result in long duration service interruptions upon occurrence. These factors would lead to customer dissatisfaction in this area.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not implementing the project would negate any O&M benefit gained by removing a substation from service. Considered a critical component of the distribution system, a typical substation requires monthly inspections and upkeep to ensure reliable operation.
	Reliability and Safety Factors	The benefits to reliability are in the renewal of the aging assets, as well as an opportunity to reconfigure any parts of the feeder that carry a higher risk for an outage (i.e. rear lot supply). There is also an opportunity to implement remote-operable devices to assist in operability of the system in the area affected. Safety benefits are captured in the renewal work being built to current construction standards, providing better working clearances and ergonomics.
	Analysis for "Like for Like" Renewal Project	The like-for-like renewal of these assets (i.e. same system configuration and same distribution voltage) will perpetuate the existing operating constraints and require capital investment to renew substation assets. Renewal of the distribution assets at a higher voltage does not involve any material incremental costs over renewal at the existing voltage. Operating constraints (e.g. undersized conductor, radial feeds) are addressed on a case by case basis where appropriate.



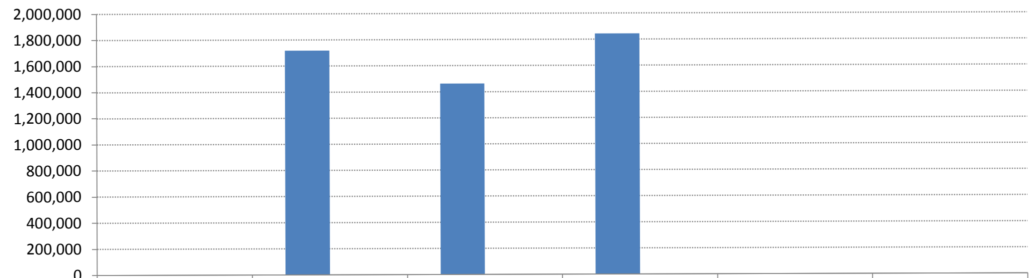
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,348,994	$0	$0	$2,080,018	$1,268,976	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150352	
Project Name	Voltage Conversion - Central MS_2020 to 2022, Hamilton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Hamilton
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is addressing the renewal of assets served by Central MS in Hamilton. Currently the station supplies customers at a primary voltage of 4kV from an indoor municipal substation. As part of the renewal of feeder assets, the equipment will be replaced with similar equipment rated for 13.8kV. This will allow the municipal substation assets to be bypassed, thereby avoiding the cost to refurbish station assets in the future. Aberdeen MS and Central MS share inter-ties and have been scheduled to undergo voltage conversion together to sustain operational capability. This project is a continuation of an ongoing conversion at Central MS started in 2016.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	This project mainly addresses aging and poor condition assets at the station and on the feeders by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the municipal substation and associated equipment. The asset condition assessment indicate that the Switchgear are in Fair condition, the breakers are in Poor or Very Poor condition, and the T1 transformer is in Poor condition. The priority assets determining the voltage conversion are the substation assets as failure of a critical component, such as the switchgear bus, can cause a major outage for an extensive timeframe impacting a large number of customers. Furthermore due to system design and construction in the 1950's, feeder redundancy is minimal and loss of a station would result in stranded load and increased cost as generators would be required The legacy substation equipment is • No longer supported by the manufacturer; • Parts are difficult to come by or must be custom made; • Difficult or costly to maintain; • Functional and Operational Obsolesces; (e.g. safety restrictions on operation circuit breakers) • Unable to meet current safety standards (e.g., switchgears that are not arc resistance); • Unable to meet current performance standards Feeder Assets Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment.
	Customer Attachment / Load (KVA)	10,000 kVA and 4700 customers.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	New construction built to current standards, coordination with joint-use tenants, coordination with the municipality.
	Economic Development	Not applicable.
	Environmental Benefits	Lower line losses due to conversion to higher voltage class.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as the breaker assets have reached functional obsolescence and there are no parts available.

	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings. Under the like-for-like replacement option, existing 4 kV infrastructure would be replaced with 4 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels.
	Alternative #2	Full conversion of the lines to new 13 kV primary system voltages This alternative proposes to renew the assets in the area while also proceeding with voltage conversion to a higher voltage class for the equipment. Other benefits include taking the opportunity to redesign the feeder configuration to provide improved reliability where possible by creating loops where none exist today as well as converting rear lot supply to front lot. This alternative also provides value in the form of avoided costs to rebuild the existing 4kV substation assets.
	Justification for Recommended Alternative	Like-for-like or reactive replacement does not prove to be as economical on a large scale renewal project with numerous assets affected. 13.8kV equipment are standard stock items in many cases and can result in savings over the 4kV equivalent. Reduced O&M costs and lower line losses due to the elimination of substation assets, improvements to the system configuration for greater operability and reliability are considered some of the incremental benefits. The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers. For those reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable.
	Comparative Information on Equivalent Historical Projects (if any)	Comparable voltage conversion projects in Hamilton have typically seen phases budgeted for $2MM - $2.5MM depending on the degree of urbanization in the affected area.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	The two substations servicing the downtown Hamilton operating area service a total of 7,400 customers and were constructed in 1950 and 1960. The overall Station Health Index for Aberdeen and Central substations is 53% and 56% respectively. Central substation utilizes oil-filled circuit breakers that need to be racked in vertically.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Generally the 4kV assets are of the oldest vintage in the system. The asset condition assessment indicate that the Switchgear is in Fair condition, the breakers are in Poor or Very Poor condition, and the T1 transformer is in Poor condition. The circuit breakers are 1950's vintage Oil circuit breaker and are obsolete.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	4700
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Central MS 3 year stats (2014 - 2017): 23 outages, 1,060,300 customer minutes (75 minutes/customer/year)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets with inadequate backup. Aging assets represent an increased risk of service interruption to customers and inadequate backup would result in long duration service interruptions upon occurrence. These factors would lead to customer dissatisfaction in this area.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not implementing the project would negate any O&M benefit gained by removing a substation from service. Considered a critical component of the distribution system, a typical substation requires monthly inspections and upkeep to ensure reliable operation.
	Reliability and Safety Factors	The benefits to reliability are in the renewal of the aging assets, as well as an opportunity to reconfigure any parts of the feeder that carry a higher risk for an outage (i.e. rear lot supply). There is also an opportunity to implement remote-operable devices to assist in operability of the system in the area affected. Safety benefits are captured in the renewal work being built to current construction standards, providing better working clearances and ergonomics.
	Analysis for "Like for Like" Renewal Project	The like-for-like renewal of these assets (i.e. same system configuration and same distribution voltage) will perpetuate the existing operating constraints and require capital investment to renew substation assets. Renewal of the distribution assets at a higher voltage does not involve any material incremental costs over renewal at the existing voltage. Operating constraints (e.g. undersized conductor, radial feeds) are addressed on a case by case basis where appropriate.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $5,022,695	$0	$1,717,339	$1,462,834	$1,842,522	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

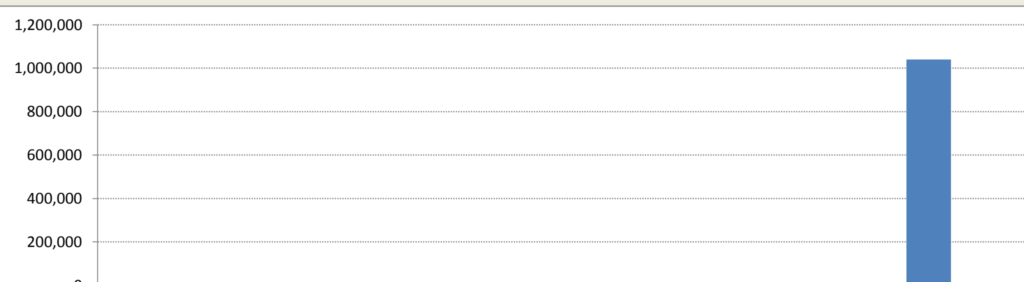
OEB Multi-Project Report

Project Code	150353
Project Name	Truscott Plaza - Additional capacity, Mississauga
Major Category	System Service
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	The area North and South of Truscott Dr at the intersections of Bodmin Rd, and Seagull Dr.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
4. Evaluation Criteria (OEB)	Project Summary	Convert the Truscott Plaza area from 4.16kV to 27.6kV through the installation of a main feeder, switch gear, and 1/0 loops. Existing comercial customers connected to radial 4.16kV systems are converting to looped 27.6kV. In a previous section, a 27.6kV feeder was extended to a new switch gear north of the Truscott Dr and Seagull Dr intersection. New routing will extend 1/0 cables to replace failing cables and provide contingency to customers on Truscott Dr, Bodmin Rd, and Seagull Dr. Section 1: Bring 27.6kV circuit down Sandgate Cres. to switch gear in Plaza (Complete) Section 2: Extend 1/0 up Bodmin Dr. to connect customers west of Bodmin. Section 3: Connect customers east of Bodmin Section 4: Connect customers south of Truscott on Seagull Dr.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This project addresses aging assets, radial connections, and capacity supply ability by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the associated equipment. The asset condition assessment indicates that switchgear are in poor condition. The priority assets determining the voltage conversion are the switchgear and feeders as failure can cause a major outage for an extensive timeframe, particularly given radial connections. Feeder Assets Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of other investments. Radial customers will be given N-1 contingency. 4 existing switch gear will be removed, with the addition of 1 new gear. 2 of these gear pose higher collision hazard as they are located on intersection boulevards.
	Customer Attachment / Load (KVA)	4.16kV voltage does not provide service size for growing energy demands. Counted Capacity of the plaza customers: 4530kVA.
	Safety	Modern equipment reduces safety risks associated with older aging equipment. Current switchgear pose higher collision hazard due to location.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Alectra Utilities prioritizes and paces voltage conversion projects based on needs, values and risk identified in business case for each area. The overall pacing has been determined by taking into consideration the following factors • Asset Condition – Station • Asset Age • System Configuration and Capacity • Co-ordination with other Capital and Maintenance Work Programs • Criticality and Customer Impact Alectra Utilities utilizes a multi-variable capital investment optimization tool (Copper Leaf C55) to optimize projects based on values and risk across the entire capital investment portfolio for the DSP period. The projects identified are optimized based on the available funding and the values and risk in the given year.
	Environmental Benefits	Lower line losses due to conversion to higher voltage class.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Run to Failure Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as many of the breaker assets have reached functional obsolescence and there are no parts available. This is not the recommended alternative.
	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings Under the like-for-like replacement option, existing 4.16 kV infrastructure would be replaced with new 4.16 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels. This is not the recommended alternative.
	Alternative #2	Full conversion of the lines to new 27.6 kV primary system voltage Renewal investments already would need to be undertaken based on the asset health condition for many of the station assets, poles and distribution transformers. Under this alternative, assets will be aligned to modern standards and practices. Unification of voltage levels across large sections of the system further improves the operability and should lead to reliability gains. Converting to higher-voltages will also create opportunities for Alectra Utilities to reconfigure the grid to add new switching points and automation, and to phase-out trouble areas like rear-lot construction. These improvements will allow Alectra Utilities to improve service to customers by conducting isolation, sectionalizing and restoration activities much faster. This is the recommended alternative.
	Justification for Recommended Alternative	The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Halting voltage conversion would result in the loss of any additional benefits such as: • Reduction in OPEX costs (from eliminated station maintenance); • Increased reliability from feeder ties at 13.8 kV for both 4 kV customers and customers already on 13.8 kV feeders; • Automation (reduction in outage duration) for legacy 4 kV customers and some 13.8 kV customers; • Reduction in reactive costs triggered by asset failure; and • Reduction in line losses. • If Alectra were to renew the deteriorated lower-voltage assets without converting to a higher voltage, it would lose the opportunity to economically transition to higher voltage equipment for a long period. • Rear lot equipment will be more difficult for both inspection and servicing.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	Since there are a large population of feeder assets, the condition of feeder assets tends to be diverse. While the overall condition shows the average, this can be a case of diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment. Even if the assets in the worst condition were replaced, the rest of the system would continue to deteriorate and continue to pose reliability risk and eventually need to be replaced.



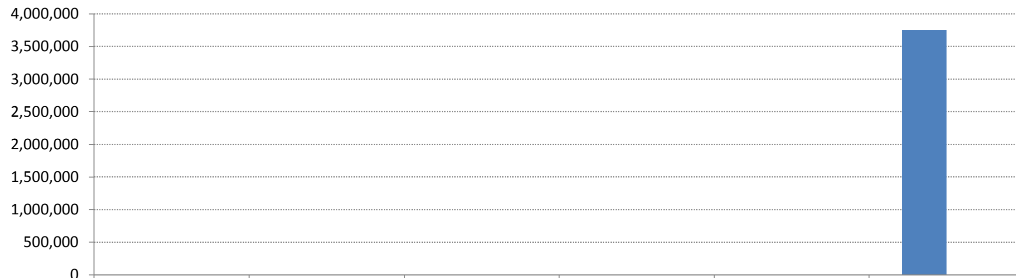
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,039,592	$0	$0	$0	$0	$0	$1,039,592
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150354	
Project Name	Voltage Conversion - Eastmount MS, Hamilton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Hamilton, East Hamilton Mountain area
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is addressing the renewal of assets served by Eastmount MS in Hamilton. Currently the station supplies customers at a primary voltage of 4kV from an indoor municipal substation. As part of the renewal of feeder assets, the equipment will be replaced with similar equipment rated for 13.8kV. This will allow the municipal substation assets to be bypassed, thereby avoiding the cost to refurbish station assets in the future.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	This project mainly addresses aging assets at the station and on the feeders by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the municipal substation and associated equipment. The asset condition assessment indicate that the Switchgear is in Fair condition and the breakers are in Poor or Very Poor condition. The priority assets determining the voltage conversion are the substation assets as failure of a critical component, such as the switchgear bus, can cause a major outage for an extensive timeframe impacting a large number of customers. Furthermore due to system design and construction in the 1950's, feeder redundancy is minimal and loss of a station would result in stranded load and increased cost as generators would be required The legacy substation equipment is •No longer supported by the manufacturer; •Parts are difficult to come by or must be custom made; •Difficult or costly to maintain; •Functional and Operational Obsolesces; (e.g. safety restrictions on operation circuit breakers) •Unable to meet current safety standards (e.g., switchgears that are not arc resistance); •Unable to meet current performance standards Feeder Assets Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment.
	Customer Attachment / Load (KVA)	20,348 kVA and 5812 customers.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	New construction built to current standards, coordination with joint-use tenants, coordination with the municipality.
	Economic Development	Not applicable.
	Environmental Benefits	Lower line losses due to conversion to higher voltage class.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as the breaker assets have reached functional obsolescence and there are no parts available.

	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings. Under the like-for-like replacement option, existing 4.16 kV infrastructure would be replaced with 4.16 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels.
	Alternative #2	Full conversion of the lines to new 13.8 kV primary system voltages This alternative proposes to renew the assets in the area while also proceeding with voltage conversion to a higher voltage class for the equipment. Other benefits include taking the opportunity to redesign the feeder configuration to provide improved reliability where possible by creating loops where none exist today as well as converting rear lot supply to front lot. This alternative also provides value in the form of avoided costs to rebuild the existing 4kV substation assets.
	Justification for Recommended Alternative	Like-for-like or reactive replacement does not prove to be as economical on a large scale renewal project with numerous assets affected. 13.8kV equipment are standard stock items in many cases and can result in savings over the 4kV equivalent. Reduced O&M costs and lower line losses due to the elimination of substation assets, improvements to the system configuration for greater operability and reliability are considered some of the incremental benefits. The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers. For those reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable.
	Comparative Information on Equivalent Historical Projects (if any)	Historical projects that compare would be from other similar voltage conversion projects undertaken as part of the 4kV/8kV Renewal Program. These projects typically fall within a range of $2MM - $2.5MM per year for the life of the project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Eastmount and Elmwood municipal substations, originally built in the late 1950's on the Hamilton Mountain, are both 4kV stations that serve over 9000 customers in areas that are geographically constrained by the escarpment and are bordered by 13kV feeders. There are some feeders from these stations which feature rear-lot construction, and generally the overhead construction is on old crossarms. The substations are fitted with older electromechanical relays. By bundling the voltage conversion along with the renewal of rear lot assets, greater cost efficiencies can be gained. As well, some savings can be realized by not rebuilding the station, as there would be needed investments at these stations in the near term otherwise.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Generally the 4kV assets are of the oldest vintage in the system. The asset condition assessment indicate that the Switchgear is in Fair condition and the breakers are in Poor or Very Poor condition. There have been several issues with failing electromechanical relays at this station in recent years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	5812
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Eastmount MS 3 year stats (2014 - 2017): 43 outages, 1,997,706 customer minutes (114.5 minutes/customer/year)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets with inadequate backup. Aging assets represent an increased risk of service interruption to customers and inadequate backup would result in long duration service interruptions upon occurrence. These factors would lead to customer dissatisfaction in this area.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not implementing the project would negate any O&M benefit gained by removing a substation from service. Considered a critical component of the distribution system, a typical substation requires monthly inspections and upkeep to ensure reliable operation.
	Reliability and Safety Factors	The benefits to reliability are in the renewal of the aging assets, as well as an opportunity to reconfigure any parts of the feeder that carry a higher risk for an outage (i.e. rear lot supply). There is also an opportunity to implement remote-operable devices to assist in operability of the system in the area affected. Safety benefits are captured in the renewal work being built to current construction standards, providing better working clearances and ergonomics.
	Analysis for "Like for Like" Renewal Project	The like-for-like renewal of these assets (i.e. same system configuration and same distribution voltage) will perpetuate the existing operating constraints and require capital investment to renew substation assets. Renewal of the distribution assets at a higher voltage does not involve any material incremental costs over renewal at the existing voltage. Operating constraints (e.g. undersized conductor, radial feeds) are addressed on a case by case basis where appropriate.



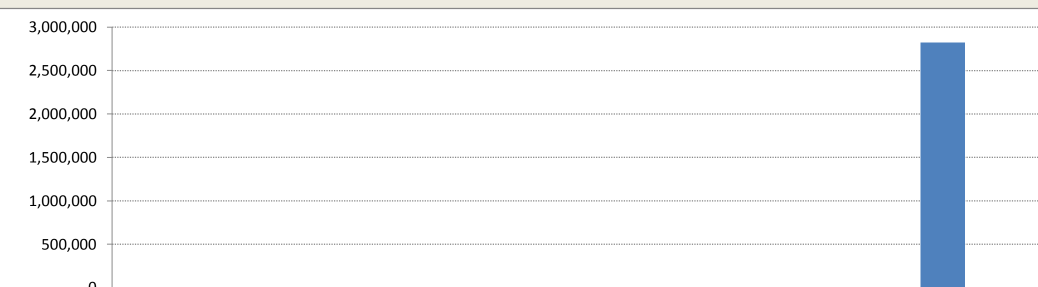
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,751,973	$0	$0	$0	$0	$0	$3,751,973
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150355	
Project Name	Voltage Conversion - Elmwood MS, Hamilton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Hamilton, West Hamilton Mountain area
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is addressing the renewal of assets served by Elmwood MS in Hamilton. Currently the station supplies customers at a primary voltage of 4kV from an indoor municipal substation. As part of the renewal of feeder assets, the equipment will be replaced with similar equipment rated for 13.8kV. This will allow the municipal substation assets to be bypassed, thereby avoiding the cost to refurbish station assets in the future.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	This project mainly addresses aging assets at the station and on the feeders by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the municipal substation and associated equipment. The asset condition assessment indicate that the Switchgear is in Fair condition and the breakers are in Poor condition. The priority assets determining the voltage conversion are the substation assets as failure of a critical component, such as the switchgear bus, can cause a major outage for an extensive timeframe impacting a large number of customers. Furthermore due to system design and construction in the 1950's, feeder redundancy is minimal and loss of a station would result in stranded load and increased cost as generators would be required The legacy substation equipment is •No longer supported by the manufacturer; •Parts are difficult to come by or must be custom made; •Difficult or costly to maintain; •Functional and Operational Obsolesces; (e.g. safety restrictions on operation circuit breakers) •Unable to meet current safety standards (e.g., switchgears that are not arc resistance); •Unable to meet current performance standards Feeder Assets Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment.
	Customer Attachment / Load (KVA)	12,429 kVA and 3570 customers.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	New construction built to current standards, coordination with joint-use tenants, coordination with the municipality.
	Economic Development	Not applicable.
	Environmental Benefits	Lower line losses due to conversion to higher voltage class.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as the breaker assets have reached functional obsolescence and there are no parts available.
	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings. Under the like-for-like replacement option, existing 4.16 kV infrastructure would be replaced with 4.16 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels.

	Alternative #2	Full conversion of the lines to new 13.8 kV primary system voltages This alternative proposes to renew the assets in the area while also proceeding with voltage conversion to a higher voltage class for the equipment. Other benefits include taking the opportunity to redesign the feeder configuration to provide improved reliability where possible by creating loops where none exist today as well as converting rear lot supply to front lot. This alternative also provides value in the form of avoided costs to rebuild the existing 4kV substation assets.
	Justification for Recommended Alternative	Like-for-like or reactive replacement does not prove to be as economical on a large scale renewal project with numerous assets affected. 13.8kV equipment are standard stock items in many cases and can result in savings over the 4kV equivalent. Reduced O&M costs and lower line losses due to the elimination of substation assets, improvements to the system configuration for greater operability and reliability are considered some of the incremental benefits. The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers. For those reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable.
	Comparative Information on Equivalent Historical Projects (if any)	Historical projects that compare would be from other similar voltage conversion projects undertaken as part of the 4kV/8kV Renewal Program. These projects typically fall within a range of $2MM - $2.5MM per year for the life of the project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Eastmount and Elmwood municipal substations, originally built in the late 1950's on the Hamilton Mountain, are both 4kV stations that serve over 9000 customers in areas that are geographically constrained by the escarpment and are bordered by 13kV feeders. There are some feeders from these stations which feature rear-lot construction, and generally the overhead construction is on old crossarms. The substations are fitted with older electromechanical relays. By bundling the voltage conversion along with the renewal of rear lot assets, greater cost efficiencies can be gained. As well, some savings can be realized by not rebuilding the station, as there would be needed investments at these stations in the near term otherwise.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Generally the 4kV assets are of the oldest vintage in the system. The asset condition assessment indicate that the Switchgear is in Fair condition and the breakers are in Poor condition. There have been several issues with failed electromechanical relays in recent years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	3570
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Elmwood MS 3 year stats (2014 - 2017); 22 outages, 27,912 customer minutes (2.6 minutes/customer/year)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging and poor condition assets with inadequate backup. Poor condition assets represent an increased risk of service interruption to customers and inadequate backup would result in long duration service interruptions upon occurrence. These factors would lead to customer dissatisfaction in this area.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not implementing the project would negate any O&M benefit gained by removing a substation from service. Considered a critical component of the distribution system, a typical substation requires monthly inspections and upkeep to ensure reliable operation.
	Reliability and Safety Factors	The benefits to reliability are in the renewal of the aging assets, as well as an opportunity to reconfigure any parts of the feeder that carry a higher risk for an outage (i.e. rear lot supply). There is also an opportunity to implement remote-operable devices to assist in operability of the system in the area affected. Safety benefits are captured in the renewal work being built to current construction standards, providing better working clearances and ergonomics.
	Analysis for "Like for Like" Renewal Project	The like-for-like renewal of these assets (i.e. same system configuration and same distribution voltage) will perpetuate the existing operating constraints and require capital investment to renew substation assets. Renewal of the distribution assets at a higher voltage does not involve any material incremental costs over renewal at the existing voltage. Operating constraints (e.g. undersized conductor, radial feeds) are addressed on a case by case basis where appropriate.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,819,597	$0	$0	$0	$0	$0	$2,819,597
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150356	
Project Name	Voltage Conversion - Clarkson Area, Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Section1: Conversion along Constable Rd & Bodley Rd Section 2-4: The townhomes are located south of Bromsgrove Rd between Tredmore Dr and Seagull Dr.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	Clarkson Bromsgrove Area 11 in southern Mississauga conversion from 4.16kV to 27.6kV. Rear lot underground single phase 1/0 4.16kV cables, single phase pad mount transformers, and switch gear will be removed and replaced with 27.6kV infrastructure on the boulevards. Townhome equipment will be placed on blanket easements. Section1: Conversion along Constable Rd & Bodley Rd The townhomes are located south of Bromsgrove Rd between Tredmore Dr and Seagull Dr. Section 2: Townhomes (East) Section 3: Townhomes (Central) Section 4: Townhomes (West)
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The purpose of the planned Voltage Conversion investment is to create long-term value for Alectra Utilities and its customers by replacing deteriorated 4.16 kV distribution assets with modern, higher-voltage equipment. The lower-voltage substation assets that will be replaced through Voltage Conversion investments are the oldest in the distribution system and must be renewed in the DSP period. By decommissioning these assets and converting the system to a higher-voltage equipment that meets present-day safety and performance standards, Alectra Utilities can mitigate the failure and safety risks and improve system resilience and gain efficiencies.
	Customer Attachment / Load (KVA)	Existing kVA of installed transformers: 525 kVA at Constable Rd & Bodley Rd section. 2035 kVA at Townhomes in 3 single phase circuits. 2560kVA Total
	Safety	Rear lot infrastructure poses a safety risk as customers are in closer proximity to equipment. Modern equipment reduces safety risks associated with older aging equipment.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Alectra Utilities prioritizes and paces voltage conversion projects based on needs, values and risk identified in business case for each area. The overall pacing has been determined by taking into consideration the following factors • Asset Condition – Station • Asset Age • System Configuration and Capacity • Co-ordination with other Capital and Maintenance Work Programs • Criticality and Customer Impact Alectra Utilities utilizes a multi-variable capital investment optimization tool (Copper Leaf C55) to optimize projects based on values and risk across the entire capital investment portfolio for the DSP period. The projects identified are optimized based on the available funding and the values and risk in the given year.
	Environmental Benefits	Conversion to 27.6kV from 4.16kV will result in less line losses on the circuits. Leaking transformers in backyards pose a larger cost to remediate.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Run to Failure Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as many of the breaker assets have reached functional obsolescence and there are no parts available. This is not the recommended alternative.

	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings Under the like-for-like replacement option, existing 4.16 kV infrastructure would be replaced with new 4.16 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels. This is not the recommended alternative.
	Alternative #2	Full conversion of the lines to new 27.6 kV primary system voltage Renewal investments already would need to be undertaken based on the asset health condition for many of the station assets, poles and distribution transformers. Under this alternative, assets will be aligned to modern standards and practices. Unification of voltage levels across large sections of the system further improves the operability and should lead to reliability gains. Converting to higher-voltages will also create opportunities for Alectra Utilities to reconfigure the grid to add new switching points and automation, and to phase-out trouble areas like rear-lot construction. These improvements will allow Alectra Utilities to improve service to customers by conducting isolation, sectionalizing and restoration activities much faster. This is the recommended alternative.
	Justification for Recommended Alternative	The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Operational issues with rear lot construction on some feeders, and direct buried cables. Old 4.16kV structure is located in rear lots, causing difficult access for equipment replacement.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Underground 1/0 cables in rear lot of Constable Dr are over 47 years old (1971) . Underground 1/0 cables at the town homes are over 31 years old (1987).
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	422
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Feeder Faults 2015 - 2017 40F1 - 1320 Customer Hours 40F4- 0.5 Customer Hours 41F4 - 207 Customer Hours
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Customer dissatisfaction will be mitigated by not tearing up backyards and removing transformers from rear lots.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Halting voltage conversion would result in the loss of any additional benefits such as: • Reduction in OPEX costs (from eliminated station maintenance); • Increased reliability from feeder ties at 13.8 kV for both 4 kV customers and customers already on 13.8 kV feeders; • Automation (reduction in outage duration) for legacy 4 kV customers and some 13.8 kV customers; • Reduction in reactive costs triggered by asset failure; and • Reduction in line losses. • If Alectra were to renew the deteriorated lower-voltage assets without converting to a higher voltage, it would lose the opportunity to economically transition to higher voltage equipment for a long period. • Rear lot equipment will be more difficult for both inspection and servicing.
	Reliability and Safety Factors	Since there are a large population of feeder assets, the condition of feeder assets tends to be diverse. While the overall condition shows the average, this can be a case of diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment. Even if the assets in the worst condition were replaced, the rest of the system would continue to deteriorate and continue to pose reliability risk and eventually need to be replaced.
	Analysis for "Like for Like" Renewal Project	Like-for-like renewal of lower-voltage assets would increase Alectra Utilities' stations capital requirements during the first three years of the DSP period by approximately $22M. If Alectra Utilities decided to take an opportunistic approach, where only during rebuilds would conversion take place, in a piece-meal style approach, this would actually introduce more risk to customers. Stations in general are normally backed up by one or more stations in the same geographical area. Similarly feeders themselves are also backed up by other feeders in the surrounding geographical area. Removing any feeder as part of a rebuild could create gaps in the resiliency of the network and increase the risk and exposure to the remaining customers to prolonged outages.

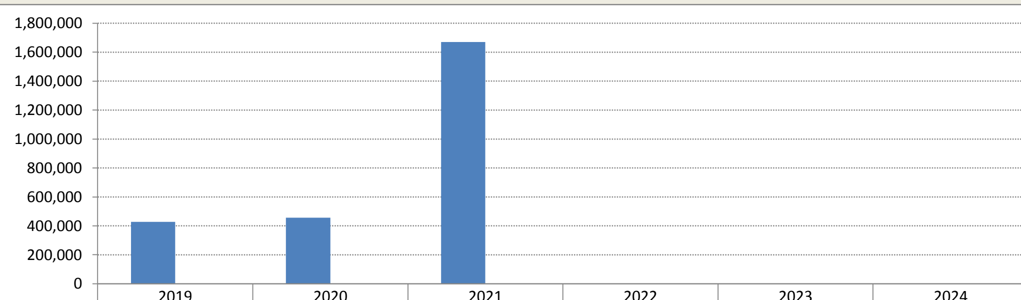
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,714,736	$0	$0	$0	$0	$0	$2,714,736
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150357	
Project Name	New build - 25M9 Extension to Derry Rd, Mississauga	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Feeder crossing under Hwy 407 west of Mavis on Brampton/Mississauga border. Mavis Rd, city limits south to Derry Rd W. Derry Rd, Mavis Rd to Mississauga Rd. Mississauga Rd, Derry Rd to North city limits.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	A 27.6kV Tie from Jim Yarrow TS in Brampton that will : -Offload Erindale TS in Mississauga instead of building Mini-Britannia MS for this reason. -Provide capacity back into Brampton using a link along Derry Rd. 3 Sections of Work 1. Provide an overhead tie from feeder 25M9 at the Chingaucousy 407 crossing to the existing Mavis OH. 2. Stretch a new circuit of OH 27.6kV along existing poles on Derry Rd. including a credit river crossing 3. Build a new pole line North on Derry to Mississauga and stretch a circuit north on Mississauga Rd using existing poles. Connect to the 27.6kV at the north City limits.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This Lines Capacity investment is driven primarily by the need to offload growing load from the Erindale TS 27.6kV station. Erindale TS requires load to be moved off of the 27.6kV feeders. Brampton requires capacity west of feeder 25M9; however there is difficulty extending this feeder west in Brampton. This project will allow capacity transfer through Mississauga to both provide capacity in Brampton and offload capacity from Erindale TS. Failure to offload capacity from Erindale TS will ultimately require construction of a new Municipal Station in Mississauga.
	Customer Attachment / Load (KVA)	Amount of load able to offload from Erindale TS 27.6kV would be dependent on availability of capacity from JYTS. 100A would give P = 1.732*27.6kV*100 = 4780 kVA 600A full load would provide 25kVA of capacity offload.
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes.
	Economic Development	Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Do Nothing Brampton load is new development, if new overhead lines are not constructed, it will be physically impossible for Alectra Utilities to connect new Brampton customers to the grid. Failure to offload capacity from Erindale TS will ultimately require construction of a new Municipal Station in Mississauga. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.

	Alternative #1	Non-Wires Alternatives Alectra Utilities’ load forecast process considers the impact of CDM and distributed generation, which is accounted for as part of the load forecast underpinning the lines capacity projects. For urban expansion projects these options have not been considered as new feeders are needed to connect the customers to grid. For back up projects Alectra Utilities has considered solar and storage options and determined that this option is not economical for the capacity that is required. Based on typical loading of 20 MW the cost of non-wire alternatives would 15 times that of traditional solution. This is not the recommended alternative.
	Alternative #2	Construct New Feeders Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities’s distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This is the recommended alternative.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to reliably meet forecast connection requirements, and it forms the basis of the planned Lines Capacity investments.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Crossing the Credit River may not be permitted. Constructing a pole line on both sides of Derry Rd east of Mississauga Rd may not be permitted.
	Comparative Information on Equivalent Historical Projects (if any)	Not applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Alectra Utilities has identified each proposed Lines Capacity project as required in the proposed timeline and determined that each investment is required to meet the pace of development in each service area to ensure sufficient capacity and reliable service for Alectra Utilities customers. Since larger projects require greater capital investment and take multiple years to build, Alectra Utilities plans to construct large projects in a phased manner to minimize the impact on rates and resources. A capacity benefit would be provided without the need to construct Britannia MS.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Britannia MS will not need construction priority if capacity can be provided through the link.
	Description of Incorporation of Advanced Technology, if applicable	Not applicable
	Identify any reliability, efficiency, safety or coordination benefits	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,555,324	$428,553	$456,215	$1,670,556	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

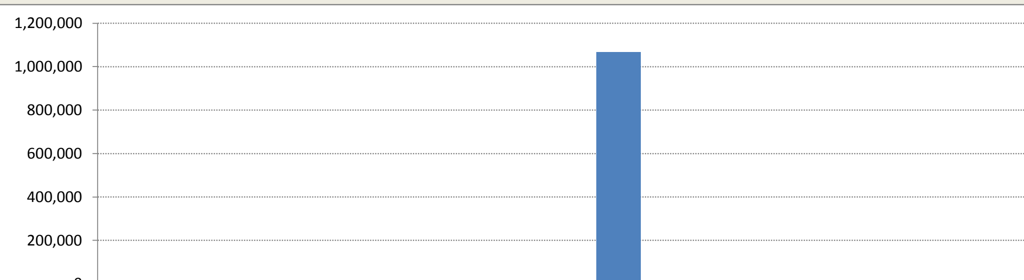
OEB Multi-Project Report

Project Code	150358	
Project Name	New build - QEW Dixie West New OH Circuits, Mississauga	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Queen Elizabeth Way crossing at Stanfield Rd and Ogden Ave.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	QEW highway crossing Additional 27.6kV circuits. Added betterment coordinated with the QEW Expansion along Dixie West OH Relocate. MTO driven expansion project D07-367911. Incremental betterment portion to add additional 27.6kV lines crossing the QEW. QEW Stanfield Rd. crossing: 1 circuit to 4 circuits. QEW Ogden Ave. crossing: 2 circuits to 4 circuits.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This Lines Capacity investments is driven primarily by the intensification and redevelopment of the surrounding areas where existing supply is insufficient to meet the increased demand. Coordination with the existing rebuild project will make the incremental crossings addition much easier.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes. Project is coordinated with city road works rebuild.
	Economic Development	Capital Lines investments from 2020 to 2024 total $116.1MM. Investments in Lines Capacity provide Alectra Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems. Over the DSP period, Alectra Utilities plans to invest in expanding feeders to meet the growth and the contingency capability in the 17 municipalities that Alectra Utilities serves. Relative to the last five years, the planned increase of investment in lines capacity is mainly due to the need to build feeders to support the new urban growth areas in Markham and the redevelopment of Mississauga Lakeshore, Downtown Brampton and areas in downtown Hamilton.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Do Nothing Adding feeders with the existing build will allow coordination cost benefits. Taking no action will ultimately result in feeders becoming overloaded and exceeding their carrying capacity. Once feeders are at full utilization, load shedding will need to be executed during the summer peak period or during contingency conditions to mitigate the risk of failure from overloaded equipment. Supplying customers through highly loaded feeders may impact power quality. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.
	Alternative #1	Non-Wires Alternatives Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 20 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected. This is not the recommended alternative.

	Alternative #2	Construct New Feeders Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions. This is the recommended alternative.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to reliably meet forecast connection requirements, and it forms the basis of the planned Lines Capacity investments. Future lines will easily be able to connect to the extra ties across the highway. Future traffic stoppages and work over the highway will be eliminated by coordinating with the existing work. Cost of implementing with the existing rebuild will result in roughly half the cost. $1M rather than future $2M.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Alectra Utilities has identified each proposed Lines Capacity project as required in the proposed timeline and determined that each investment is required to meet the pace of development in each service area to ensure sufficient capacity and reliable service for Alectra Utilities customers. Since larger projects require greater capital investment and take multiple years to build, Alectra Utilities plans to construct large projects in a phased manner to minimize the impact on rates and resources. Incremental installation costs will be much lower due to coordination with existing work.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area. Coordinating with existing road works project will result in a decreased in cost for installing incremental circuits.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,065,897	$0	$0	$0	$1,065,897	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150360	
Project Name	New build - Extend 44kV feeder Centre View Dr, Mississauga	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Centre View Dr, Living Arts Dr, and Rathburn Rd W.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	A new 44 kV overhead/underground feeder extension is needed to provide supply to downtown Mississauga area on Centre View Drive as well as provide primary supply for Duke Municipal Station (MS). Phase 1: Section on Centre View Dr from Mavis to Living Arts Dr Phase 2: Sections to provide contingency and downtown supply UG estimates assumed for future contingency, as further OH has not been guaranteed. Tentative approval to construct an OH line on Centre View Dr from Mavis to Living Arts Dr was granted by the city.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Alectra Utilities services downtown Mississauga through a 13.8 kV distribution network. Based on known development plans, this network does not have sufficient capacity to accommodate the planned developments in downtown Mississauga. Alectra Utilities has been notified of the Block 8 and Block 1 plan developments which identifies 6 buildings, each approximately 40 storeys tall, requiring 18 MVA of incremental load between Rathburn Road and Centre View Drive. In addition there are planned office towers along Centre view drive and Rathburn which will another 10 MW of load. In addition, Alectra Utilities is aware that several new developments require connections above the 3 MVA limit of the 13.8 kV system. Without the planned investments, Alectra Utilities will not be able to connect the large developments over 3 MVA. Intensification of Mississauga Downtown Core: The downtown core of the City of Mississauga continues to grow at a substantial rate, with the arrival of new condo and town house development, the expansion of the Square One shopping centre and surrounding retail and commercial development, and the ongoing expansion of City and Regional transportation hubs.
	Customer Attachment / Load (KVA)	40MW New Capacity
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes. Road extension and construction of the traffic circle on Living Arts Dr must be completed before Alectra's work.
	Economic Development	Capital Lines investments from 2020 to 2024 total $116.1MM. Investments in Lines Capacity provide Alectra Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems. Over the DSP period, Alectra Utilities plans to invest in expanding feeders to meet the growth and the contingency capability in the 17 municipalities that Alectra Utilities serves. Relative to the last five years, the planned increase of investment in lines capacity is mainly due to the need to build feeders to support the new urban growth areas in Markham and the redevelopment of Mississauga Lakeshore, Downtown Brampton and areas in downtown Hamilton.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Do Nothing This project is required to provide the primary supply to the DUKE MS. Without this process Alectra Utilities will be unable to provide primary supply to Duke MS. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.

	Alternative #1	Non-Wires Alternatives Alectra Utilities' load forecast process considers the impact of CDM and distributed generation, which is accounted for as part of the load forecast underpinning the stations project and determined that the capacity requirement cannot be met by non wires alternative. This is not the recommended alternative.
	Alternative #2	Construct New Feeder to provide primary supply to Duke MS.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to provide primary supply to DUKE MS and it forms the basis of the planned Lines Capacity investments.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Land for Duke MS is not obtained yet, and may change the final supply location.
	Comparative Information on Equivalent Historical Projects (if any)	Webb MS supply in city center.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	Work on Living Arts Dr needs to be coordinated with the city road extension.

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $6,478,755	$0	$0	$0	$0	$885,463	$5,593,292
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

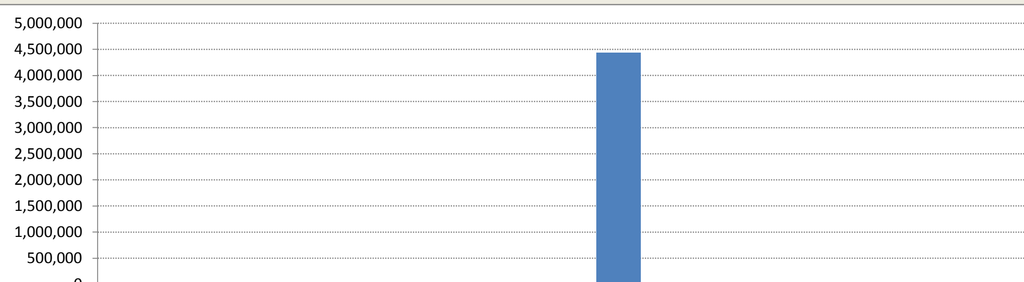
OEB Multi-Project Report

Project Code	150364
Project Name	New build - Port Credit Village East (Marina) 27.6kV Feeders, Mississauga
Major Category	System Service
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Port Credit Village East Lakeshore Rd from the Credit River to Hurontario St, and Port St to Park St W.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	Intensification of the Port Credit East development requires a 27.6kV circuit expansion in order to provide capacity and backup contingency for the Mid-rise mixed residential/commercial development. OH extensions will be constructed on Stavebank Rd, and Helen St. UG duct bank will be constructed on Lakeshore Rd to tie into the OH system.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner. This Lines Capacity investments is driven primarily by the intensification and redevelopment of the marina area where existing supply is insufficient to meet the increased demand, and the need to address specific locations where customers currently have inadequate backup capacity due to configuration of existing supply lines.
	Customer Attachment / Load (KVA)	4 proposal plans for the Marina were developed. The high model proposes 1500 units ranging from 8-14 stories. Using 3kVA/unit we generate a high level estimate of 4.5MVA. This does not address further growth in the adjacent lands.
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes.
	Economic Development	Investments in Lines Capacity provide Alectra Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Do Nothing Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner. The 4.16kV feeders are already loaded and their capacity limits will not support new emerging development, taking no action will result in new customers not being serviced, feeders becoming overloaded and exceeding their carrying capacity. Once feeders are at full utilization, load shedding will need to be executed during the summer peak period or during contingency conditions to mitigate the risk of failure from overloaded equipment. Supplying customers through highly loaded feeders may impact power quality. The area has limited/and or no back up options. In case of an outage approximate 4.5MVA of future load will be lost until the repair is completed. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.
	Alternative #1	Non-Wires Alternatives Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs New feeders are required to connect customers hence the non wire alternative was not considered.

	Alternative #2	Construct New Feeders Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions. This is the recommended alternative.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to reliably meet forecast connection requirements, and it forms the basis of the planned Lines Capacity investments. Conversion of 4.16kV to 27.6kV agrees with the overall voltage conversion plan.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	This project timelines matches the pace of development in Since larger projects require greater capital investment and take multiple years to build, Alectra Utilities plans to construct large projects in a phased manner to minimize the impact on rates and resources.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,439,592	$0	$0	$0	$4,439,592	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

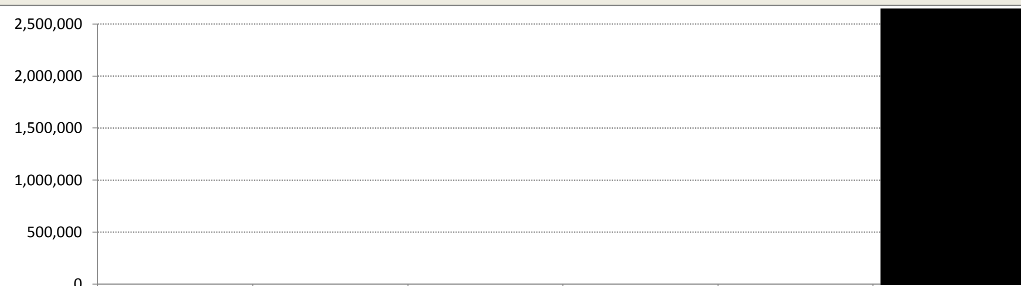
OEB Multi-Project Report

Project Code	150367
Project Name	Mini-Orlando MS 27.6kV Land Purchase, Mississauga
Major Category	System Service
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Mini Orlando MS North-East Corner of Mavis Rd and Britannia Rd.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Stations)
	Alectra Subcategory	Station Capacity Projects
4. Evaluation Criteria (OEB)	Project Summary	Mini-Orlando MS is situated on leased land in the area of Mavis Road, south of Highway 401, provides capacity for the commercial and industrial customers in the Heartland area. Based on the analysis set out below, Alectra Utilities forecasts the value of this property to be [redacted]. Alectra will purchase the land that Mini-Orlando MS resides on. Lease expires 2020
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	The Heartland Town Centre is an outdoor shopping centre located in Mississauga. Heartland Town Centre occupies 2,200,000 square feet of space and has 180 stores, making it is one of Canada's largest malls. The Heartland Town Centre is serviced by 27.6 kV supply. Mini-Orlando MS was specifically built to supply the Heartland Town Centre, since the nearby Erindale TS did not have sufficient capacity to supply the development. Although Erindale TS supplies both 44 kV and 27.6 kV service, the station's 27.6 kV supply is overcapacity, while its 44 kV supply had available capacity. Since Erindale TS could not supply 27.6 kV capacity, the mini-Orlando Station was constructed to transforms the available 44 kV of Erindale TS to 27.6 kV to feed the Heartland Town Centre, and to off-load capacity from the 27.6 kV supply at Erindale TS. Mini-Orlando MS can accommodate transfer from Erindale TS 27.6 kV feeders and meets the capacity requirement of the industrial/commercial customers of the Heartland Town Centre-area. During the 2017 peak, Mini Orlando shed 13 MVA from the Erindale TS which was still over the LTR limit. In the absence of mini-Orlando, Alectra Utilities would be unable to supply the Heartland Town Centre load as Erindale 27.6 kV is already over the its rated capacity. Given its importance to the area, Alectra Utilities has determined that it would be imprudent to continue leasing the land on which the Mini-Orlando MS is built. There is limited availability of land in the area, and it would not be possible for Alectra Utilities to secure land to move the Mini Orlando MS. Purchasing the property from the current owner would eliminate the capacity risk and cost associated in the case where Alectra Utilities was required to relocate the station (assuming it were possible to find another site for the station). Alectra Utilities plans to purchase the leased property.
	Customer Attachment / Load (KVA)	13MVA during 2017 coincident peak. 40MVA ONAN rating.
	Safety	Alectra Utilities will utilize internal and external contractors to complete the design and construction of the stations. The Execution phase will follow Alectra Utilities' internal project management methodology which provides specific guidelines, procedures, work instructions, and industry best practices that allow the project work to be performed in an economically efficient, cost-effective, and safe manner.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / "Do Nothing" The lease of the station is expiring in 2020. Alectra Utilities has also examined the risk of not securing land for the station and determined that if Alectra Utilities was asked to relocate the there would be significant cost to relocate the station and associated feeder integration cost. In addition the lands available in the area are very scare and Alectra Utilities may not be able to secure suitable land. This is not the recommended alternative.
	Alternative #1	Utilizing Non-Wire Alternatives Alectra Utilities' load forecast process considers the impact of CDM and distribution generation, which is accounted for as part of the load forecast underpinning the Stations Capacity portfolio. Alectra Utilities has also considered other options, such as battery storage, and determined that these options are not economical for the capacity that is required to meet the load growth and contingency conditions. This is not the recommended alternative.

	Alternative #2	Purchase Mini-Orlando lands from Orlando.
	Justification for Recommended Alternative	This is the recommended alternative. Purchase of the lands is the simplest solution to ensuring continued future operation of the Municipal Station.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Failure to acquire lands could ultimately lead to necessity of station relocation.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Adding capacity on the 27.6KV system entails building a new TS.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	The SA report noted that the existing Erindale TS (T1/T2) DESN load exceeded the normal supply capacity. However, there was extra capacity available in the area's 44 kV system that was able to be utilized by building a step down (44/27.6 kV) distribution station.
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	Not Applicable



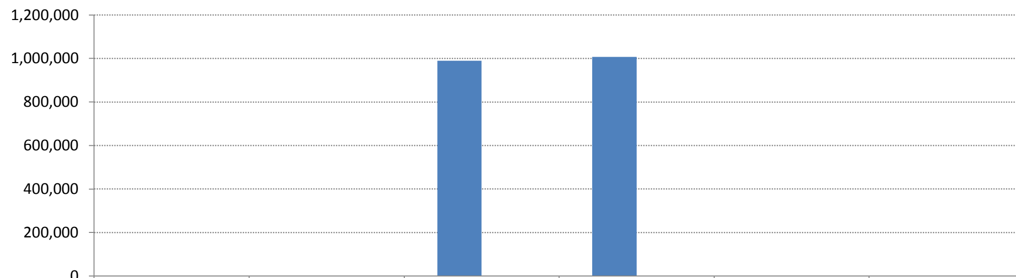
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,156,066	$0	$0	$0	$0	$0	[redacted]
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150368	
Project Name	New build - North Central feeders capacity (Carlton TS to Linwell Rd/Lake St) relief, St.Catharines	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	St. Catherines
	Location	St.Catharines, along Ontario St to Linwell Rd
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is to alleviate capacity issues in the North and Central section of St.Catharines, primarily served by Carlton BY bus feeders. These feeders regularly exceed the planning limit established in the Planning Philosophy. This project would be to bring a new feeder into the area and follow that with feeder reconfiguration to rebalance the loading on the feeders in the area back to below the Planning Limit. The 3 feeders targeted by this project to alleviate overloading are the CTM10, CTM11, and CTM12 which historically had, and forecasted to have the following loading levels in 2017, 2018, 2019, 2020, 2021; CTM10: 89%, 125%, 125%, 133%, 132% *offset by generation to below rated ampacity* CTM11: 79%, 93%, 92%, 92%, 92% CTM12: 87%, 106%, 106%, 105%, 105%
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This project is meant as part of a 2-part approach to deal with ongoing capacity constraints in the North end of St.Catharines by bringing available supply from Bunting and Carlton TS's. This condition has persisted for several years and has impacted Alectra's ability to supply load requests that have been made by customers, while also hindering the Operation of the system as multiple feeders that tie to each other are exceeding the planning limit and/or encroaching on their thermal limit.
	Customer Attachment / Load (KVA)	Not applicable, new feeder.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	Coordinating this project with Project #150579 which is bringing capacity out of Bunting TS in order to provide timely delivery of adequate new capacity to the area.
	Economic Development	Not applicable.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner.
	Alternative #1	The feeders are already loaded and nearing/or their capacity limits, taking no action will result in feeders becoming overloaded and exceeding their carrying capacity. Once feeders are at full utilization, load shedding will need to be executed during the summer peak period or during contingency conditions to mitigate the risk of failure from overloaded equipment. Supplying customers through highly loaded feeders may impact power quality. The recommended alternative is to bring a new overhead feeder from Carlton TS to the North/central area of St.Catharines where several adjacent feeders can be tied into and several chunks of existing feeders can be transferred to this new supply, thereby balancing out the loading to the region to meet planning limits. There are a few underground crossings required along the proposed route. This plan requires reconfiguring existing feeders in the St.Catharines downtown loop to free up a breaker position for this proposed project.
	Alternative #2	Non-Wires Solution Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs assessment. This area has benefited from generation to offset load for many years. Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of10 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected.
	Justification for Recommended Alternative	Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Coordination with the city for municipal consent.

	Comparative Information on Equivalent Historical Projects (if any)	Project #150390 which is a new capacity feeder for the Waterdown area along existing pole lines and is budgeted for $1.7MM for a similarly scoped project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable.
	Description of Incorporation of Advanced Technology, if applicable	Automated/remote-operable switches will be utilized at new tie-points.
	Identify any reliability, efficiency, safety or coordination benefits	Enhanced reliability is expected with reconfiguration of the feeders as less customers per feeder will be impacted by an outage and with new remote-operable switches added to improve restoration.



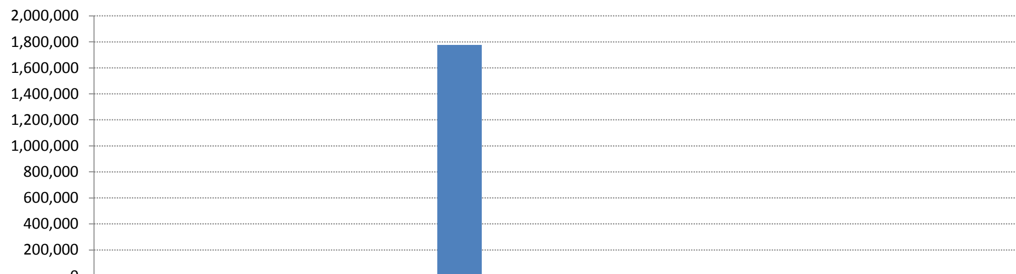
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,997,266	$0	$0	$989,556	$1,007,710	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150369	
Project Name	New build - 44kV Feeder Extension York/Meadowpine, Mississauga	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Meadowpine Blvd from Howe Court to the OH circuit west of Meadowvale Blvd.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	A 44kV OH feeder extension along Meadowpine in order to loop the existing 44kV feeding the cold storage . Circuit will run on Meadowpine Blvd from Howe Court to the OH circuit west of Meadowvale Blvd. This project will coordinate with a future 44kV customer on Meadowpine Blvd. The customer is to pay for OH connection to the 44kV and Alectra will pay the incremental costs to loop the circuit.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This Lines Capacity investments is driven primarily by the need to address backup of the 44kV supply to Meadowpine. There is no 44KV circuit on Meadowpine Blvd. and it is expected that the large customers will be connecting to the 44KV circuit. In addition 16MVA of connected load is on radial supply. The large industrial customer will incur a long outage as it on radial supply. The 44 circuit will be built in order to provide capacity for new 44KV loads and to provide looped feed.
	Customer Attachment / Load (KVA)	44kV R3107M3 had 2017 Peak of 345A 16000kVA currently radial on Howe court.
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes. Coordination should be done with incoming customer on Meadowpine Blvd.
	Economic Development	Investments in Lines Capacity provide Alectra Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Do Nothing The area has no back up options. In case of an outage approximate 16MVA of load will be lost until the repair is completed. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.
	Alternative #1	Non-Wires Alternatives Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 30 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected. This is not the recommended alternative.
	Alternative #2	Construct New Feeders Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions. This is the recommended alternative.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to reliably meet forecast connection requirements, and it forms the basis of the planned Lines Capacity investments.

6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Alectra Utilities has identified each proposed Lines Capacity project as required in the proposed timeline and determined that each investment is required to meet the pace of development in each service area to ensure sufficient capacity and reliable service for Alectra Utilities customers. Since larger projects require greater capital investment and take multiple years to build, Alectra Utilities plans to construct large projects in a phased manner to minimize the impact on rates and resources.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area. Extension of the feeder will provide contingency and thus increase reliability of the 44kV customers on Meadowpine Blvd. Coordination with an incoming customer will allow costs to be shared with that customer.



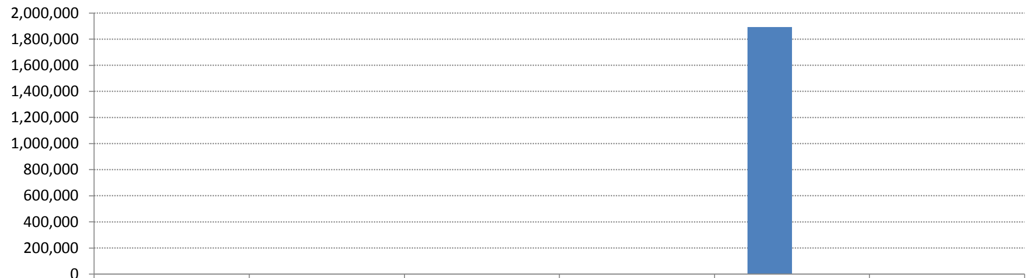
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,776,037	$0	$0	$1,776,037	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150370	
Project Name	New build - 27.6kV New Feeders Lakeview Development, Mississauga	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Located South of Lakeshore Rd E from Lakefront Promenade to Hydro Rd.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	Two 27.6kV feeders are to be extended in order to provide for 10,000 tentative units in the Lakeview area. Located South of Lakeshore Rd E from Lakefront Promenade to Hydro Rd. The OH circuits will be extended down Lakefront Promenade, and UG circuits will extend from Lakefront Promenade to Hydro Rd. The routing is preliminary and will be finalized when site plans are made available.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This Lines Capacity investment is driven primarily by the rapid expansion of urban development into historically rural greenfield regions. 10,000 units are proposed for development in the Lakeview area. At present there are no feeders to feed this development.
	Customer Attachment / Load (KVA)	10,000 units at 2.5KVA/unit = 25MVA
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes.
	Economic Development	Investments in Lines Capacity provide Alectra Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Do Nothing These are new development, if new overhead lines are not constructed, it will be physically impossible for Alectra Utilities to connect new customers to the grid. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.
	Alternative #1	Non-Wires Alternatives For this project these options have not been considered as new feeders are needed to connect the customers to grid. This is not the recommended alternative.
	Alternative #2	Construct New Feeders With the Execution of this investment Alectra will be able to connect new customers. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions. This is the recommended alternative.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to connect customers and it forms the basis of the planned Lines Capacity investments.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Alectra Utilities plans to construct large projects in a phased manner to minimize the impact on rates and resources.

Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
Description of Incorporation of Advanced Technology, if applicable	Not Applicable
Identify any reliability, efficiency, safety or coordination benefits	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area.



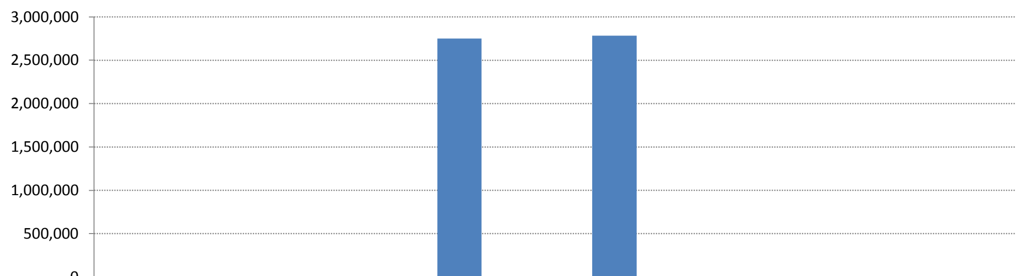
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,890,065	$0	$0	$0	$0	$1,890,065	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150371	
Project Name	New build - 27.6kV Feeder Extension Traders, Mississauga	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	The area between Hurontario St and Kennedy Rd from Matheson Blvd to Britannia Rd.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	Install new feeders in the Traders area between Hurontario St and Kennedy Rd from Matheson Blvd to Britannia Rd. These new feeders will service growing customers in the traders area. Brunel Rd Feeder Traders Blvd E Feeder Whittle Rd & Watline Ave Feeder Watline Ave & McAdam Rd. Feeder Matheson Blvd Feeder Feeder extension should coordinate with incoming/upgrading customer loads.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This Lines Capacity investments is driven primarily by the intensification and redevelopment of multiple locations around the Traders area where existing supply is insufficient to meet the increased demand.
	Customer Attachment / Load (KVA)	Red Loop 10225kVA (31 Tx, 71 BLDGS.) YC5676 to YC5672 Light Blue Loop 8175kVA (21 Tx, 34 BLDGS.) YC5675 to YC54394 Dark Blue Loop 7775kVA (22 Tx, 51 BLDGS.) YC5439 to YC5671 Orange Loop 4050kVA (13 Tx, 30 BLDGS.) YC5438 to YC54254 Pink Loop 8700kVA (23 Tx, 56 BLDGS.) YC54255 to YC5444
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes. Feeder extension should be coordinated with incoming/upgrading customers in order to offset costs.
	Economic Development	Investments in Lines Capacity provide Alectra Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Do Nothing The feeders are already loaded and at their capacity limits, taking no action will result in feeders becoming overloaded and exceeding their carrying capacity. Once feeders are at full utilization, load shedding will need to be executed during the summer peak period or during contingency conditions to mitigate the risk of failure from overloaded equipment. Supplying customers through highly loaded feeders may impact power quality. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.
	Alternative #1	Non-Wires Alternatives Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 20 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected. This is not the recommended alternative.

	Alternative #2	Construct New Feeders Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions. This is the recommended alternative.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to reliably meet forecast connection requirements, and it forms the basis of the planned Lines Capacity investments.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Alectra Utilities has identified each proposed Lines Capacity project as required in the proposed timeline and determined that each investment is required to meet the pace of development in each service area to ensure sufficient capacity and reliable service for Alectra Utilities customers. Since larger projects require greater capital investment and take multiple years to build, Alectra Utilities plans to construct large projects in a phased manner to minimize the impact on rates and resources.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area.



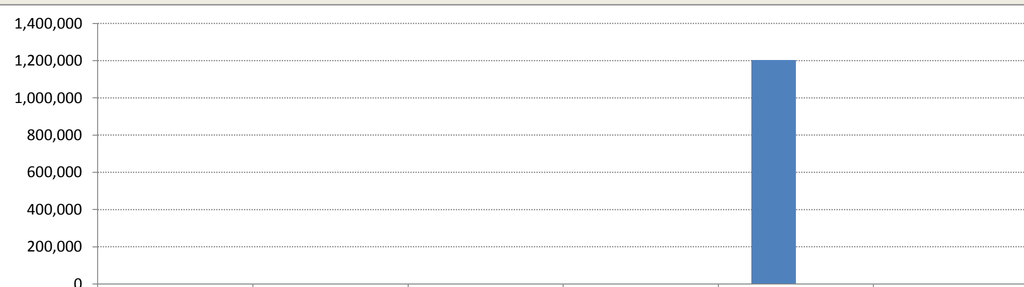
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $5,533,924	$0	$0	$2,751,754	$2,782,170	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150374	
Project Name	New build - 13.8kV Feeder Extension 9th Line, Derry to Argentia, Mississauga	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Along Ninth Line from Derry Rd W to Argentia Rd.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	13.8kV OH feeder extension From Derry Rd W to Argentia Rd. This will provide additional capacity for growth along 9th Line.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner. This Lines Capacity investments is driven primarily by the rapid expansion of urban development into historically rural greenfield regions.
	Customer Attachment / Load (KVA)	Existing 13.8kV 82F1 (204A 2017 Peak) (4700kVA available) Proposed extension 13.8kV 82F2 (147A 2017 Peak) (6000kVA available) North tie point 13.8kV 90F1 (33A 2017 Peak)
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes.
	Economic Development	Investments in Lines Capacity provide Alectra Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Do Nothing Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner. These are new development, if new overhead lines are not constructed, it will be physically impossible for Alectra Utilities to connect new customers to the grid. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.
	Alternative #1	Non-Wires Alternatives Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs For this project these options have not been considered as new feeders are needed to connect the customers to grid. This is not the recommended alternative.

	Alternative #2	Construct New Feeders Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions. This is the recommended alternative.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to reliably meet forecast connection requirements, and it forms the basis of the planned Lines Capacity investments.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Alectra Utilities has identified each proposed Lines Capacity project as required in the proposed timeline and determined that each investment is required to meet the pace of development in each service area to ensure sufficient capacity and reliable service for Alectra Utilities customers. Since larger projects require greater capital investment and take multiple years to build, Alectra Utilities plans to construct large projects in a phased manner to minimize the impact on rates and resources.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,205,091	$0	$0	$0	$0	$1,205,091	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

alectra utilities

OEB Multi-Project Report

Project Code	150375	
Project Name	New Build - 136M10 Goreway TS Extensions, Brampton	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Brampton
	Location	2019: OH Section 1 2020: Goreway TS across ravine, to MV3 Switch Gear 2021: Bovaird Dr. from Torbram Rd. to Bramalea Rd. on pole line 2021: Bovaird Dr. from Bramalea Rd. to Heartlake Rd. on pole line
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	GTS Expansion Goreway TS - across ravine, up Humberwest Pkwy. & across Cottrelle Blvd. to Airport Rd. Left to connect from the gear, across the ravine, into the station. Current MV3 switch gear to be replaced with a double MV3 switch gear to allow for cable capacity increase of M18. Current loading acceptable as long as the 42M69 is installed. (Project 150716) Deferred 136M10 pending road widening. Contingent on road widening from Goreway north of Queen to Mayfield to complete. 2019: OH Section 1 2020: Goreway TS across ravine, to MV3 Switch Gear 2021: Bovaird Dr. from Torbram Rd. to Bramalea Rd. on pole line 2021: Bovaird Dr. from Bramalea Rd. to Heartlake Rd. on pole line OH Sections may be subject to grandfathered ESA standards and as such finishing of overhead sections will occur 2020+.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This Lines Capacity investments is driven primarily by the requirement to supply new development and also to provide relief to the feeder 136M44. The 136M10 feeder egress project will install a new feeder from the Goreway TS to provide relief to the 136M44 circuit on Peter Robertson Boulevard and to supply new loads in the area according to Alectra's planning criteria to meet the projected load. 136M44 peak reading values are consistently reaching or over the planning limits. CDM initiatives will not provide adequate decrease to eliminate need for this investment.
	Customer Attachment / Load (KVA)	136M44 Peaks 2018 = 389A 2017 = 427A 2016 = 480A 2015 = 464A
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes. Deferred 136M10 pending road widening. Contingent on road widening from Goreway north of Queen to Mayfield to complete. OH Sections may be subject to grandfathered ESA standards and as such finishing of overhead sections will occur 2020+.
	Economic Development	Investments in Lines Capacity provide Alectra Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Do Nothing These are new development, if new overhead lines are not constructed, it will be physically impossible for Alectra Utilities to connect new customers to the grid. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.

	Alternative #1	Non-Wires Alternatives For this project these options have not been considered as new feeders are needed to connect the customers to grid. This is not the recommended alternative.
	Alternative #2	Construct New Feeders Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. This is the recommended alternative.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to reliably meet forecast connection requirements, and it forms the basis of the planned Lines Capacity investments.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Alectra Utilities has identified that this proposed Lines Capacity project as required in the proposed timeline and determined that each investment is required to meet the pace of development in each service area to ensure sufficient capacity and reliable service for Alectra Utilities customers.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area.

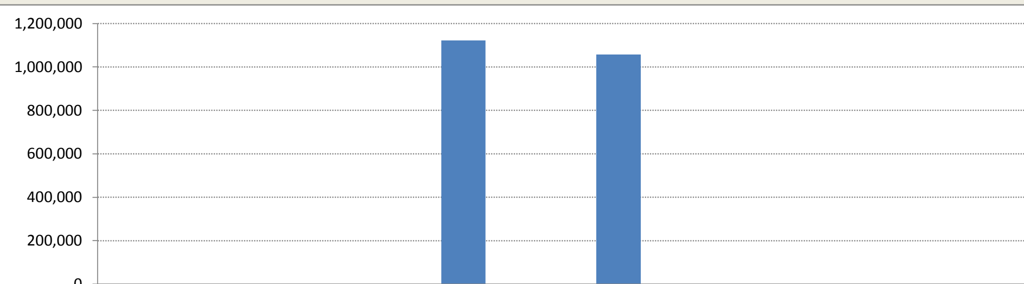
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,878,502	$305,972	$1,572,530	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150376	
Project Name	New build - Hamilton South Mountain feeders capacity relief, Hamilton	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Hamilton Mountain, along Stonechurch Rd W between West 5th and Upper Wentworth.
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is to alleviate capacity issues in the South Hamilton Mountain section of Hamilton, primarily served by Horning and Nebo QJ bus feeders. These feeders exceed the planning limit established in the Planning Philosophy. This project would be to bring at least 1 new feeder into the area and follow that with feeder reconfiguration to rebalance the loading on the feeders in the area back to below the Planning Limit. The 4 feeders targeted by this project to alleviate overloading are the 0812X, 3642X, 441X, and 4451X, which historically had, and forecasted to have the following loading levels in 2017 - 2021; 0812X: 95%, 103%, 103%, 102%, 102% 3642X: 90%, 98%, 98%, 97%, 97% 441X: 92%, 94%, 96%, 98%, 100% 4451X: 115%, 122%, 124%, 127%, 129%
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This project is meant to address ongoing capacity constraints along the south and central areas of the Hamilton mountain area by bringing available supply from Horning TS after the rebuild of the station is completed by Hydro One. These areas are seeing in-fill development and growth such that existing feeders in the area regularly exceed the planning limit, and in some cases the thermal limit of the egress cables. This excessive loading hinders the operation of the system as multiple feeders tie to each other that are afflicted with overloading.
	Customer Attachment / Load (KVA)	Not applicable, new feeder(s).
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	Coordination with Hydro One as they complete their rebuild at Horning TS as our egress cables will be terminated at a new location.
	Economic Development	Not applicable.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner.
	Alternative #1	The feeders are already loaded and nearing/or their capacity limits, taking no action will result in feeders becoming overloaded and exceeding their carrying capacity. Once feeders are at full utilization, load shedding will need to be executed during the summer peak period or during contingency conditions to mitigate the risk of failure from overloaded equipment. Supplying customers through highly loaded feeders may impact power quality. This solution is to bring one or more feeders from free positions at Horning TS to provide capacity relief to the Hamilton Mountain area in the vicinity of Stonechurch/Upper James or Upper Wentworth areas. The feeders in these areas regularly exceed the planning limits set out in the Planning Philosophy and continue to see additional in-fill development. Due to continued growth and amount of load in excess of Planning Limit on feeders in the area being targeted, there could be savings by bringing an additional feeder out of Horning TS at the same time, to further find capacity relief on the Hamilton Mountain area.
	Alternative #2	Non-Wires Solution Alectra Utilities’ load forecast process considers the impact of CDM and distributed generation and has been considered during the needs assessment. This area has benefited from generation to offset load for many years. Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 10 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected.

	Justification for Recommended Alternative	Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions. The number of heavily loaded feeders in proximity to each other the preferred solution is to run 2 new feeders to bolster multiple points in the system. As they will travel a large distance along the same duct route, there are expected efficiencies due to crews already being mobilized to the area. Horning TS has capacity available and vacant feeder positions making it the ideal candidate to supply capacity to the affected area. Nearby Mohawk TS and Nebo TS's QJ bus are both operating at peak levels approaching their 10-day LTR, so by bringing capacity from Horning TS and reconfiguring feeders, some of the capacity constraints at those 2 stations can be also be alleviated through this project.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Coordination with the city for municipal consent.
	Comparative Information on Equivalent Historical Projects (if any)	Similar projects have been budgeted for between $1.5MM - $2.5MM for a new feeder of average length, as in this case.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable.
	Description of Incorporation of Advanced Technology, if applicable	Automated/remote operable switches will be utilized at new tie-points.
	Identify any reliability, efficiency, safety or coordination benefits	Enhanced reliability is expected with reconfiguration of the feeders as less customers per feeder will be impacted by an outage and with new remote-operable switches added to improve restoration.



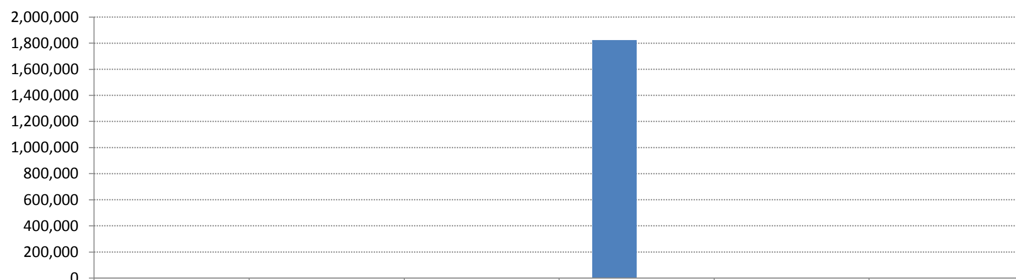
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,179,475	$0	$0	$1,122,185	$1,057,290	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150377	
Project Name	Voltage Conversion and Rear Lot - Montgomery Dr, Hamilton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Hamilton, Ancaster area along Montgomery Dr.
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is to perform a voltage conversion from 4kV to 27.6kV downstream from a distribution step-down transformer on Montgomery Dr in Ancaster. There is also a portion of the project to address some rear lot construction within the neighbourhood.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The area has seen outages due to the rear lot construction as recently as April 2018, as well, some re-work requested due to a customer service upgrade has positioned this area as an ideal candidate to complete the voltage conversion and remove the step-down transformer, while also tackling a problematic rear lot area.
	Customer Attachment / Load (KVA)	227 customers and 997 kVA
	Safety	There are some safety concerns regarding working on rear lot pole lines, due to access restrictions for larger equipment.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	Not applicable.
	Economic Development	Not applicable.
	Environmental Benefits	By removing rear lot supplied transformers to a more accessible front lot location, any potential oil spill issues can be much more effectively addressed.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist.
	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings. Under the like-for-like replacement option, existing 4 kV infrastructure would be replaced with 4 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. The operation concerns of supplying customers from Rear Lot primary would persist.
	Alternative #2	Full conversion of the lines to new 27.6 kV primary system voltages This alternative proposes to renew the assets in the area while also proceeding with voltage conversion to a higher voltage class for the equipment. Other benefits include taking the opportunity to redesign the feeder configuration to provide improved reliability where possible by creating loops where none exist today as well as converting rear lot supply to front lot. The plan for this area is to leverage some of the existing repair work and customer driven redesign to finally eliminate the rear lot in the area and complete the voltage conversion to 27kV for the remaining assets. The majority of customers would be supplied from front lot overhead, but some will have to be supplied via underground secondary.
	Justification for Recommended Alternative	This area would have been left as-is during the last voltage conversion that was conducted in Ancaster to bring surrounding areas to 27kV. Given the vintage of the majority of assets is the 1950's, and there are several sections that have seen spot replacement in the last decade, it makes sense to take the cost effective approach to replace the remaining assets in a systematic way. To perform voltage conversion at the same time is prudent to bring this pocket of customers up to the same voltage class as surrounding areas. The full conversion option presents the best value long-term by having conversion completed in a planned manner as well as benefits to the operability of the system, which ultimately benefits the customers. For those reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Municipal consent for any pole relocation. Customer expectation for what the new distribution will look like is a risk, especially if the customer is pushing for a more aesthetically-pleasing but more expensive alternative by going fully underground. Customer consultation will be an important step in mitigating this risk and ensure the public and the utility are aligned in addressing this renewal.
	Comparative Information on Equivalent Historical Projects (if any)	Similar rear lot projects have been budgeted between $1.25MM - $2MM per year, depending on whether a full underground solution or only partial underground solution is chosen.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0

7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	The assets in this area are of 1950's vintage and are generally substandard height for supporting 3 phase primary conductor.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Health index of a sample of assets in the area put them at approximately 60%, however majority of poles are showing visible signs of rot. There are a number of poles where Alectra is a joint use tenant on Bell owned poles in the area, therefore no condition data is available for these assets.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	227
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Some rear lot as part of the project that has been cause of outages in recent history. 2D2X 3 year (2014 - 2017) stats: 68 outages, 4,326,754 customer minutes (421 minutes/customer/year) This project area constitutes about 6% of the customer base and 4% of connected kVA of the feeder. Assume 10% of outages caused by this section of the feeder due to recent rear lot outages in area.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Rear lot supply failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Rear lot system also poses safety hazards to the customers because live electrical components are in proximity of customer’s backyard and proper clearance may be violated due to customer’s installations (examples: trees, garden, swimming pool, storage shed, deck, house extension).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Not applicable
	Reliability and Safety Factors	Due to rear lot location these assets are not easily accessible.
	Analysis for "Like for Like" Renewal Project	Like for like renewal would address the issue of equipment failure due to end-of-life assets in the area, but there is no system benefit in rebuilding this area at 4kV.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,824,762	$0	$0	$0	$1,824,762	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150378	
Project Name	Rear Lot Renewal Project - East of Queen Street/North of Mill Street	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	North-east corner of Mill/Queen Street in Tottenham
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Rear Lot Conversion
	Alectra Subcategory	Rear Lot Conversion
4. Evaluation Criteria (OEB)	Project Summary	Convert the area east of Queen Street and north of Mill Street in Tottenham from rear lot overhead supply to front lot underground supply (primary and secondary). This will reduce number of outages and power restoration time. The project is proposed to be completed over one year. The existing rear lot location east of Queen Street and north of Mill Street in Tottenham will be 37 years old in 2022. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2012 and 2013, where a majority of the poles were found to be in poor condition. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The priority of this project is high. This project is to decrease the outage impacts due to deteriorating distribution system assets and mitigate the outage impacts due to increasing effect of adverse weather events. Reasons for Priority: The electrical system is deteriorating and poses many operations, safety, and customer service concerns that must be addressed. If not addressed, the system will deteriorate further and failures and safety hazards will increase. In December 2013, an ice storm came in across Ontario including Alectra (East) service territory. During the storm, many trees, including trees in rear lot areas, fell onto power lines and created prolonged power outages to customers. Power restoration in rear lot areas was very difficult due to accessibility. The December 2013 ice storm caused 29,831,573 CMI within the rear lot grids, which accounted for 16.68% of the total system CMI due to the ice storm. The existing rear lot location east of Queen Street and north of Mill Street in Tottenham will be 37 years old in 2022. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2012 and 2013, where a majority of the poles were found to be in poor condition. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Customer Attachment / Load (KVA)	Total connected load of 438 kVA.
	Safety	Safety risk associated with close proximity to power line in the backyard: Although the Electrical Safety Code and easement terms specify minimum clearance between customer facilities and power line, there are cases that customers do not follow the safety rules and install facilities too close to power line. Examples are shed, storage, playground, trampoline, swimming pool, patio deck, landscape, house extension, etc. This encroachment creates a safety hazard for both customers and crews. Safety risk associated with reduced clearance due to encroachment of power line: Over time, growth of vegetation and obstruction due to customer facilities may jeopardize the minimum clearance requirements and restrict crew mobility. Occasionally dogs may also be a safety hazard to the crews.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Because overhead transformers are installed on the pole in rear lot area, a pole falling down may also cause the transformers to fall down, resulting in transformer tank rupturing, and oil being spilled onto the ground.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under this option, no proactive investments would be executed to replace either existing rear lot infrastructure and these assets would only be intervened upon in reactive scenarios, when the assets have reached their end-of-life. Under this approach, customers would be exposed to prolonged reliability impacts, due to the accessibility issues associated with rear lot infrastructure, as well as the complex restoration procedures that would be required for a four-feeder outage event. As standardized equipment (e.g. bucket trucks) cannot be used to service rear lot plant, wood poles, transformers and overhead switches would have to be replaced manually, with field crews accessing private customer properties in order to execute the work. Customers and field crews would continue to be exposed to elevated safety risks, due to the minimal proximity between customer plant and the rear lot overhead lines, as well as the non-standard and non-ergonomic work procedures that field crews would have to continue to execute to sufficiently maintain, inspect and service the plant. Finally, as assets are replaced reactively, new assets would need to be installed according to the rear lot configuration. By its design, rear lot can only be converted if the entire line is replaced at once as part of an overall project. Therefore, the legacy design will continue to be maintained under this scenario. This will include the continued operation of the legacy voltage system, along with continuing the associated inefficiencies, such as line losses.
	Alternative #1	Remediate the existing rear lot plant with other design options . The other design options considered are described below. Rear Lot Overhead Option: Under this Option, the existing rear lot plant is replaced with new overhead plant in the rear lot. When the replacement project is implemented, the following design parameters should be considered: • Install critical components such as fuse, switch, and transformer as close to the accessible street as possible This Option is not acceptable because it does not resolve the major operations and customer reliability concerns related to the distribution assets located at rear lot at this location. Partial Underground Option This scenario involves the replacement of existing rear lot infrastructure with a new hybrid solution, where primary voltage infrastructure, including transformers, switches and lines would be installed as per an underground configuration within the front right-of-way, following standard Alectra Utilities installation practices. Under this approach, secondary infrastructure, including wood poles and secondary conductor, would remain in the rear lot in overhead configuration. This approach would not fully address the reliability and safety concerns associated with rear lot distribution, as secondary connections will remain in the rear lot. However, future outage impacts will be reduced and contained to only those customers connected to the associated transformer. Lower voltage classes will also be converted up to the standardized 27.6kV voltage standard as per this investment option. Under this option, reliability and safety issues would continue to persist due some infrastructure remaining overhead. The cost of partial underground renewal is higher than the renewal of the rear lot overhead and further more does not result in mitigating the risks associated with the existing system. This partial underground approach has been adopted where feasible.
	Alternative #2	Replace with Full Underground Infrastructure This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure. All existing primary and secondary distribution assets within the rear lot corridor will be removed and replaced with new underground primary and secondary infrastructure that is installed within the front lot corridor as per current standard design practices. Underground secondary cables will run from the front lot underground transformers to the individual meter bases in order to supply the customers. Under this approach, existing under-classed legacy wood poles will be replaced with higher-class poles that are better suited to withstand major weather events. Through this investment scenario, these high impact assets will be better secured and weather-hardened against future outage events. This approach would completely mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated.
	Justification for Recommended Alternative	It is recommended to convert the area east of Queen Street and north of Mill Street in Tottenham from rear lot overhead supply to front lot underground supply (primary and secondary). Under this Option, the existing rear lot plant is removed and new underground plant is installed in front lot. This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated and line losses associated with the legacy voltage classes can be eliminated. For these reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Fluctuation in cost and staff resource (internal and external) to complete high annual volume of work. Risk Management: Alectra has retained external contractor working at different work sites throughout the year under a multi-year EPC (Engineering Procurement Construction) Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track.
	Comparative Information on Equivalent Historical Projects (if any)	Alectra has completed and is completing similar rear lot remediation project since 2013. Alectra has experience on executing several rear lot remediation project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0

7. Category-Specific Requirements for Each Project/Activity (OEB)

Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:

The scope involves converting the area east of Queen Street and north of Mill Street from rear lot overhead supply to front lot underground supply (primary and secondary). There are a total of 104 customers affected by the existing rear lot supply.

Rear lot infrastructure is functionally obsolete for the following key reasons:
- The rear lot configuration is generally unsafe to the public due to the large trees growing near energized power lines. In tandem with such an unsafe configuration, there are also line clearing hazards and related additional costs to do this work.
- Alectra Utilities is unable to use labour saving tools and devices such as bucket trucks to efficiently maintain and repair the distribution system due to assets located in customer backyards.
- Rear lot wood poles are generally congested, due to multiple service attachments and communication drops, which generally make it impossible to sufficiently climb poles. Crews must, therefore, use ladders to access these poles.
- Alectra Utilities is limited in utilizing ladders to access the overhead system due to Ministry of Labour restrictions for congested areas.
- Due to the presence of legacy porcelain top tie insulators, rear lot lines must be fully isolated before any maintenance or repair work on the overhead system can commence.
- Porcelain insulators are far more susceptible to contamination and flashover when compared to present-day standard polymer insulators.
- Rear lot infrastructure typically contains undersized #4 aluminum conductor steel-reinforced cable and aluminum conductor, along with #4 and #6 copper conductor, which are undersized and generally have a greater probability of annealing due to their reduced carrying capacity. These conductors must be fully isolated before any work can commence.

Condition of Asset vs. Typical Life Cycle and Performance Record

It is extremely difficult to gain access to the backyard to maintain, repair, and restore power. As a result there are prolonged outages to customers. This is especially more difficult in the event of ice storm.

Many of the Rear Lot Supply distribution systems were built in 1950s, 1960s, and 1970s (40-68 years old in 2016). The rear lot equipment is older than typical useful life and the asset condition is deteriorating. According to the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board", typical useful life of overhead transformers and wood poles are 40 and 45 years respectively. Many of the installations are not in compliance to today’s standards.

The existing rear lot location east of Queen Street and north of Mill Street in Tottenham will be 37 years old in 2022. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2012 and 2013, where a majority of the poles were found to be in poor condition.

Number of Customers in Each Customer Class Potentially Affected by Asset Failure

104

Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)

Number of failures and duration based on historical outage data for specific north-east corner of Mill/Queen Street rear lot area:
November 2015; 22 hour outage (Incident # 737528)
March 2016; 3 hour outage (Incident # 740667)
June 2017; 1 hour outage (Incident # 755628)
Based on three year average (2015-2017) assume 1 outage at 8.6 hours for north-east corner of Mill/Queen Street rear lot area.

Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)

Rear lot supply failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Rear lot system also poses safety hazards to the customers because live electrical components are in proximity of customer’s backyard and proper clearance may be violated due to customer’s installations (examples: trees, garden, swimming pool, storage shed, deck, house extension).

Value of Customer Impact

High

Factors Affecting Project Timing, if any

Not Applicable

Consequences for O&M System Costs Including Implications of Not Implementing

In case of not implementing the project the OM&A cost will continue to occur due to tree trimming activities as well as increase in responding to outages since the assets are deteriorated and prone to failure.

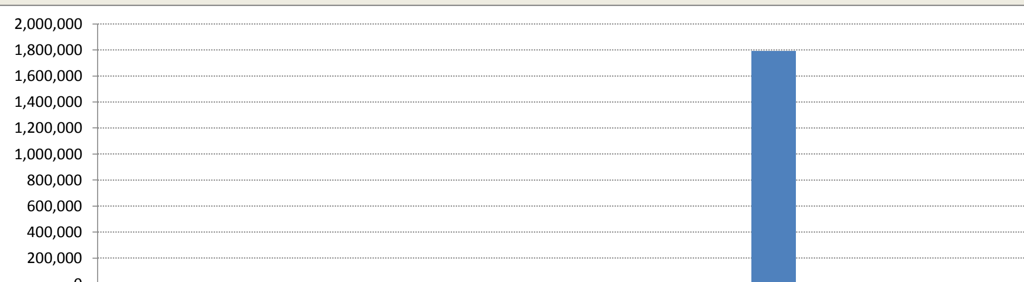
Reliability and Safety Factors

This project is part of the long-term rear lot supply remediation program. The project will help avoid potential rear lot failures. In addition, this project also eliminates safety hazards associated with ageing and deteriorating rear lot system.

This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure.

Analysis for "Like for Like" Renewal Project

The selected option is not a like for like replacement. This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,792,484	$0	$0	$0	$0	$1,792,484	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150380	
Project Name	Rear Lot Renewal Project - Gunn/Oakley Park/St.Vincent	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Oakley Park Square near Gunn Street and St. Vincent Street in Barrie
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Rear Lot Conversion
	Alectra Subcategory	Rear Lot Conversion
4. Evaluation Criteria (OEB)	Project Summary	Convert Oakley Park Square near Gunn Street and St. Vincent Street in Barrie from rear lot overhead supply to front lot underground supply (primary and secondary). This will reduce number of outages and power restoration time. The project is proposed to be completed over one year. The existing rear lot location at Oakley Park Square near Gunn Street and St. Vincent Street in Barrie will be 57 years old in 2024. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2012 and 2013, where the poles were found to be in fair or poor condition. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	The priority of this project is high. This project is to decrease the outage impacts due to deteriorating distribution system assets and mitigate the outage impacts due to increasing effect of adverse weather events. Reasons for Priority: The electrical system is deteriorating and poses many operations, safety, and customer service concerns that must be addressed. If not addressed, the system will deteriorate further and failures and safety hazards will increase. In December 2013, an ice storm came in across Ontario including Alectra (East) service territory. During the storm, many trees, including trees in rear lot areas, fell onto power lines and created prolonged power outages to customers. Power restoration in rear lot areas was very difficult due to accessibility. The December 2013 ice storm caused 29,831,573 CMI within the rear lot grids, which accounted for 16.68% of the total system CMI due to the ice storm. The existing rear lot location at Oakley Park Square near Gunn Street and St. Vincent Street in Barrie will be 57 years old in 2024. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2012 and 2013, where the poles were found to be in fair or poor condition. These assets pose a safety risk for the public and for Alectra Utilities crews, are more prone to failure than other overhead distribution assets, and otherwise do not align with current standards, policies and practices.
	Customer Attachment / Load (KVA)	Total of 91 downstream customers with 275 kVA connected.
	Safety	Safety risk associated with close proximity to power line in the backyard: Although the Electrical Safety Code and easement terms specify minimum clearance between customer facilities and power line, there are cases that customers do not follow the safety rules and install facilities too close to power line. Examples are shed, storage, playground, trampoline, swimming pool, patio deck, landscape, house extension, etc. This encroachment creates a safety hazard for both customers and crews. Safety risk associated with reduced clearance due to encroachment of power line: Over time, growth of vegetation and obstruction due to customer facilities may jeopardize the minimum clearance requirements and restrict crew mobility. Occasionally dogs may also be a safety hazard to the crews.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Because overhead transformers are installed on the pole in rear lot area, a pole falling down may also cause the transformers to fall down, resulting in transformer tank rupturing, and oil being spilled onto the ground.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)

Status Quo

Under this option, no proactive investments would be executed to replace either existing rear lot infrastructure and these assets would only be intervened upon in reactive scenarios, when the assets have reached their end-of-life.

Under this approach, customers would be exposed to prolonged reliability impacts, due to the accessibility issues associated with rear lot infrastructure, as well as the complex restoration procedures that would be required for a four-feeder outage event.

As standardized equipment (e.g. bucket trucks) cannot be used to service rear lot plant, wood poles, transformers and overhead switches would have to be replaced manually, with field crews accessing private customer properties in order to execute the work. Customers and field crews would continue to be exposed to elevated safety risks, due to the minimal proximity between customer plant and the rear lot overhead lines, as well as the non-standard and non-ergonomic work procedures that field crews would have to continue to execute to sufficiently maintain, inspect and service the plant.

Finally, as assets are replaced reactively, new assets would need to be installed according to the rear lot configuration. By its design, rear lot can only be converted if the entire line is replaced at once as part of an overall project. Therefore, the legacy design will continue to be maintained under this scenario. This will include the continued operation of the legacy voltage system, along with continuing the associated inefficiencies, such as line losses.

Alternative #1

Rear Lot Overhead Option:

Under this Option, the existing rear lot plant is replaced with new overhead plant in the rear lot.
When the replacement project is implemented, the following design parameters should be considered:
• Install critical components such as fuse, switch, and transformer as close to the accessible street as possible

This Option is not acceptable because it does not resolve the major operations and customer reliability concerns related to the distribution assets located at rear lot at this location.
Partial Underground Option
This scenario involves the replacement of existing rear lot infrastructure with a new hybrid solution, where primary voltage infrastructure, including transformers, switches and lines would be installed as per an underground configuration within the front right-of-way, following standard Alectra Utilities installation practices. Under this approach, secondary infrastructure, including wood poles and secondary conductor, would remain in the rear lot in overhead configuration.
This approach would not fully address the reliability and safety concerns associated with rear lot distribution, as secondary connections will remain in the rear lot. However, future outage impacts will be reduced and contained to only those customers connected to the associated transformer. Lower voltage classes will also be converted up to the standardized 27.6kV voltage standard as per this investment option.
Under this option, reliability and safety issues would continue to persist due some infrastructure remaining overhead. The cost of partial underground renewal is higher than the renewal of the rear lot overhead and further more does not result in mitigating the risks associated with the existing system. This partial underground approach has been adopted where feasible.

Alternative #2

Replace with Full Underground Infrastructure
This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure. All existing primary and secondary distribution assets within the rear lot corridor will be removed and replaced with new underground primary and secondary infrastructure that is installed within the front lot corridor as per current standard design practices. Underground secondary cables will run from the front lot underground transformers to the individual meter bases in order to supply the customers.

Under this approach, existing under-classed legacy wood poles that support four feeders will be replaced with higher-class poles that are better suited to withstand major weather events. Through this investment scenario, these high impact assets will be better secured and weather-hardened against future outage events.
This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated and line losses associated with the legacy voltage classes can be eliminated.

Justification for Recommended Alternative

It is recommended to convert Oakley Park Square near Gunn Street and St. Vincent Street in Barrie from rear lot overhead supply to front lot underground supply (primary and secondary). Under this Option, the existing rear lot plant is removed and new underground plant is installed in front lot.

This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated and line losses associated with the legacy voltage classes can be eliminated. For these reasons, Alectra Utilities selected this approach.

6. General Information on the Project/Activity (OEB)

Risks to Completion and Risk Management

Risk: Fluctuation in cost and staff resource (internal and external) to complete high annual volume of work.

Risk Management: Alectra has retained external contractor working at different work sites throughout the year under a multi-year EPC (Engineering Procurement Construction) Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track.

Comparative Information on Equivalent Historical Projects (if any)

Alectra has completed and is completing similar rear lot remediation project since 2013. Alectra has experience on executing several rear lot remediation project.

Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)

0

7. Category-Specific Requirements for Each Project/Activity (OEB)

Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:

The scope involves converting the Oakley Park Square near Gunn Street and St. Vincent Street area from rear lot overhead supply to front lot underground supply (primary and secondary). There are a total of 91 customers affected by the existing rear lot supply.

Rear lot infrastructure is functionally obsolete for the following key reasons:

- The rear lot configuration is generally unsafe to the public due to the large trees growing near energized power lines. In tandem with such an unsafe configuration, there are also line clearing hazards and related additional costs to do this work.
- Alectra Utilities is unable to use labour saving tools and devices such as bucket trucks to efficiently maintain and repair the distribution system due to assets located in customer backyards.
- Rear lot wood poles are generally congested, due to multiple service attachments and communication drops, which generally make it impossible to sufficiently climb poles. Crews must, therefore, use ladders to access these poles.
- Alectra Utilities is limited in utilizing ladders to access the overhead system due to Ministry of Labour restrictions for congested areas.
- Due to the presence of legacy porcelain top tie insulators, rear lot lines must be fully isolated before any maintenance or repair work on the overhead system can commence.
- Porcelain insulators are far more susceptible to contamination and flashover when compared to present-day standard polymer insulators.
- Rear lot infrastructure typically contains undersized #4 aluminum conductor steel-reinforced cable and aluminum conductor, along with #4 and #6 copper conductor, which are undersized and generally have a greater probability of annealing due to their reduced carrying capacity. These conductors must be fully isolated before any work can commence.

Condition of Asset vs. Typical Life Cycle and Performance Record

It is extremely difficult to gain access to the backyard to maintain, repair, and restore power. As a result there are prolonged outages to customers. This is especially more difficult in the event of ice storm.

Many of the Rear Lot Supply distribution systems were built in 1950s, 1960s, and 1970s (40-68 years old in 2016). The rear lot equipment is older than typical useful life and the asset condition is deteriorating. According to the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board", typical useful life of overhead transformers and wood poles are 40 and 45 years respectively. Many of the installations are not in compliance to today's standards.

The existing rear lot location at Oakley Park Square near Gunn Street and St. Vincent Street in Barrie will be 57 years old in 2024. The asset is end of life and requires remediation. In addition, the poles in this rear lot location were inspected in 2012 and 2013, where the poles were found to be in fair or poor condition.

Number of Customers in Each Customer Class Potentially Affected by Asset Failure

91

Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)

Number of failures and duration based on historical outage data for specific Oakley Park Square rear lot area:
August 2015; 20 hour outage (Incident # 733815)
March 2016; 8.4 hour outage (Incident # 741602)
March 2016; 10.5 hour outage (Incident # 741986)
Based on three year average (2015-2017) assume 1 outage at 13 hours for Oakley Park Square rear lot area.

Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)

Rear lot supply failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Rear lot system also poses safety hazards to the customers because live electrical components are in proximity of customer's backyard and proper clearance may be violated due to customer's installations (examples: trees, garden, swimming pool, storage shed, deck, house extension).

Value of Customer Impact

High

Factors Affecting Project Timing, if any

Not Applicable

Consequences for O&M System Costs Including Implications of Not Implementing

In case of not implementing the project the OM&A cost will continue to occur due to tree trimming activities as well as increase in responding to outages since the assets are deteriorated and prone to failure.

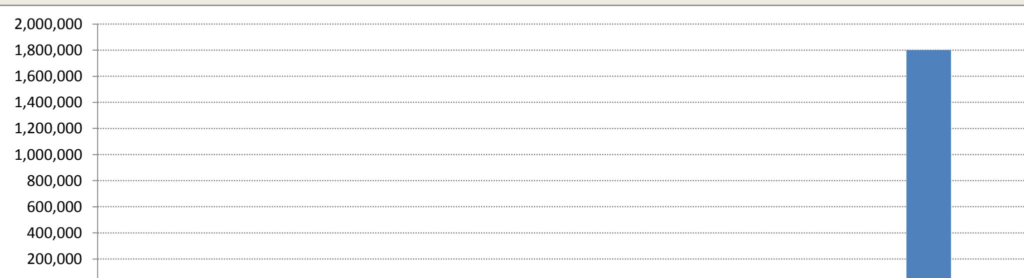
Reliability and Safety Factors

This project is part of the long-term rear lot supply remediation program. The project will help avoid potential rear lot failures. In addition, this project also eliminates safety hazards associated with ageing and deteriorating rear lot system.

This approach would complete mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure.

Analysis for "Like for Like" Renewal Project

The selected option is not a like for like replacement. This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure.

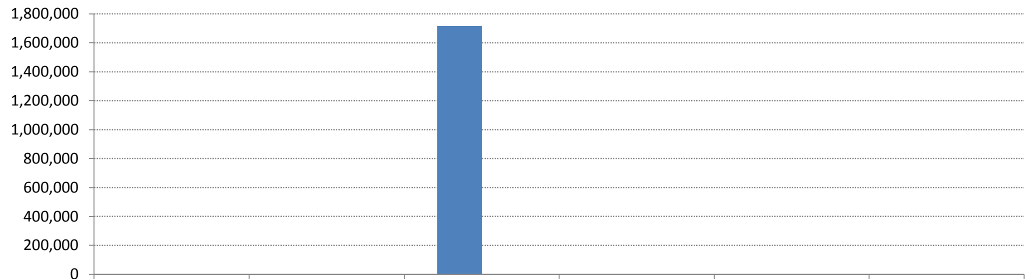


	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,800,029	$0	$0	$0	$0	$0	$1,800,029
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150390	
Project Name	New build - Waterdown 3rd Feeder, Hamilton	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Hamilton (Waterdown), along Dundas St , from Hwy 6 to Centre Rd
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is to alleviate capacity issues in the Waterdown area of Hamilton, primarily served by two Dundas 27.6kV feeders. This part of the city is seeing steady growth and the load forecast has shown that the existing feeders in the area will be at risk of supplying capacity under a contingency situation. Part of the work to extend a feeder to Waterdown has already been completed, but the intersection of Hwy 6 and Dundas St has been planned to be developed into a cloverleaf intersection for a number of years, leading to ongoing deferrals of this project.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Continued growth in the area as well as several large customer requests necessitate the increased capacity brought to this area.
	Customer Attachment / Load (KVA)	9756 customers and 111,161 kVA connected.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	Coordination with road authorities on timing of work.
	Economic Development	Not applicable.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Not proceeding with this project would continue to subject these feeders to loading levels that are above the normal planning limit. This becomes an issue when an outage occurs and in order to restore customers by using adjacent feeders, but in this instance the adjacent feeders are also heavily loaded. Outages often occur during heavy loading periods, which makes restoration under these conditions particularly challenging.
	Alternative #1	Non wires Alternatives Alectra load forecast is net of CDM and DG. Alectra has considered solar and energy storage and for the capacity (20MW) the cost is over 15 times the wires option and hence this option has been rejected.
	Alternative #2	By proceeding with building out the feeder to supply Waterdown with extra capacity, long term growth needs will be met and the feeders will be able to have adequate back-up capabilities during abnormal (N-1) situations. This project is a continuation of existing work already completed.
	Justification for Recommended Alternative	This project is a continuation of work already begun to bring capacity to the area to alleviate constraints on the system where there is growth.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	This project has seen some scheduling impact due to the MTO timing and delays to the proposed cloverleaf at Hwy 6 and Dundas St where this new feeder circuit currently ends. As any work related to this project is on-hold indefinitely, Alectra is proceeding with building out the pole line to bring the capacity to where it is needed and will include consideration to any relocation work required in the future due to the new cloverleaf. Delaying this project any further presents an unacceptable risk to being able to provide adequate capacity to customers in the Waterdown area.
	Comparative Information on Equivalent Historical Projects (if any)	This project consists of normal work to add a second circuit to an existing pole line along Dundas St. There will be some poles that will be required to be replaced to meet current clearance standards for having a double circuit.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	This project will help to address capacity issues where feeders in the Waterdown area are exceeding the Planning limit, and in extreme weather years, encroaching on thermal limits.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not applicable.
	Identify any reliability, efficiency, safety or coordination benefits	Not applicable.



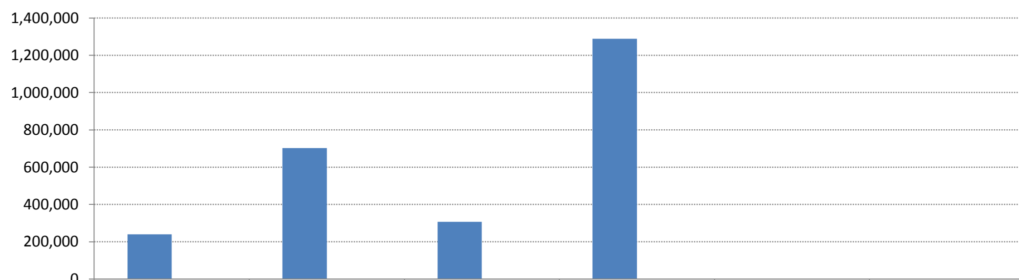
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,713,361	$0	$0	$1,713,361	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150392	
Project Name	Storage Upgrade	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Undefined
	Location	
	Units	1
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	Yes
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Not Funded by Rate Base
	Alectra Grouping	Information Technology Systems
	Alectra Subcategory	IT Upgrades & Enhancements
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' IT hardware must be renewed on a regular basis to ensure that systems that support the customer-facing services, core distribution operations and other important processes continue to perform reliably with a low risk of failure. Alectra Utilities utilizes software applications to automate processes and efficiently execute required tasks, with these applications running on IT hardware, the building blocks of the overall IT System that must be reliable and secure to ensure that the software applications it houses adapt to the new emerging utility availability requirements.
	Main Driver - General Plant	Capital Investment Support
	Priority and Reasons for Priority	Hardware assets support critical systems, enabling the utility's ability to meet operational outcomes, including reliability. In the event of core backend storage infrastructure failure, the functionality of these applications would be impaired, and as a result, Alectra's outage response time would be negatively affected. In the event of an storage hardware failure, employees may not have access to the critical systems required for the operation of the business. IT hardware investments are planned and implemented with regard to both current and future evolving utility needs and operational requirements in order to enable Alectra to execute its strategic plans and programs securely and efficiently in pursuit of its short- and long-term objectives.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	These investments will provide cyber-security and privacy benefits including: •Maintaining current enterprise applications including CC&B, GIS, ERP and OMS ensure that the most up-to-date security patches have been applied and that data remains secure. •Upgrading of IT hardware ensures that the threat of data intrusion and theft is mitigated as hardware remains supported.
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Do nothing, which introduces operational risk due to aging unsupported hardware as well as the inability to accommodate any growth , newer technological innovations (high throughput, etc.)
	Alternative #1	Refreshing our Storage infrastructure on a regular cycle (program) supports their availability, reliability and the stability of the storage environment.
	Alternative #2	Alectra moves a portion or whole of IT Infrastructure to be managed externally. Alectra is not willing to assume the security and maintenance risks as well the uncertainty associated with option 2 at this stage. Managing hardware externally would not allow Alectra the flexibility to make changes that require being addressed urgently – which could jeopardize the response time in dealing with issues that affect Alectra customers (outages and customer-facing system issues that are supported by IT hardware).

	Justification for Recommended Alternative	Alternative #1 IT hardware standards are regularly reviewed, assessed, and implemented based on the utility's requirements from operational, regulatory, security and customer service perspectives. This review requires Alectra to strategically invest in its IT hardware assets. Storage assets enable the secure retention of digital data such as customer information, and include disk and flash arrays, which store records for access by servers. As the end of the hardware lifecycle emerges, the risk of failure increases significantly which impacts core business processes.and prevents the utility from moving to the new modernized and evolving digital platforms needed to empower employees to work anytime, anywhere in the most productive manner. Reliance on digital equipment is critical to regular on-going business activities and enhance the customer experience. Failure to maintain a Storage hardware refresh program can result in increased risk to the business as it relates to systems availability, reliability and sustainability as well as increase costs due to unplanned downtime. These investments will provide reliability benefits including: • Reliability for critical Business Applications such as CC&B, ERP, GIS, OMS. • Up-to-date IT Storage hardware ensure that Alectra can continue to manage the system on a proactive basis Continuing to rely on older storage hardware can also increase costs and delays when failures occur as vendor warranties expire. Replacing older storage hardware is evaluated to determine whether investment is made in physical, virtual, or cloud based infrastructure to allow the utility to manage larger environments as a result of the changing utility landscape, customer experience, and new application services.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,537,406	$239,040	$703,000	$306,871	$1,288,495	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150399
Project Name	Rear Lot Renewal Project - Richlieu Dr and Trelawne Dr, St.Catharines
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	St. Catherines
	Location	St.Catharines, north end
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Rear Lot Conversion
	Alectra Subcategory	Rear Lot Conversion
4. Evaluation Criteria (OEB)	Project Summary	This project is to convert existing rear lot primary distribution to a front lot supply. Rear lot primary poses a problem for both reliability and safety. Due to the reduced access to the distribution assets, restoration of power to customers is significantly impacted by not having access to powered equipment, while also presenting risks to workers .
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Alectra has many pockets of customers being supplied by rear lot construction. The electrical system is ageing and deteriorating and poses many operations, safety, and customer service concerns that must be addressed. If not addressed, the system will deteriorate further and failures and safety hazards will increase to a level that is not manageable and not tolerable by the customers.
	Customer Attachment / Load (KVA)	185 customers & 708 kVA
	Safety	Although the Electrical Safety Code and easement terms specify minimum clearance between customer facilities and power line, there are cases that customers do not follow the safety rules and install facilities too close to power line. Examples are shed, storage, playground, trampoline, swimming pool, patio deck, landscape, house extension, etc. This encroachment creates a safety hazard for both customers and crews. Safety risk associated with reduced clearance due to encroachment of power line: Over time, growth of vegetation and obstruction due to customer facilities may jeopardize the minimum clearance requirements and restrict crew mobility. Occasionally dogs may also be a safety hazard to the crews.
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicalbe
	Economic Development	Not applicable
	Environmental Benefits	Because overhead transformers are installed on the pole in rear lot area, a pole falling down may also cause the transformers to fall down, resulting in transformer tank rupturing, and oil being spilled onto the ground.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Under this option, no proactive investments would be executed to replace either existing rear lot infrastructure and these assets would only be intervened upon in reactive scenarios, when the assets have reached their end-of-life. Under this approach, customers would be exposed to prolonged reliability impacts, due to the accessibility issues associated with rear lot infrastructure, as well as the complex restoration procedures that would be required for a four-feeder outage event. As standardized equipment (e.g. bucket trucks) cannot be used to service rear lot plant, wood poles, transformers and overhead switches would have to be replaced manually, with field crews accessing private customer properties in order to execute the work. Customers and field crews would continue to be exposed to elevated safety risks, due to the minimal proximity between customer plant and the rear lot overhead lines, as well as the non-standard and non-ergonomic work procedures that field crews would have to continue to execute to sufficiently maintain, inspect and service the plant. Finally, as assets are replaced reactively, new assets would need to be installed according to the rear lot configuration. By its design, rear lot can only be converted if the entire line is replaced at once as part of an overall project. Therefore, the legacy design will continue to be maintained under this scenario. This will include the continued operation of the legacy voltage system, along with continuing the associated inefficiencies, such as line losses.

	Alternative #1	Remediate the existing rear lot plant with other design options . The other design options considered are described below. Rear Lot Overhead Option: Under this Option, the existing rear lot plant is replaced with new overhead plant in the rear lot. When the replacement project is implemented, the following design parameters should be considered: • Install critical components such as fuse, switch, and transformer as close to the accessible street as possible This Option is not acceptable because it does not resolve the major operations and customer reliability concerns related to the distribution assets located at rear lot at this location. Partial Underground Option This scenario involves the replacement of existing rear lot infrastructure with a new hybrid solution, where primary voltage infrastructure, including transformers, switches and lines would be installed as per an underground configuration within the front right-of-way, following standard Alectra Utilities installation practices. Under this approach, secondary infrastructure, including wood poles and secondary conductor, would remain in the rear lot in overhead configuration. This approach would not fully address the reliability and safety concerns associated with rear lot distribution, as secondary connections will remain in the rear lot. However, future outage impacts will be reduced and contained to only those customers connected to the associated transformer. Lower voltage classes will also be converted up to the standardized 27.6kV voltage standard as per this investment option. Under this option, reliability and safety issues would continue to persist due some infrastructure remaining overhead. The cost of partial underground renewal is higher than the renewal of the rear lot overhead and further more does not result in mitigating the risks associated with the existing system. This partial underground approach has been adopted where feasible.
	Alternative #2	Replace with Full Underground Infrastructure This investment scenario considers the full replacement of existing rear lot infrastructure – including primary and secondary plant – with new front lot underground infrastructure. All existing primary and secondary distribution assets within the rear lot corridor will be removed and replaced with new underground primary and secondary infrastructure that is installed within the front lot corridor as per current standard design practices. Underground secondary cables will run from the front lot underground transformers to the individual meter bases in order to supply the customers. Under this approach, existing under-classed legacy wood poles will be replaced with higher-class poles that are better suited to withstand major weather events. Through this investment scenario, these high impact assets will be better secured and weather-hardened against future outage events. This approach would completely mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. This approach also introduces efficiencies for the utility, as tree trimming activities can be eliminated.
	Justification for Recommended Alternative	It is recommended to convert the area to partial underground. This approach would mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure. For these reasons, Alectra Utilities selected this approach.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Customer expectation for what the new distribution will look like is a risk, especially if the customer is pushing for a more aesthetically-pleasing but more expensive alternative by going fully underground. Customer consultation will be an important step in mitigating this risk and ensure the public and the utility are aligned in addressing this renewal.
	Comparative Information on Equivalent Historical Projects (if any)	Alectra Utilties has completed rear lot conversion projects.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Rear lot infrastructure is functionally obsolete for the following key reasons: • The rear lot configuration is generally unsafe to the public due to the large trees growing near energized power lines. In tandem with such an unsafe configuration, there are also line clearing hazards and related additional costs to do this work. • Alectra Utilities is unable to use labour saving tools and devices such as bucket trucks to efficiently maintain and repair the distribution system due to assets located in customer backyards. • Rear lot wood poles are generally congested, due to multiple service attachments and communication drops, which generally make it impossible to sufficiently climb poles. Crews must, therefore, use ladders to access these poles. • Alectra Utilities is limited in utilizing ladders to access the overhead system due to Ministry of Labour restrictions for congested areas. • Due to the presence of legacy porcelain top tie insulators, rear lot lines must be fully isolated before any maintenance or repair work on the overhead system can commence. • Porcelain insulators are far more susceptible to contamination and flashover when compared to present-day standard polymer insulators. • Rear lot infrastructure typically contains undersized #4 aluminum conductor steel-reinforced cable and aluminum conductor, along with #4 and #6 copper conductor, which are undersized and generally have a greater probability of annealing due to their reduced carrying capacity. These conductors must be fully isolated before any work can commence.

Condition of Asset vs. Typical Life Cycle and Performance Record	It is extremely difficult to gain access to the backyard to maintain, repair, and restore power. As a result there are prolonged outages to customers. This is especially more difficult in the event of ice storm. Many of the Rear Lot Supply distribution systems were built in 1950s, 1960s, and 1970s . The rear lot equipment is older than typical useful life and the asset condition is deteriorating. According to the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board", typical useful life of overhead transformers and wood poles are 40 and 45 years respectively. Many of the installations are not in compliance to today's standards.
Number of Customers in Each Customer Class Potentially Affected by Asset Failure	185
Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	3 Year stats for BUM75 (2014 - 2017) 40 outages, 922,245 customer minutes (87 minutes/customer/year)
Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Rear lot supply failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage). Rear lot system also poses safety hazards to the customers because live electrical components are in proximity of customer's backyard and proper clearance may be violated due to customer's installations (examples: trees, garden, swimming pool, storage shed, deck, house extension).
Value of Customer Impact	High
Factors Affecting Project Timing, if any	Not applicable
Consequences for O&M System Costs Including Implications of Not Implementing	In case of not implementing the project the OM&A cost will continue to occur due to tree trimming activities as well as increase in responding to outages since the assets are deteriorated and prone to failure.
Reliability and Safety Factors	This approach mitigate the reliability and safety issues associated with rear lot distribution, as well as the operational constraints associated with the existing infrastructure.
Analysis for "Like for Like" Renewal Project	The selected option is not a like for like replacement.

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,420,705	$0	$0	$0	$0	$1,263,321	$1,157,384
Actuals: $0	$0	$0	$0	$0	$0	$0

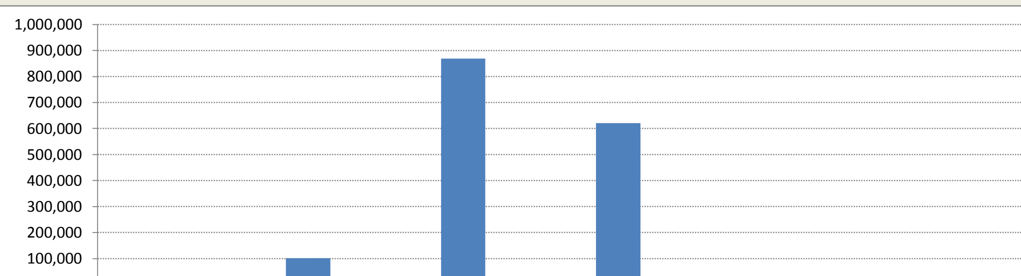
Currency scale is in literal

OEB Multi-Project Report

Project Code	150404
Project Name	Kenilworth TS Power Factor Correction
Major Category	System Service
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Hamilton
	Location	Kenilworth TS
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	System Control, Comm'ns & Performance
	Alectra Subcategory	Power Quality
4. Evaluation Criteria (OEB)	Project Summary	Install capacitor bank at Kenilworth TS to meet IESO power factor requirements.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	The project improves power factor which improves capacity.
	Customer Attachment / Load (KVA)	12, 000MVAR Capacitor Bank.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	Not applicable
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Install one 12MVAR capacitor bank to comply with IESO requirements to maintain the power factor above 90%. This issue has been flagged by the IESO and requires resolution.
	Alternative #1	National Steel Car install their own power factor correction at their site, and Alectra installs a smaller capacitor bank to offset power factor issues being caused by ArcelorMittal Dofasco.
	Alternative #2	Not applicable.
	Justification for Recommended Alternative	ArcelorMittal Dofasco has already stated that they are ok with paying penalties for their poor power factor. Alectra Key Accounts has reached out to National Steel Car to see if they want to install power factor correction or if they want to keep paying penalties. Since Alectra Utilities is required by the IESO to correct the power factor and the customers do not want to resolve the issue locally. Alectra Utilities must correct the issue and will continue to charge the customer penalties for poor power factor.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Easement issues with Dofasco land beside Kenilworth TS.
	Comparative Information on Equivalent Historical Projects (if any)	Capacitor banks are already installed at PowerStream MTS1, VTS1, VTS3, MTS4.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Improved power factor.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Improved power factor.
	Description of Incorporation of Advanced Technology, if applicable	Not applicable.
	Identify any reliability, efficiency, safety or coordination benefits	Improved power factor increases capacity.

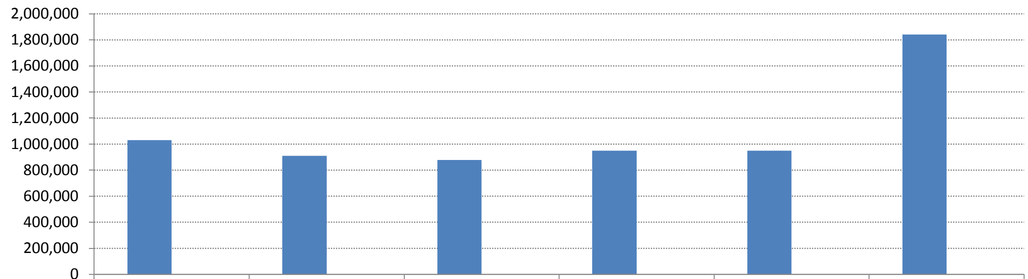


	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,591,335	$0	$101,139	$869,467	$620,729	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150453	
Project Name	CIS CC&B Modifications(Regulatory Enhancements)	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Undefined
	Location	all locations
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	Yes
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Information Technology Systems
	Alectra Subcategory	IT Upgrades & Enhancements
4. Evaluation Criteria (OEB)	Project Summary	Enhancements to the CIS (CC&B) application are needed to meet any regulatory requirements. Such requirements in the past have been Ontario Energy Savings Program (OESP) as well as the Monthly Billing projects.
	Main Driver - General Plant	Customer Service
	Priority and Reasons for Priority	Regulatory Requirements as required.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	By maintaining the status quo in the CC&B System, we are at severe risks of, - not meeting key regulatory changes/requirements - not delivering expected regulatory changes and rollout to our customers - may be subject to fines or incompliance
	Alternative #1	Implement necessary regulatory system changes and customer enhancements as outlined by regulation , in order to avoid fines or non-compliance and in order to provide the service to Customers as required.
	Alternative #2	An alternative option would be to outsource the implementation of the regulatory change to third party. However this option will introduce more challenges as - Introduces one-off, standalone solutions which are not harmonize within the main CIS system. - It introduces a compete business process changes, and redesign - It introduces another entity and integration point - our front staff won't have the complete info when servicing and responding to our customers - Given that most regulatory changes are customer billing driven, these changes must be implemented in the main billing system not external systems
	Justification for Recommended Alternative	Alternative 1 selected : To allocate capital dollars to ensure Alectra's Customer Information System continues to meet the regulatory requirements, to avoid fines or non-compliance and in order to provide the service to Customers as required.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Ensure proper project management and solftware development lifecycle processes are adhered, along with a steering commitee, vendor management, evaluation criteria & priority.
	Comparative Information on Equivalent Historical Projects (if any)	not applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable.

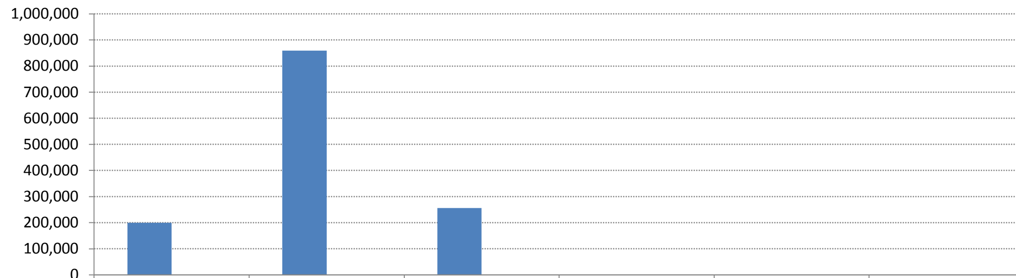


	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $6,558,529	$1,030,590	$910,728	$878,571	$948,822	$949,800	$1,840,018
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150463	
Project Name	Customer Self Service Portal Enhancements 2019	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Undefined
	Location	
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Information Technology Systems
	Alectra Subcategory	IT Upgrades & Enhancements
4. Evaluation Criteria (OEB)	Project Summary	Enhancement to CIS (CC&B) self service portal application to support process improvement requirements The self service portal is the means by which Alecra customers can obtain their customer related information, interact with a CSR, post questions. The enhancements will allow Alectra customers a better experience .The system will allow customers to manage transactions, move-in/move-out requests, customer name changes, and billing/ account inquire through platforms of their choice. The website will provide tailored conservation advice and will integrate with utility energy programs. This investment will include increased automation to the back-end processes that power the customer website, removing manual input and increasing the speed that services are provided to customers. Automating more services on Alectra Utilities' website and billing engine, will free customer service time for more complex customer issues. Alectra will continue to invest in its payment channels, in particular electronic payment methodologies which provide convenience to customers and automated processes for the utility. Currently Alectra's electronic payment offerings include pre-authorized payment, online or internet banking, credit card payments. Despite an increasing customer transition to electronic payment channels, adoption levels to receive electronic billing remain low with only 16% of customers receiving their bills electronically. This can be compared to industry peers who have optimized their services for customers to achieve penetration rates in excess of 25%. New e-billing services will be implemented to streamline the registration process, enhance the delivery model, and promote this "best practice" service. Alectra sees the potential to achieve 25% or greater e-billing adoption within 5 years with investment and promotion of its services.
	Main Driver - General Plant	Customer Service
	Priority and Reasons for Priority	Business Driven to support and improve customer experience , facilitating improved access to information Throughout the term of this DSP, Alectra Utilities plans to review and optimize processes and systems that will enhance the customer experience and increase utility effectiveness.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	By maintaining a status quo the Alectra self- service portal, the organization is at risk of missing process improvements and enhancements that drive efficiencies and meet new business demands. Without making changes to address any enhancements, the lack in operational efficiencies of the system will impede the ability to meet customer requirements.By maintaining the status quo, our customers will not have the ability for timely, easy access to update their info, profile or complete self-service functions such as moves.
	Alternative #1	Upgrades to the Customer Self Service Portal will introduce process optimization and enhanced customer experience. Added functionality will ensure data accuracy and accessibility , quicker responses to customers evidenced by improved phone call metrics, and user experience enhancements to Alectra Utilities' website and customer portal.
	Alternative #2	Not Applicable
	Justification for Recommended Alternative	To allocate capital dollars to ensure Alectra's Self service portal continues to operate efficiently and meet customer and business requirements, ensure data accuracy and accessibility , quicker responses to customers evidenced by improved phone call metrics, and user experience enhancements to Alectra Utilities' website and customer portal.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Ensure proper project management and solftware development lifecycle processes are adhered, along with a steering commitee, vendor management, evaluation criteria & priority.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,315,404	$200,000	$859,678	$255,726	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

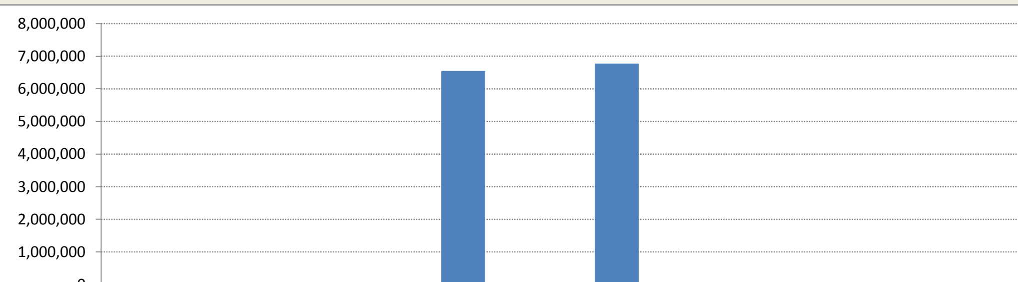
OEB Multi-Project Report

Project Code	150467
Project Name	CIS CC&B upgrade 2021 - 2022
Major Category	General Plant
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Undefined
	Location	
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Information Technology Systems
	Alectra Subcategory	IT Upgrades & Enhancements
4. Evaluation Criteria (OEB)	Project Summary	Meter to Cash systems are comprised of number of IT systems involved in the meter to cash process including Meter Reading, Advanced Metering Infrastructure (AMI) systems, Meter Data Management, Wholesale and Retail Settlement, EBT transactions, MDMR transactions, Billing, Cash, Collections, Business Intelligence and related field activity systems, including interfaces among these systems. Interfaces to ERP, CRM and GIS applications are also supported. Supporting approximately 900-1000 users; Alectra's meter to cash process is to maintain and operate Oracle Customer Care and Billing (CC&B) CIS system and its auxiliary systems in order to provide efficient and accurate meter readings and billing for the residents of Alectra Utilities. Originally implemented in production in 2018 along with smart meter systems, and other auxiliary applications. The solution supports the following business areas: • Customer Service i.e. customer account management/premise management/customer contact • Collection • Metering i.e. meter management/field activities • Meter Readings i.e. validation/estimation • Billing i.e. bill creation/adjustments • Wholesale Settlement i.e. settlement with IESO, embedded generation, Hydro One, etc. • Retail Settlement i.e. settlement with retailers and retail transactions CCB upgrade is a critical roadmap component to ensure that we maintain adequate support from primary vendor (Oracle) as well as other involved vendors e.g. hardware, Operating Systems, etc. who are part of the CIS echo-system. If unsupported, the operation risks increases daily as there is constant change in technology and constant threats e.g. security. Vendor support would be only for most recent version or n-x depending on the support policy. Thus older software versions outside the n-x will be unsupported and any new releases are not backwards compatible, leaving the organization with significant operational risks. Furthermore, the greater the gap between the version used and latest product version may result in significant additional costs in the future as the upgrade may need to be performed in multiple steps.
	Main Driver - General Plant	Customer Service
	Priority and Reasons for Priority	Prioritization considers business needs and vendor support agreements (in terms of upgrade requirements for the larger enterprise systems). For Alectra Enterprise Systems the vendor roadmaps and vendor specifications provide Investment direction in terms of upgrades. These guidelines ensure the optimal amount of vendor support, enhancements to maximize benefits of the systems and security patches to maintain and protect data and information. For CC&B - Alectra uses the Oracle CC&B roadmap as a guide for vendor support and upgrades.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Various system are integrated to CC&B such as the AMI, MDMR, ERP, GIS. - upgrading will continue to ensure compatibility and functionality with all related systems as each system is enhanced and upgraded.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	By maintaining the status-quo on CCB and meter-to-cash auxiliary systems, Alectra does not benefit from process improvements and enhancements issued with updates and upgrades that drive efficiencies and meet new business demands. More importantly, maintaining status-quo will result in software being out of vendor support exposing the organization to risks as relates to:- 1- Vendor support, system fixes and Security patches to protect customer information and data integrity would be compromised if systems are not upgraded and not supported. 2- System reliability is compromised without system upgrades and update. 3- System failures and potential prolonged restoration to address issues could significantly affect Alectra's operations and its ability to deliver service to customers and execute planned work programs. Finally without upgrade and utilization of new product enhancements, the lack of realizing new operational efficiencies can impede the ability to meet future business customer requirements.
	Alternative #1	Alectra maintains upgrades and software applications to support business and customer facing applications. By maintaining upgrades on software, Alectra would benefit from associated improvements, security patches and system fixes that come with upgrades that in turn drive efficiencies, improve processes and meet new business demands.

	Alternative #2	An alternative to updating software to current versions would be to purchase extended support from the vendor, if available. Alectra has determined that this option would not deliver value for Alectra or its customers, as: - Extended support, if available, comes at a higher operating cost than regular ongoing maintenance. Vendors required to support end of life software version can cost up to 25% – 30% more than normal maintenance costs. However, even if Alectra choses to pay the additional costs, vendors can't guarantee that they will be able to provide the full support particularly as relates to security because the software is one component of the echo-system that is fully dependent on other components (e.g. Operating System, JAVA version, etc.). These other components are often outside of the software vendors' control and they can never guarantee 100% backwards compatibility. Another alternative is to implement a new CIS system, this is a much more expensive option, particularly • Requiring a significant capital investment to implement a new CIS system approximately $78M to $95M • Imposing significant write-off for the value of the current system. Both costs and write-off are completely unwarranted since the current system is capable of meeting the current operation and future demands if upgraded and maintained accordingly. The greater the gap between the version used and latest product version may result in significant additional costs in the future as the upgrade may need to be performed in multiple steps.
	Justification for Recommended Alternative	Alternative 1 selected : To allocate capital dollars to ensure Alectra's Customer Information System continues to operate efficiently and meet customer and business requirements. Upgrading will ensure the optimal amount of vendor support, enhancements to maximize benefits of the system and security patches to maintain and protect data and information.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Ensure proper project management and software development lifecycle processes are adhered, along with a steering commitee, vendor management, evaluation criteria & priority.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $13,322,386	$0	$0	$6,545,804	$6,776,582	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

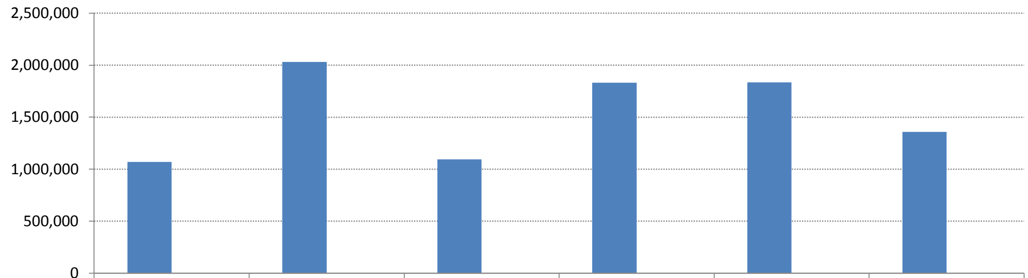
OEB Multi-Project Report

Project Code	150469
Project Name	ERP JD Edwards Enhancements
Major Category	General Plant
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Undefined
	Location	
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Information Technology Systems
	Alectra Subcategory	IT Upgrades & Enhancements
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities plans to invest $8.15MM to implement Oracle feature releases to the current version of the JDE software between 2020 and 2024. Maintaining the reliability and integrity of this critical business system is essential for the recording and reporting of data. During this 5 year period, application and security related feature enhancements will be released by the vendor as part of the software support process. Without strict adherence to this continuous innovation release process, security patches, support and software enhancements will not be implemented, resulting in the risk of software failure, disruption to business processes, non- compliance to regulatory requirements, cyber security exposure and compatibility issues with third party applications and systems. Such disruptions will affect Alectra Utilities' financial, vendor, and employee processes and the ability to report accurate information in line with regulatory requirements. Implementation of these planned Oracle releases to the ERP platform will allow Alectra Utilities to expand the capabilities of the system by integrating new modules or add-ons into the core ERP system.
	Main Driver - General Plant	Capital Investment Support
	Priority and Reasons for Priority	With the implementation of these Oracle releases Alectra Utilities plans to integrate the ERP with other core IT systems. Integration enhancements will facilitate exchange of information between systems, mitigate the status-quo risks of manual input errors, simplify data points, and improve reporting capabilities to assist decision-making. Enhancements will address core business processes such as regulatory compliance, timekeeping, health and safety functionality, asset analytics. The ERP system is a critical business system and as Alectra Utilities continues to deploy new assets and new technologies, it is necessary to ensure business functions and processes adapt to and evolve within the platform. Enhancements to the ERP will streamline processes, allow for more accurate and detailed end user reporting, reduce overtime, reduce manual entry, and leverage ERP functionality.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Enhancements ensure continued compatibility with other systems.
	Economic Development	Not Applicable
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Maintaining the ERP system as is, fails to take advantage of operational improvements, thereby missing out on opportunities to streamline business processes and improve user efficiencies. Critical patching is left unapplied, creating potential security breaches putting Alectra at risk. The usability of the system is diminished, resulting in lost productivity, increased staff dissatisfaction, and risk of not meeting regulatory requirements.
	Alternative #1	By working through a consolidated list of enhancements, planned out and prioritized, the organization can focus the efforts in the most beneficial areas of the system, maximizing value. Factors such as business resource availability, coupled with other ongoing projects competing for prioritization, the team will set a realistic goal for each year working through the list as outlined by the organization. The intent will be to ensure the ERP system is maximized for efficiencies with the biggest gains amid minimal effort and disruption to implement. Implementing feature enhancements released by the vendor improves functionality on the ERP platform by taking advantage of security patches, selected modules that have been improved by the vendor and used at Alectra in order to derive optimal support on the system by the vendor and ensure minimal business process down-time when obtaining support.
	Alternative #2	In an effort to reduce costs, focus will solely be on critical items that will put the organization at risk. These may be security or regulatory related enhancements, as well as the extremely inefficient processes only. Further enhancements without a critical impact will be deferred for future efforts.
	Justification for Recommended Alternative	As Alectra continues to deploy new assets and new technologies, integration of functions and processes will need to be made within the JDE ERP. Making enhancements to the ERP to allow for this integration as well as to improve functionality within the ERP will allow Alectra to operate to is maximum capability.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0

7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $9,221,362	$1,070,000	$2,030,113	$1,094,505	$1,832,090	$1,835,871	$1,358,783
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150571	
Project Name	Cable Injection Project - (J3-K3-N2-O2), Brampton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Brampton
	Location	Brampton (J3-K3-N2-O2)
	Units	48365
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $51/m. The difference is based on the assumption that this project is less complicated (has fewer splices to replace) than projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 2019 years old (installed in), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	3469
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 45368 m of cable in the whole area: Frequency of Failure is: 0.25 x 45368 /1000 = 11.3 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 11.3 failures: 307 x 11.3 = 3469 customers affected and 43,131 x 11.3 = 487380 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 11.3 potential cable failures and 487380 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,295,687	$0	$2,295,687	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150572	
Project Name	Cable Replacement Project - (J4) - Queen - Clark - Bramalea - Kensington - Knightsbridge, Brampton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Brampton
	Location	(J4) - Queen - Clark - Bramalea - Kensington - Knightsbridge, Brampton
	Units	5274
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.

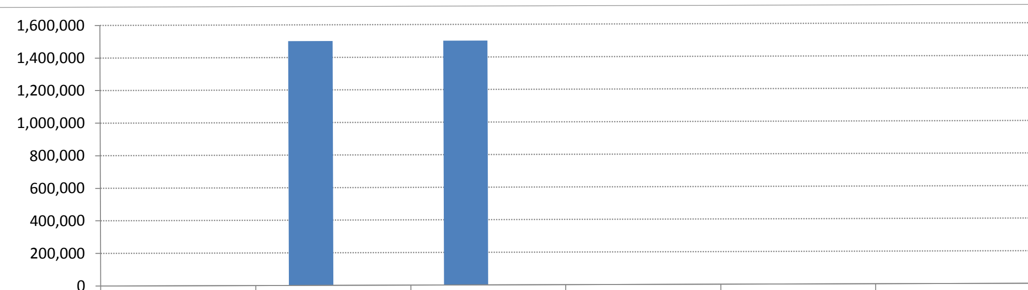
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $207/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra Central North, there were 40, 38, 24, 30, 28, 32 and 20 primary cable failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 30 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 2019 years old (installed in 0), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	399
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 5274 m of cable in the whole area: Frequency of Failure is: 0.25 x 5274 /1000 = 1.3 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.3 failures: 307 x 1.3 = 399 customers affected and 43,131 x 1.3 = 56070 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.3 potential cable failures and 56070 potential CMI.
	Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,093,654	$0	$1,093,654	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150573	
Project Name	Oracle ULA Extension 2020	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Undefined
	Location	
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Information Technology Systems
	Alectra Subcategory	IT Upgrades & Enhancements
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities plans to renew its unlimited license agreement (ULA) with Oracle, to ensure its licenses remain active past the expiration date of 2020. This will come at a cost of $3MM .The licenses allow Alectra Utilities to use the CC&B platform and related data. Renewing the ULA will also provide necessary support for security, automated database backups, ongoing database infrastructure operations, and access to new functionality from Oracle. Renewal of the ULA for Oracle CC&B is the most cost-effective option to standardize licenses relating to the underlying database and associated tools. If Alectra Utilities were to licence CC&B without the ULA, would result in an additional annual expenditure of $2.4MM for compliance with Oracle's licensing framework.
	Main Driver - General Plant	Customer Service
	Priority and Reasons for Priority	Business Driven to align with vendor License agreement- to ensure Oracle licenses remain active past the expiration date of 2020.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Not Applicable.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	By maintaining status quo and do nothing, the ULA will expire in 2020 which means that Alectra will no longer have access to ULA licensing - Alectra would then be charged on per core, environment bases resulting in much higher cost for Alectra.
	Alternative #1	Renewal of the ULA for Oracle CC&B is the most cost-effective option to standardize licenses relating to the underlying database and associated tools. This option would ensure we continue to have licensed vendor support.The licenses allow Alectra to use the CC&B platform and related data. Renewing the ULA will also provide necessary support for security, automated database backups, ongoing database infrastructure operations, and access to new functionality from Oracle.
	Alternative #2	An alternative Oracle licensing without the ULA, would result in an additional annual expenditure of $2.4M in order to maintain compliance with Oracle's licensing framework.
	Justification for Recommended Alternative	Select Alternative 1: To allocate capital dollars to ensure Alectra's systems running Oracle are licensed accordingly. The licenses allow Alectra to use the CC&B platform and related data. Renewing the ULA will also provide necessary support for security, automated database backups, ongoing database infrastructure operations, and access to new functionality from Oracle. Renewal of the ULA for Oracle CC&B is the most cost-effective option to standardize licenses relating to the underlying database and associated tools. The alternative, licencing CC&B without the ULA, would result in an additional annual expenditure of $2.4M for compliance with Oracle's licensing framework.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Ensure proper project management and solftware development lifecycle processes are adhered, along with a steering commitee, vendor management, evaluation criteria & priority.
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable.



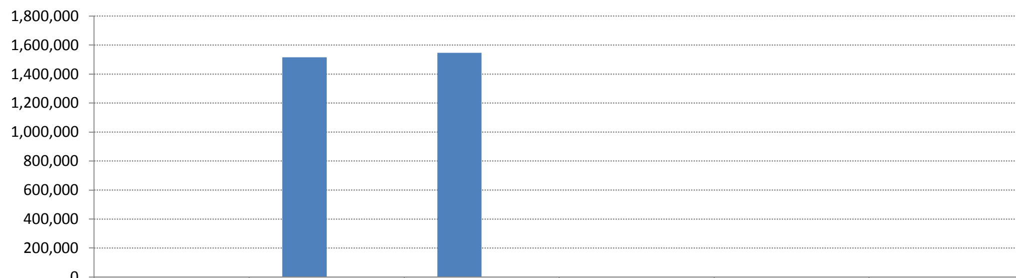
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,000,000	$0	$1,500,000	$1,500,000	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150579	
Project Name	New build - Extend Bunting M81 Feeder, St.Catharines	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	St. Catherines
	Location	St.Catharines, north end
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project is to alleviate capacity issues in the North and Central section of St.Catharines, primarily served by Carlton BY bus and Bunting TS feeders. These feeders exceed the planning limit established in the Planning Philosophy. Through this project Alectra Utilities would be to extend an existing underutilized feeder into the area and follow that with feeder reconfiguration to rebalance the loading on the feeders in the area back to below the Planning Limit. The 4 feeders targeted by this project to alleviate overloading are the BUM62, BUM75, BUM77 and CTM11 which historically had, and forecasted to have the following loading levels in 2017 - 2021: BUM62: 72%, 72%, 72%, 72%, 72% BUM75: 68%, 71%, 71%, 71%, 71% BUM77: 83%, 80%, 80%, 79%, 79% CTM11: 79%, 93%, 92%, 92%, 92%
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This project is meant as part of a 2-part approach to deal with ongoing capacity constraints in the North end of St.Catharines by bringing available supply from Bunting and Carlton TS's. This condition has persisted for several years and limits utilities ability to supply additional customers, while also hindering the Operation of the system as multiple feeders that tie to each other are exceeding the planning limit and/or encroaching on their thermal limit.
	Customer Attachment / Load (KVA)	Not applicable, new feeder.
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	Coordinating this project with Project #150368 which is bringing capacity out of Carlton TS in order to provide timely delivery of adequate new capacity to the area.
	Economic Development	Not applicable.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the DSC. Alectra Utilities must be able to connect new customers in a timely manner.
	Alternative #1	The feeders are already loaded and nearing/or their capacity limits, taking no action will result in feeders becoming overloaded and exceeding their carrying capacity. Once feeders are at full utilization, load shedding will need to be executed during the summer peak period or during contingency conditions to mitigate the risk of failure from overloaded equipment. Supplying customers through highly loaded feeders may impact power quality. The recommended alternative is to extend an existing underutilized overhead feeder from Bunting TS to the North/central area of St.Catharines where several adjacent feeders can be tied into and several chunks of existing feeders can be transferred to this new supply, thereby balancing out the loading to the region to meet planning limits. There are a few underground crossings required along the proposed route.
	Alternative #2	Non-Wires Solution Alectra Utilities' load forecast process considers the impact of CDM and distributed generation and has been considered during the needs assessment. This area has benefited from generation to offset load for many years. Alectra Utilities has considered non wire alternative (solar and storage option) and determined that this option is not economical for the capacity that is required. Based on typical capacity of 10 MW per feeder the cost of non-wire alternatives would 15 times that of traditional solution and hence this option has been rejected.
	Justification for Recommended Alternative	Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions.

6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Coordination with the city for municipal consent.
	Comparative Information on Equivalent Historical Projects (if any)	Project #150390 which is a new capacity feeder for the Waterdown area along existing pole lines and is budgeted for $1.7MM for a shorter section.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable.
	Description of Incorporation of Advanced Technology, if applicable	Automated/remote-operable switches will be utilized at new tie-points.
	Identify any reliability, efficiency, safety or coordination benefits	Enhanced reliability is expected with reconfiguration of the feeders as less customers per feeder will be impacted by an outage and with new remote-operable switches added to improve restoration.



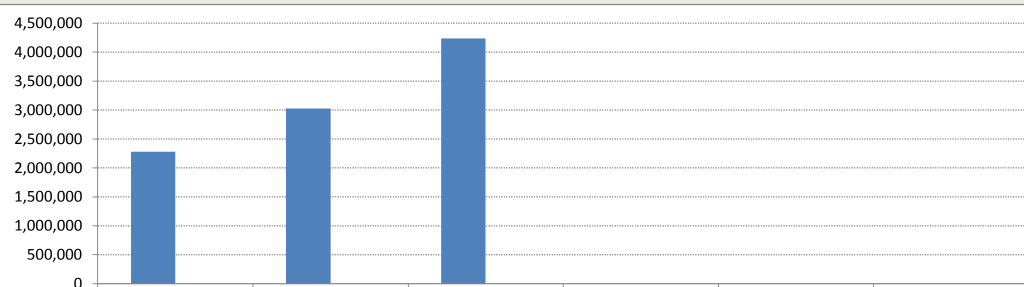
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,060,625	$0	$1,514,558	$1,546,067	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150605	
Project Name	Residential "ICON F" Meter Replacement - PowerStream RZ	
Major Category	System Access	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	Various locations in the PowerStream RZ
	Units	2000
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Network Metering
	Alectra Subcategory	Metering
4. Evaluation Criteria (OEB)	Project Summary	Remove 108K Sensus ICON F residential meters, from 2013 to 2021, and replace with meters that support these benefits. These meters do not provide a signal to the AMI head end when they lose power. This "last gasp" signal is passed to the Outage Management System. As well as identifying individual customers, the Outage Management System uses signals from multiple meters to determine when power is interrupted for a transformer, or an feeder. This results in prompt identification of the required action and dispatch of crews to restore power. This is much faster than relying on calls from customers, and it identifies outages even when the customer is not at home. Bell Wurld cyber-security audit in 2011 recommended removal of ICON F meters with a flexnet module firmware version that does not meet encryption data standards. "ICON F" meters cannot be upgraded to improve encryption. Meters will be scrapped and replaced with 3rd generation ICON meters with firmware programming. Meter data is susceptible to corruption, which will lead to inaccurate customer bills. A worn of faulty customer meter socket will not provide a good connection with the electric meter. This can result in heat from electrical resistance at the meter jaws. Heat build up from a "hot socket" can result in damage to customer equipment or their premises. The replacement meters have temperature sensors that detect "hot sockets"and send an alarm to the AMI head end., so Alectra can dispatch staff investigate the issue. Carrying out this work after 2021 will be higher due to an increase in meter costs. The meters have a 15 year depreciation period and were installed in 2007 to 2009. They will be removed from service with 80% of their capital value depreciated. Historical costs and unit costs (per meter): Year Units Unit Costs 2017 4,200 $110 historical 2018 6,500 $110 historical 2019 20,000 $115 2020 26,000 $118 2021 35,000 $120
	Main Driver - System Access	Service Requests
	Priority and Reasons for Priority	High. Support outage management and prompt response to customer outages. Reduce damage to customer equipment through detection and alarm of "hot sockets". Eliminate this identified cyber-security risk. Meter costs will rise after 2021.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not Applicable.
	Cyber-Security, Privacy	Because the "ICON F" meters are first generation smart meters installed in 2007, and data encryption was not a concern at that time, they do not meet the data encryption requirements that have been implemented since that time. The risk was identified in a cyber-security audit of the PowerStream AMI system in 2011.
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status quo is to do nothing. The effect of this is: 1. Slower response to customer outages due to failure of "last gasp" alarms. Drop in reliability KPI's. 2. These meters will continue to pose a cyber-security risk. Audit states a likely outcome is meter data manipulated. This will result in incorrect bills to many thousands of customers, and reputational damage. 3. Potential damage to customer property due to undetected "hot sockets". 4. Higher meter costs after 2021 will result in higher required investment if the work is delayed.
	Alternative #1	Carry out field labour with Alectra staff instead of the outside contractor. Alectra staff do not have capacity to carry out this work during regular hours. Cost to carryout this work on overtime will result in a 30% to 40%increase in costs.
	Alternative #2	Delay this work to after 2024. The meter costs will rise substantially after 2021.

	Justification for Recommended Alternative	The benefits listed in the "Status Quo" section are delivered in a financially responsible manner.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The timing and priority for meter replacement will be determined by seal date, model, and serial numbers of the meters being replaced.
	Comparative Information on Equivalent Historical Projects (if any)	Meter changes have been done on time and on budget. Use of contract labour reduces risk for time lines.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Factors Relating to Customer Preferences or Input	Not Applicable.
	Factors Affecting the Final Cost of the Project	Factors affecting the Final Cost of the Project include: 1) Meter type 2) Meter features 3) Manufacturer of Meter 4) Ability to negotiate volume discounts from the meter supplier. 5) Cost of meter communication infrastructure require to support communicating with the meters.
	How Controlled Costs have been Minimized	Controllable costs will be minimized through a comprehensive work plan and competitive meter pricing.
	Identify if Other Planning Objectives are Met by the Project, if so, which ones	Not applicable
	Results of Final Economic Evaluation, if applicable	Not Applicable.
	System Impacts (Nature, Magnitude and Costs)	Not Applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $9,539,382	$2,280,384	$3,023,606	$4,235,392	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

alectra utilities

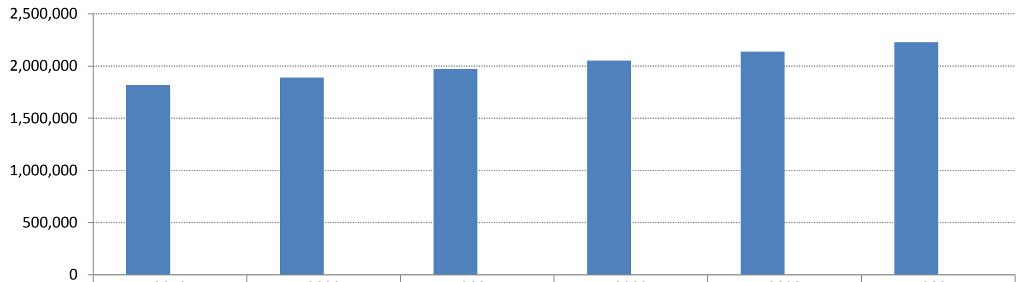
OEB Multi-Project Report

Project Code	150620
Project Name	Metering - all types - Horizon RZ
Major Category	System Access
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Hamilton
	Location	Various locations in Horizon RZ
	Units	1600
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Network Metering
	Alectra Subcategory	Metering
4. Evaluation Criteria (OEB)	Project Summary	All meters (every rate class, and Suite Meters). 1. Install metering on new and upgraded distribution services. 2. Renew wholesale metering points. 3. Carry out the meter seal refurbishment program. 4. Renew failed metering and metering communication equipment. 5. Renew meter data management systems and equipment.
	Main Driver - System Access	Service Requests
	Priority and Reasons for Priority	High Priority 1. Distribution System Code requires: - Installing and renewing a meter installation for settlement and billing purposes for each customer connected to the distribution system. - Installing and renewing a MIST meter, by August 21, 2020, on any new or existing metering installation that has a monthly average peak demand during a calendar year of over 50 kW; and - Enhancing and renewing the meter data communication and processing systems to support Time-Of-Use and interval billing. 2. Measurement Canada requires (i.e. pursuant to Weights and Measures Act, Electricity and Gas Inspection Act and related regulations): - Using certified meters and metering installations to charge a customer for electrical consumption; and - Using a Measurement Canada certified Meter Test Facility to refurbish meters. 3. IESO requires installing and renewing metering equipment at wholesale metering points in accordance with IESO Market Rules.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not applicable
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	Not applicable
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status quo is to do nothing. The effect of this is: 1. New customers will not have meters on new services. 2. Data on customer electrical use not confirmed to be accurate due to: - Failed equipment, - Meters with expired seals not tested, - meter data management systems not renewed. 3. Loss of reputation and fines due to non-compliance with: - Distribution System Code, - Weights and Measures Act, Electricity and Gas Inspection Act and related regulations, - IESO Market Rules.
	Alternative #1	Carry out single phase meter field work with internal staff instead of a service provider. Costs for single phase meter field work will increase by 10%. Inside staff does not have capacity during regular hours to take on these tasks; they are fully utilized on work that matches their higher qualifications.
	Alternative #2	Use an outside test facility to test meters, instead of the Alectra Measurement Canada meter test facility. Costs for meter testing will increase by 25%.
	Justification for Recommended Alternative	Lowest level of investment required while complying with regulatory requirements.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	No additional risks beyond the typical project risks
	Comparative Information on Equivalent Historical Projects (if any)	Past projects have been completed on time. Costs vary with customer demand for new connections.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Factors Relating to Customer Preferences or Input	Not applicable
	Factors Affecting the Final Cost of the Project	Not applicable
	How Controlled Costs have been Minimized	Use contract staff for single phase (residential meter) field work. Use in house test facility to verify meters.

Identify if Other Planning Objectives are Met by the Project, if so, which ones	Not applicable
Results of Final Economic Evaluation, if applicable	Not applicable
System Impacts (Nature, Magnitude and Costs)	Not applicable



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $12,095,372	$1,815,743	$1,890,903	$1,970,146	$2,052,188	$2,139,030	$2,227,362
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150637
Project Name	Station Switchgear Replacement - MS10
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Brampton
	Location	MS10 in Brampton
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Substation Renewal
	Alectra Subcategory	Switchgear Replacement
4. Evaluation Criteria (OEB)	Project Summary	The major power equipment installed at MS10 (27.6 kV-to-13.8 kV) consists of one obsolete non-arc-resistant medium voltage (15kV), 10 cell metal-clad switchgear lineup, two 10/16 MVA power transformers, two sets of 27.6 kV outdoor power fuses and two sets of 27.6 kV outdoor disconnects. The equipment details at MS10 are as follows: Low Voltage (13.8 kV) metal-clad switchgear (not arc resistant) • Manufacturer –Westinghouse • Manufacturer year– 1969 Low Voltage (13.8 kV) Circuit Breakers • Type – ABB VM1 (retrofitted) • Manufacturer year – 2009 - 2011 Power transformers (2-10 MVA 27.6 kV-to-13.8 kV) • Manufacturer – ABB • Year of Manufacture – 2003 High Voltage (27.6 kV) outdoor disconnect switches (2 units) • Manufacturer – S&C • Year of Manufacture – 1965 Transformer protection • Power fuses The substation upgrade project consists of replacing the 15 kV switchgear and 27.6 kV fuses as these have been deemed to be most in need of replacement. The scope also includes other ancillary work that may be required to bring the station up to current standards, improve overall reliability and achieve cost savings through bundling of work. This additional work may include the following. • power cables and terminations • cable duct banks • switchgear cell for ancillary equipment • station service transformer • communications panel • relay panel • AC and DC panels • End-of-life feeder egress cables
	Main Driver - System Renewal	Mitigate Failure Risks

	Priority and Reasons for Priority	Municipal substation assets are integral to the performance of the Alectra Utilities distribution system. They are used to step down sub-transmission voltages to lower distribution voltages. The municipal substation equipment are considered critical and some of the most significant assets to the sustainability of the organization. As such, Alectra Utilities utilizes a replacement strategy to proactively replace their substation assets before they fail or if they are no longer supported by the manufacturer, hence technically obsolescent, approaching end of life or displaying failures. This can help to avoid a major failure which would have a significant impact on customer outage frequency and duration, the environment, safety, and Alectra Utilities' reputation. Alectra Utilities has determined that the switchgear at MS10 is no longer suitable for service. The main project driver is the condition of the metal-clad switchgear housing the feeder breakers and bus-tie breakers. Bus insulators are showing signs of corona and tracking. The manufacturer no longer supports this type of equipment and the design of the switchgear does not meet Alectra Utilities' current safety standards and presents a potential risk to its employees. In addition, an ad hoc motorized feeder breaker control system was custom built and installed in 1996 from salvaged parts. The reliability of this unit is suspect due to lack of operation and maintenance over its life cycle. In order to test or maintain this unit the entire bus must be taken out of service Therefore existing switchgear is to be replaced with modern arc-resistant metal clad switchgear. The LV circuit breakers at MS10 were retrofits as an interim solution to upgrading from their obsolete predecessors. These circuit breakers must be replaced along with the switchgear. Replacing existing non-arc-resistant switchgear with modern arc-resistant switchgear will also serve to facilitate maintenance and repair practices. With the existing equipment, the switchgear must be offloaded prior to racking breakers in or out. Priority is high because MS10 presently provides the only supply to the Shoppers World shopping complex.
	Customer Attachment / Load (KVA)	The peak load at MS10 in 2018 was 5.1 MVA for LV1 and 3.5 MVA for LV2. Forecast peak load for 2024 is 5.5 MVA and 3.7 MVA for LV1 and LV2, respectively.
	Safety	Existing switchgear does not meet current safety criteria. The mis-operation of a breaker could result in an explosive failure of the existing switchgear seriously injure personnel in the proximity or even members of the public who may be passing by the station. The proposed new metal-clad 15 kV switchgear lineup with arc-resistant construction will meet Alectra Utilities' standard.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	The replacement of the obsolete switchgear with new equipment will help modernize the system and facilitate Control Room operations in managing the system.
	Economic Development	Not Applicable.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Doing nothing is not recommended. An increasing risk of equipment failure will have a negative impact on Alectra Utilities' customers, safety and its reputation. MS10 is a 27.6 kV to 13.8 kV station. Voltage conversion is not applicable on the 13.8 kV system and there is an ongoing need for supply from this facility. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Alectra Utilities would be forced to purchase new equipment at a premium cost in the event of a failure. System reliability would be affected and restoration of the system to normal conditions could take 8-10 months due to long equipment lead times. These risks are not acceptable to Alectra Utilities. Impact on customers can be minimized with proactive replacement.
	Alternative #1	Refurbish existing equipment. This alternative is not considered as feasible since this equipment is obsolete and no longer supported by the manufacturer, and parts are not readily available.
	Alternative #2	Not applicable

	Justification for Recommended Alternative	The recommended solution is to replace the 15 kV switchgear at MS10 with a new 15 kV metal-clad switchgear lineup with arc-resistant construction that meets Alectra Utilities' standards. It is also recommended that the switchgear replacement be combined with ancillary equipment upgrades required to bring the station up to current standards, improve overall reliability and result in cost savings through bundling of work. The main advantages of installing arc-resistant metal-clad switchgear are as follows: • In the case of a breaker failure there is minimal damage to adjacent equipment. Thus fewer customers are affected by a failure. • Enhanced safety for personnel and equipment. • The switchgear will be equipped with microprocessor based relays, which can be used in future smart grid projects since they have peer-to-peer communication capability. • The new microprocessor based relays can provide additional useful information not available in the electromechanical or electronic relays such as: - Number of operations of the circuit breakers - Fault magnitude - Event recorder The relay data and the transformer on-line temperature monitoring information can be imported into a computerized maintenance management system (CMMS) that will help in the future to provide a real time picture of equipment status. Since the new LV switchgear will be equipped with microprocessor relays, there is an opportunity to upgrade the transformer protection with new microprocessor relay as well. The transformer relay also provides control and protection functions for the high voltage breaker and the LV main breaker. If the HV control cabinet is not upgraded, additional relay needs to be purchased and installed in the LV switchgear main breaker cell. Execution of this project will serve to extend the useful life of this station and improve the overall reliability of supply to the City of Brampton downtown and to the Shoppers World shopping coimplex.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Equipment has a long lead time. This risk would be mitigated by starting preliminary engineering and ordering the equipment in the year prior to replacement. Standard materials are used and field crews have the required experience.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement have been executed a number of times in recent years. Examples include Brampton's MS19 in 2014 and MS14 in 2018.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	From a configuration perspective, this is a like-for-like replacement, however, the proposed replacement equipment is technologically enhanced as compared with the existing equipment. The new equipment is designed to require less maintenance and meets current safety standards.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Existing switchgear has a history of performance issues, which include signs of corona and tracking on the bus insulators and an unreliable motorized breaker control system. At the time that this switchgear is proposed to be replaced, it will be 50 years old. This exceeds the typical useful life of 40 years for circuit breakers in metalclad switchgear and 35 years for electromagnetic relays as indicated in Kinectrics Inc. Report No: K-418099-RA-001-R000 “Asset Amortization Study for the Ontario Energy Board”
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	783
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	Switchgear failure would result in loss of the entire bus and possibly the entire station. A failure could result in the inability to supply load from the station anywhere for a day to two to well over a week. The replacement of the obsolete equipment at MS10 will improve reliability in the service area.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Failure of this equipment would negatively impact the electricity supply to many residential, commercial and industrial customers in the area.
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	Equipment delivery times from suppliers
	Consequences for O&M System Costs Including Implications of Not Implementing	Existing switchgear has higher maintenance costs than the proposed replacement equipment. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Replacement of failed equipment is expected to be more costly than proactive replacement. Also, leaving until emergency replacement is required would not allow for efficiencies gained in bundling with other work at this station.
	Reliability and Safety Factors	The proposed replacement equipment is more reliable and safer due to arc-resistant construction.
	Analysis for "Like for Like" Renewal Project	From a configuration perspective, this is a like-for-like replacement but the replacement equipment is more technologically advanced, requiring reduced maintenance and has improved safety features.

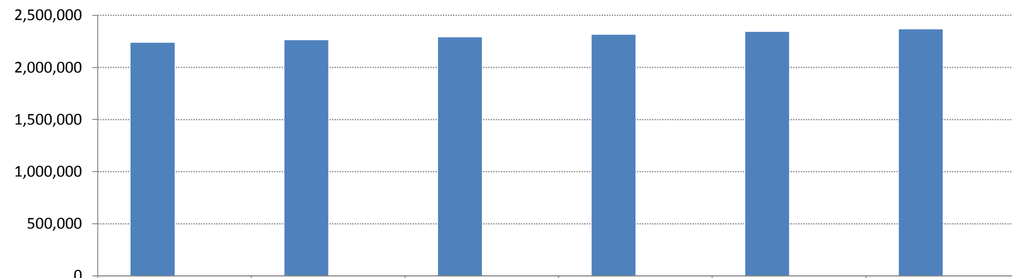
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,573,843	$0	$2,573,843	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150648	
Project Name	Metering - all types but Suite - Enersource RZ	
Major Category	System Access	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Various locations in Enersource RZ
	Units	1600
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Network Metering
	Alectra Subcategory	Metering
4. Evaluation Criteria (OEB)	Project Summary	All meters (every rate class, except Suite Meters). 1. Install metering on new and upgraded distribution services. 2. Renew wholesale metering points. 3. Carry out the meter seal refurbishment program. 4. Renew failed metering and metering communication equipment. 5. Renew meter data management systems and equipment.
	Main Driver - System Access	Service Requests
	Priority and Reasons for Priority	High Priority 1. Distribution System Code requires: - Installing and renewing a meter installation for settlement and billing purposes for each customer connected to the distribution system. - Installing and renewing a MIST meter, by August 21, 2020, on any new or existing metering installation that has a monthly average peak demand during a calendar year of over 50 kW; and - Enhancing and renewing Alectra Utilities' meter data communication and processing systems to support Time-Of-Use and interval billing. 2. Measurement Canada requires (i.e. pursuant to Weights and Measures Act, Electricity and Gas Inspection Act and related regulations): - Using certified meters and metering installations to charge a customer for electrical consumption; and - Using a Measurement Canada certified Meter Test Facility to refurbish meters. 3. IESO requires installing and renewing metering equipment at wholesale metering points in accordance with IESO Market Rules.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not applicable
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	Not applicable
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status quo is to do nothing. The effect of this is: 1. New customers will not have meters on new services. 2. Data on customer electrical use not confirmed to be accurate due to: - Failed equipment, - Meters with expired seals not tested, - meter data management systems not renewed. 3. Loss of reputation and fines due to non-compliance with: - Distribution System Code, - Weights and Measures Act, Electricity and Gas Inspection Act and related regulations, - IESO Market Rules.
	Alternative #1	Carry out single phase meter field work with internal staff instead of a service provider. Costs for single phase meter field work will increase by 10%. Inside staff does not have capacity during regular hours to take on these tasks; they are fully utilized on work that matches their higher qualifications.
	Alternative #2	Use an outside test facility to test meters, instead of the Alectra Measurement Canada meter test facility. Costs for meter testing will increase by 25%.
	Justification for Recommended Alternative	Lowest level of investment required while complying with regulatory requirements.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	No additional risks beyond the typical project risks
	Comparative Information on Equivalent Historical Projects (if any)	Past projects have been completed on time. Costs vary with customer demand for new connections.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Factors Relating to Customer Preferences or Input	Not applicable
	Factors Affecting the Final Cost of the Project	Not applicable

How Controlled Costs have been Minimized	Use contract staff for single phase (residential meter) field work. Use in house test facility to verify meters.
Identify if Other Planning Objectives are Met by the Project, if so, which ones	Not applicable
Results of Final Economic Evaluation, if applicable	Not applicable
System Impacts (Nature, Magnitude and Costs)	Not applicable

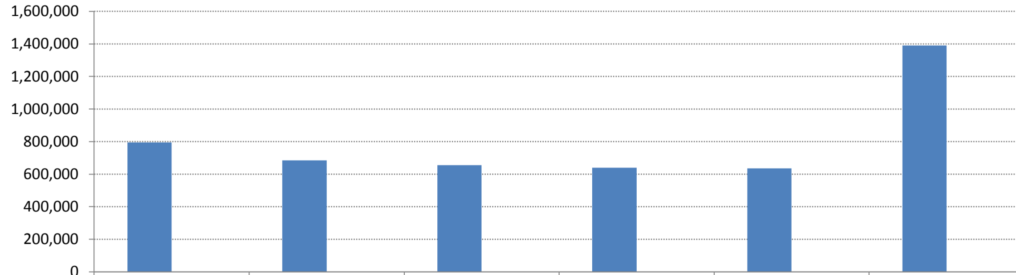


	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $13,810,016	$2,236,942	$2,262,582	$2,288,676	$2,314,222	$2,340,459	$2,367,135
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150664	
Project Name	Residential Meters - by Lines - Brampton RZ	
Major Category	System Access	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Brampton
	Location	Various locations in Brampton RZ
	Units	2000
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Network Metering
	Alectra Subcategory	Metering
4. Evaluation Criteria (OEB)	Project Summary	Residential meters. 1. Install metering on new and upgraded distribution services. 2. Renew failed meters. Work done by Lines.
	Main Driver - System Access	Service Requests
	Priority and Reasons for Priority	High Priority 1. Distribution System Code requires: - Installing and renewing a meter installation for settlement and billing purposes for each customer connected to the distribution system; and - Enhancing and renewing Alectra Utilities' meter data communication and processing systems to support Time-Of-Use and interval billing. 2. Measurement Canada requires (i.e. pursuant to Weights and Measures Act, Electricity and Gas Inspection Act and related regulations): - Using certified meters and metering installations to charge a customer for electrical consumption.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status quo is to do nothing. The effect of this is: 1. New customers will not have meters on new services. 2. Data on customer electrical use not confirmed to be accurate due to: - Failed equipment. 3. Loss of reputation and fines due to non-compliance with: - Distribution System Code, - Weights and Measures Act, Electricity and Gas Inspection Act and related regulations.
	Alternative #1	No acceptable alternatives exist for this project.
	Alternative #2	No acceptable alternatives exist for this project.
	Justification for Recommended Alternative	Lowest level of investment required while complying with regulatory requirements.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Reactive work. We need to keep minimum stock of meters and promptly reorder.
	Comparative Information on Equivalent Historical Projects (if any)	Past projects on time. Cost may vary if the rate of meter failure changes as the meters age.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Factors Relating to Customer Preferences or Input	Not Applicable.
	Factors Affecting the Final Cost of the Project	Factors affecting the Final Cost of the Project include: 1) Meter type 2) Meter features 3) Manufacturer of Meter 4) Ability to negotiate volume discounts from the meter supplier. 5) Cost of meter communication infrastructure require to support communicating with the meters.
	How Controlled Costs have been Minimized	Controllable costs will be minimized through a comprehensive work plan and competitive meter pricing.
	Identify if Other Planning Objectives are Met by the Project, if so, which ones	Not Applicable.
	Results of Final Economic Evaluation, if applicable	Not Applicable.
	System Impacts (Nature, Magnitude and Costs)	Not Applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,801,085	$794,475	$685,671	$654,952	$640,491	$636,084	$1,389,412
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150677	
Project Name	Station Switchgear Replacement - Aquitaine MS59 LV1	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Aquitaine MS in Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Substation Renewal
	Alectra Subcategory	Switchgear Replacement
4. Evaluation Criteria (OEB)	Project Summary	The major power equipment installed at Aquitaine MS (44 kV-to-13.8 kV) consists of one obsolete conventional low voltage switchgear lineup (LV1), one 20 MVA power transformer, and one high voltage (HV) circuit breaker. The equipment details at Aquitaine MS are as follows: Low Voltage LV1 (13.8 kV) metal-clad switchgear (not arc resistant) and circuit breakers (5 units) • Manufacturer and Breaker Type and Model – Merlin Gerin, FLURAC FG2, SF6 gas • Year of Manufacture – 1983 Low Voltage protections • Manufacturer and Relay Type – GE and Stromberg, electromechanical and solid state • Year of Manufacture – 1983 Power transformers (44 kV-to-13.8 kV) • Manufacturer – Federal Pioneer • Year of Manufacture – 1997 High Voltage (44 kV) switchgear • Manufacturer – Markham Electric • Year of Manufacture – 1983 High Voltage protections • Manufacturer and Relay Type – BBC, electromechanical • Year of Manufacture – 1983 This substation renewal project consists of replacing the LV1 switchgear and circuit breakers. The scope also includes work associated with ancillary components required to bring the station up to current standards, to improve overall operating control and reliability and to achieve cost savings through bundling of work. This work includes; • Replacing the electromechanical control relays (having no logic/programmable functionality) with modern IED devices to improve event recording and operating control, and • Assessing the condition of the feeder egress cables and replacing those cables that are deemed to be at end of life, from the station switchgear terminations to the distribution system connection points.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Municipal substation assets are integral to the performance of the Alectra Utilities distribution system. They are used to step down sub-transmission voltages to lower distribution voltages. The municipal substation equipment are considered critical and some of the most significant assets to the sustainability of the organization. As such, Alectra Utilities utilizes a replacement strategy to proactively replace their substation assets before they fail or if they are no longer supported by the manufacturer, hence technically obsolescent, approaching end of life or displaying failures. This can help to avoid a major failure which would have a significant impact on customer outage frequency and duration, the environment, safety, and Alectra Utilities' reputation. The LV1 switchgear at Aquitaine MS59 houses 1983 Merlin Gerin FLURAC FG2, SF6 gas circuit breakers. These circuit breakers utilize vintage technology to provide short circuit protection against faults. These circuit breakers are in the obsolete phase of their life, meaning equipment is not available and spare parts are not readily available. The circuit breakers in this switchgear lineup are prone to failure, with the most recent failure being in May 2018. The main reasons for replacing the MS59 LV1 switchgear are as follows: • LV1 switchgear inspection results have identified this switchgear as having poor overall performance. • The control cables connecting the circuit breakers to the switchgear have a history of failing, resulting in "fail-to-trip scenarios" causing loss of supply to the switchgear bus. This is an inherent issue with this type of switchgear. • Scarcity of spare parts. Many spare parts are now obsolete and the equipment is no longer supported by the manufacturer. • Lack of arc resistant capability is a safety hazard to employees. Replacing existing non-arc resistant switchgear with modern arc-resistant switchgear will serve to facilitate maintenance and repair practices. With the existing equipment, the switchgear must be offloaded prior to racking breakers in or out.
	Customer Attachment / Load (KVA)	The station peak load at Aquitaine MS in 2018 was 20.6 MVA and the forecast for 2024 is about 21.2 MVA.
	Safety	Existing switchgear does not meet current safety criteria. An explosive failure of the existing switchgear could seriously injure personnel in the proximity. The proposed new metal-clad 15 kV switchgear lineup with arc-resistant construction will meet Alectra Utilities' standards.

	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	The replacement of obsolete switchgear with new equipment will help modernize the system and facilitate Control Room operations in managing the system.
	Economic Development	Not Applicable.
	Environmental Benefits	Existing switchgear uses SF6 gas as an insulating medium. With the replacement of this switchgear, the risk of leaks of SF6 gas into the environment will be eliminated. SF6 is a potent greenhouse gas.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	An alternative is to do nothing, allowing for random failure-related issues with the end-of-life equipment and replacing under emergency situations. An increasing risk of equipment failure will have a negative impact on Alectra Utilities' customers, safety and its reputation. Aquitaine MS is a 44 kV to 13.8 kV station. Voltage conversion is not applicable on the 13.8 kV system in Mississauga and there is an ongoing need for supply from this facility. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Alectra Utilities would be forced to purchase new equipment at a premium cost in the event of a failure. System reliability would be affected and restoration of the system to normal conditions could take 8-10 months due to long equipment lead times. These risks are not acceptable to Alectra Utilities. Impact on customers can be minimized with proactive replacement.
	Alternative #1	Refurbish existing equipment. This alternative is not considered as feasible since this equipment is obsolete and no longer supported by the manufacturer, and parts are not readily available.
	Alternative #2	Replace circuit breakers and associated protections in the existing legacy switchgear: This alternative has been rejected because it does not meet Alectra Utilities' current safety, design and operational standards. The existing switchgear is not arc resistant, posing a safety concern. While safety risk can be mitigated, in part, by wearing appropriate PPE and following operational protocols, safety concerns remain. Should there be a breaker failure while someone is even present in the station, that person could be seriously injured or killed. Also, an explosive failure may blow out building doors and windows and flying debris may pose a risk to the general public. Such risks are inconsistent with Alectra Utilities' target of maintaining a safe work environment and not replacing the switchgear along with the circuit breakers is a missed opportunity. Operational protocol for non-arc-resistant switchgear involves removing the entire bus, or even the entire station, from service when racking in or out circuit breakers for service or inspection. This would not be required for modern arc-resistant switchgear; hence equipment outage durations and costs associated with maintenance and inspection would be reduced. Moreover, this alternative is not considered to be cost effective. • Replacing breakers and protections and installing into existing non-arc-resistant switchgear can involve considerable customization and can cost a significant portion of the cost to replace the entire switchgear lineup, but does not provide all the advantages of modern equipment. • There may be ongoing issues with the legacy switchgear, requiring maintenance that would not have been required had it been replaced along with the circuit breakers. • Circuit breaker replacement into existing non-arc-resistant switchgear has been performed by the predecessors that formed Alectra Utilities, but with less than favorable outcomes, resulting in the need to prematurely replace breakers and protections when the switchgear performance has proved inadequate. Aside from the safety and operational concerns, issues that have been encountered with retrofitting switchgear with new breakers include: - Obsolescence of the switchgear in that it is no longer supported by the manufacture and parts become difficult to obtain - Instances of corona discharge, which can cause insulation damage, power loss and electromagnetic interference - Requirements for ongoing maintenance of aging components
	Justification for Recommended Alternative	The recommended solution is to replace the LV1 15 kV switchgear at Aquitaine MS with a new 15 kV metal-clad switchgear lineup with arc-resistant construction that meets Alectra Utilities' standards. It is also recommended that the switchgear replacement be combined with ancillary equipment upgrades required to bring the station up to current standards, improve overall reliability and result in cost savings through bundling of work. It is also recommended that the switchgear replacement be combined with ancillary equipment upgrades and any egress cable replacements required to bring the station up to current standards, improve overall reliability, and achieve cost savings through bundling of work. The main advantages of installing arc-resistant metal-clad switchgear are as follows: • In the case of a breaker failure, there is minimal damage to adjacent equipment. Thus fewer customers are affected by a failure. • Enhanced safety for personnel and equipment. • The switchgear will be equipped with microprocessor based relays, which can be used in future smart grid projects since they have peer-to-peer communication capability. • The new microprocessor based relays can provide additional useful information not available in the electromechanical or electronic relays such as number of operations of the circuit breakers, fault magnitude and event recording. The relay data and the transformer on-line temperature monitoring information can be imported into a computerized maintenance management system (CMMS) that will help in the future to provide a real time picture of equipment status. Since the new LV switchgear will be equipped with microprocessor relays, there is an opportunity to upgrade the transformer protection with new microprocessor relay as well. The transformer relay also provides control and protection functions for the high voltage breaker and the LV main breaker. If the HV control cabinet has not been upgraded, an additional relay needs to be purchased and installed in the LV switchgear main breaker cell. Thus the entire P&C system is upgraded. Execution of this project will serve to extend the useful life of this station and improve the overall reliability of supply to the Mississauga downtown.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Equipment has a long lead time. This risk would be mitigated by starting preliminary engineering and ordering the equipment in the year prior to replacement. Standard materials are used and field crews have the required experience.

	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement have been executed a number of times in recent years. Examples include the LV2 switchgear at Battleford MS and at Shawson MS in Mississauga in 2016.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	From a configuration perspective, this is a like-for-like replacement, however, the proposed replacement equipment is technologically enhanced as compared with the existing equipment. The new equipment is designed to require less maintenance and meets current safety standards.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Existing switchgear has a history of performance issues and is considered to be in poor condition. At the time that this switchgear is proposed to be replaced, it will be 37 years old. This exceeds the typical useful life of 35 years for electromagnetic relays as indicated in Kinectrics Inc. Report No: K-418099-RA-001-R000 “Asset Amortization Study for the Ontario Energy Board”
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1432
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	The replacement of obsolete equipment at Aquitaine MS will improve reliability in the service area. Assumed failure frequencies and outage durations follow. • Frequency is for breakers of this vintage/condition, assuming spare parts are available. • Frequency of catastrophic breaker failure is assumed to be 0.02 per year • Frequency of a breaker failure to operate is assumed to be 0.05 per year • Any breaker failure would result is loss of supply to the entire bus. • Any breaker failure would result is loss of supply to the entire bus. • It can take 2 to 3 hours to transfer load to another bus or station following a breaker mal-operation or to isolate a breaker that has mal-operated. • It can take a week or so to restore a bus following an explosive breaker failure. •A critically damaged breaker can be replaced in a week or so, assuming a spare is available.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Failure of this equipment would negatively impact the electricity supply to many residential, commercial and industrial customers in the area.
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	1) Equipment delivery times from suppliers 2) Numerous MS switchgear replacement projects in Alectra Central are scheduled over the next several years. Although all are considered to be of high or very high priority, priorities among these projects may shift.
	Consequences for O&M System Costs Including Implications of Not Implementing	Existing switchgear has higher maintenance costs than the proposed replacement equipment. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Replacement of failed equipment is expected to be more costly than proactive replacement. Also, leaving until emergency replacement is required would not allow for efficiencies gained in bundling with other work at this station.
	Reliability and Safety Factors	The proposed replacement equipment is more reliable and safer due to arc-resistant construction.
	Analysis for "Like for Like" Renewal Project	From a configuration perspective, this is a like-for-like replacement but the replacement equipment is more technologically advanced, requiring reduced maintenance and has improved safety features.

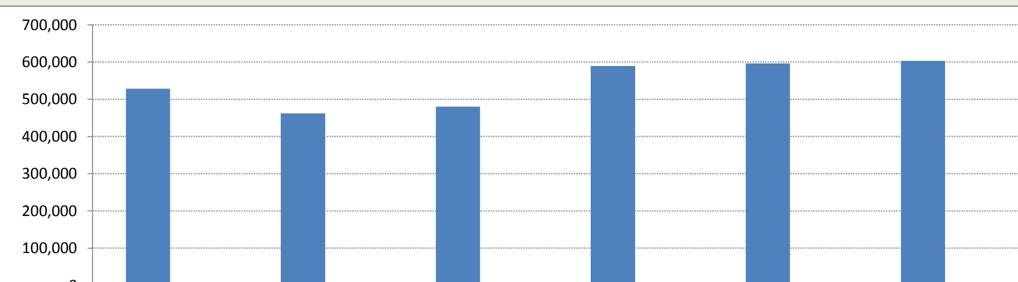
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,702,097	$0	$1,702,097	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150680	
Project Name	Alectra Drive at Home	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Undefined
	Location	
	Units	
	Project Class	No Burden
	Project Includes R&D	Yes
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	This project focuses on identifying charging solutions for electric vehicles (EVs) in the residential sector, where the majority of charging takes place. Because of the complexity of providing charging in multi-unit residential buildings (MURBs), an added emphasis will used to identify solutions that meet the needs of drivers and condo owners while providing a benefit to the electricity system and to society at large. The project will provide innovative solutions for installing and operating EV Supply Equipment (EVSE - aka, chargers) in MURBs, and allow for different approaches tailored to the participating building's physical and governance configuration. For example, charging could be installed in common areas using an hourly rate, or it could be installed in individual parking areas with a monthly fee to the unit holder. The buildings' individual load profile will be used to determine the electrical infrastructure available and how EV station control strategies and rate structures should be designed to manage consumption within the building's capacity and to minimize demand charges. It is expected that 3-5 buildings will participate in the initial stages of this project, while additional residential customers in single-family dwellings will also participate in alternative incentive offers for charging behaviour. Installation is expected to be staggered over the years, with the project taking into account feedback from initial deployments to allow it to scale to the population of buildings in this sector . .
	Main Driver - System Service	Reliability
	Priority and Reasons for Priority	EVs are a growing load and are likely to be concentrated in certain areas based on demographic criteria. Alectra has an interest in both managing this load and serving its customers as a trusted partner. Approximately 80% of charging takes place at home, but customers in MURBs are less likely to have access to charging at their buildings due to complex ownership structures and the cost of providing service to all parking spots. Governments have responded to the challenges of providing access to EVSE in MURBs, such as through recent changes to the Ontario Building Code mandating that new buildings provide access to charging stations in 20% of parking spaces.
	Customer Attachment / Load (KVA)	Customers will be multi-unit residential buildings (MURBs). Customers for this pilot project have not yet been selected.
	Safety	Not applicable
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	•Reduced or eliminated transportation-related fuel costs for Canadian homes and business', as more Canadians will be incentivized to purchase EVs over traditional automobiles •Better use of domestically produced electricity which is currently exported at negative prices for many overnight periods in the year due to the inability to curtail nuclear electricity production. •Enable greater use of renewable resources by making the electricity system more flexible through participation in IESO market services. This also creates revenue opportunities for utility which will be shared with customers •Contribute to the national economy by developing innovative, made-in-Canada solutions and technologies that drive down costs for Canadians, reduce GHG emissions and demonstrate Canadian leadership in energy innovation •Contribute to better planning processes , regulation and governance which consider and incorporate energy, environmental, demographic and financial considerations •Understand what methods are most appropriate, and in what circumstances, to influence EV charging – whether through pricing or incentives; and how to implement and maintain customer support for load control as required for building or grid purposes.

	Environmental Benefits	Electric vehicles are one of the biggest opportunities to reduce GHGs in Ontario due to the low carbon content of electricity compared to fossil fuels. The reduction in GHGs that can be attributable to this project come from two main sources: • Reduced GHG content of electricity consumed by electric vehicles through incentives (provided through either pricing or non-price mechanisms) • An increase in EV adoption rates due to increased access to EV charging stations by drivers A third source of reductions includes the enhanced ability of the electricity grid to manage higher levels of renewable generation due to the flexibility of EV load. The level of GHG reduction attributable to this change is difficult to quantify and smaller in scope to the first two sources, and so will not be included in the analysis below. With respect to reduced GHG content of electricity used to charge vehicles, these reductions are both direct to participants in this project, and also indirect, as they could be made available to all EV drivers in Canada. For this analysis, a 20% reduction in the GHG content of vehicle energy has been estimated. For the second source, reduced GHGs emerge from an increase in those who are currently 'garage orphans' but who will be provided with convenient access to charging stations through this project and so can switch to an electrically power vehicle. The indirect savings from these are assumed to bring EV uptake in MURBs to the same level that they have in single-family dwellings
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Most residents of MURBs will continue to be challenged to get access to EVSE, especially those in existing buildings, meaning that . Those that do have access will likely have an economically inefficient solution that either does not encourage efficient charging, or that subsidizes the building owner/tenant or the drivers. This could also lead to a compliance risk, if Alectra is not able to serve its customers who are seeking an EV charging solution to be installed using utility metering (suite metering).
	Alternative #1	Invest in EVSE in buildings with intelligent controls and incentives for both building owner and driver to participate.
	Alternative #2	Provide guidance to building owners and vendors to provide EVSE installation services
	Justification for Recommended Alternative	Having the utility involved will lead to a more economically efficient outcome that also provides Alectra the opportunity to provide additional services to customers and to the grid.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Demand charge reduction for MURB facilities. $60/EVSE *month
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable
	Description of Incorporation of Advanced Technology, if applicable	The project will provide innovative solutions for installing and operating EV Supply Equipment (EVSE - aka, chargers) in MURBs, and allow for different approaches tailored to the participating building's physical and governance configuration. For example, charging could be installed in common areas using an hourly rate, or it could be installed in individual parking areas with a monthly fee to the unit holder. The buildings' individual load profile will be used to determine the electrical infrastructure available and how EV station control strategies and rate structures should be designed to manage consumption within the building's capacity and to minimize demand charges.
	Identify any reliability, efficiency, safety or coordination benefits	Chosen MURBs will be preferentially located in areas with reliability issues/capacity constraints



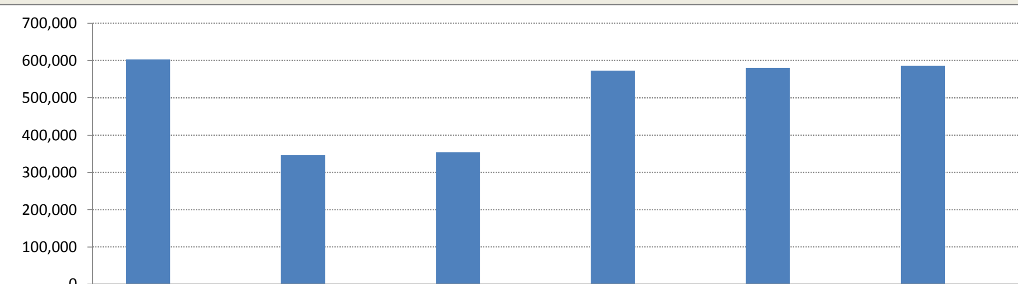
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,259,242	$528,000	$462,203	$479,741	$589,693	$596,407	$603,198
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150693	
Project Name	Smart DER Platform	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Undefined
	Location	
	Units	
	Project Class	No Burden
	Project Includes R&D	Yes
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Distributed Energy Resources (DER)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	The objective of the Smart DER Platform is to develop the real-time administration platform and processes needed to manage solar PV, battery storage, EVs and other DERs to both reduce their adverse impact on the grid, and provide capacity and power quality services. The platform will also help Alectra Utilities strengthen control and visibility over DER owners and provide benefits to the entire customer base over the long-term. Through the Smart DER Platform, Alectra Utilities will issue requests for the Power.House customer systems to provide distribution market services where each aspect of market participation will be transacted through and recorded transparently in real-time by the platform. The Smart DER Platform will provide end-to-end visibility on customer usage and DER participation patterns. By analyzing these patterns, Alectra Utilities can prove to be a highly effective intermediary between understanding customer usage and changing customer behavior, consequently providing tangible incentivized benefits. Therefore, the project is a pre-requisite for the widespread adoption and utilization of DERs,
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	Distributed Energy Resources (DERs), including solar, energy storage, electric vehicles, and home energy management devices, can contribute to a more efficient, sustainable energy future. These resources are predicted to gain widespread market penetration in the near future; however, currently, the tools and processes in place in the industry to securely manage contracts, transactions, and settlements are not positioned to be applied to many small DERs and it would be prohibitively expensive to do so. Without developing a cost-effective solution, the economic and environmental benefits of these resources to DER owners and electricity consumers may not be realized.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not applicable
	Cyber-Security, Privacy	Cyber security and data privacy considerations are core to the blockchain value proposition. As a private, permissioned blockchain platform, Hyperledger Fabric employs a ‘members only’ approach whereby only known parties, identified by certificates that are explicitly trusted within the blockchain network, are permitted to access ledger data and execute transactions. In this project, the known parties are IBM, Alectra, Sunverge, and the financial partner to be confirmed. Each organization will have data access and transaction privileges the role they are assigned, all of which are codified into the network itself.
	Coordination, Interoperability	The blockchain platform developed in this project has the potential to expand outside of Alectra's service territory, enabling cost-efficient administration of many DER participants throughout Ontario and North America.
	Economic Development	This will be one of the first projects in the world to incorporate both grid balancing services and blockchain together under a single pilot. The additional use of energy coins will be particularly novel, as this concept has never been proven in a market setting before. This project has the potential to establish Canada’s energy sector as a world leader in the blockchain space. It will create valuable technological skill sets with Highly Qualified Personnel here in the country in an area that is rapidly being seen as one of the most promising, disruptive technologies in the world. Blockchain technology also has applications across multiple market verticals, so many of the lessons learned for this particular use case will be applicable across other industries. As the blockchain fabric is inherently designed to transfer value to participating DERs for their role in balancing the grid, the technology paves the way for a democratized approach to procuring energy solutions that were previously only available to larger scale generators. Since the increase in energy participants creates more competition, it will also lead to lower cost non wires alternatives to traditional asset investment, allowing the savings to be socialized among non-participants as well. The Power.House feasibility study demonstrated that such approaches could create up to $2.7B in societal benefit over time in a single region.
	Environmental Benefits	Blockchain technology has the potential to provide a cost-effective and engaging contract, transaction, and settlement process to fairly compensate DER owners for the services they provide to the electricity system. Therefore, although this project will not directly install GHG reducing technologies such as solar-storage and EVs, it provides incentives for, and reduces a critical barrier to, widespread adoption of DERs.

5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Distributed Energy Resources (DERs), including solar, energy storage, electric vehicles, and home energy management devices, can contribute to a more efficient, sustainable energy future. However, currently, the tools and processes in place in the industry to securely manage contracts, transactions, and settlements are not positioned to be applied to many small DERs and it would be prohibitively expensive to do so. A mechanism for practically, cost effectively, and securely managing the contracts, transactions, and settlement activities of many DER participants in near-real time is needed in order to enable DERs to contribute to grid services, energy markets, and provide value to consumers.
	Alternative #1	Not applicable
	Alternative #2	Not applicable
	Justification for Recommended Alternative	Not applicable
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Given the early stage nature of the technology, there is potential for budgetary exceedance due to an underestimation of the complexity of certain tasks. Having multiple world-class experts from the blockchain field, as this project does, will greatly reduce the risk of unintended costs and scope creep. Furthermore, establishing consistent project updates and leveraging agile development allows the team to foresee overages well before they happen and the team will be prepared to address such problems accordingly. Financial services is a highly regulated industry, and the rules around generating tokens and exchanging them for goods are currently under development. There is a risk that financial regulators would create additional roadblocks for the long term implementation of the system that will take time to be overcome. Since this is an early stage demonstration of the technology platform, the team has identified several contingency measures that would allow the same functionality to be demonstrated but with intermediary steps that would fit within today's regulatory guidelines.
	Comparative Information on Equivalent Historical Projects (if any)	Not applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not applicable
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable
	Description of Incorporation of Advanced Technology, if applicable	This project represents a major technological advancement in an extremely promising field that is currently generating worldwide attention. The primary benefit that the technology can deliver within 5 years is unlocking the full potential that DERs can provide by facilitating their ability to provide grid support and GHG reduction services. It also bridges an important gap for customer engagement, by facilitating new ways to incentivize customers and connect them directly to merchants who wish to align themselves with the most valued members of their consumer base. Currently, LDCs are lacking a foundational architecture to manage a localized grid services market. This technology will provide Alectra and utilities across Canada with a mechanism that greatly increases the efficiency by which these services can be managed by integrating procurement, contracting, settlement and verification functions all within a common fabric. This effectively allows existing market intermediaries to eliminate a significant amount of internal overhead to solve some of their most challenging problems. The technology will also pre-empt the challenges associated with increased EV and renewable penetration on the electricity network – an eventuality that increases in likelihood as the popularity of these technologies continues to rise. Blockchain's architecture offers energy markets the level of flexibility that is required to adapt to the ever changing conditions that will characterize the grid of the future.
	Identify any reliability, efficiency, safety or coordination benefits	On site solar and storage provides customers with a level of outage protection in the case of a loss of electrical supply. The proposed project increases the affordability of these technologies, making them more accessible to customers to protect against systemic uncertainties such as adverse weather events or network equipment malfunction. Increasing visibility and insight into customer sited assets creates unique opportunities to improve system efficiency. Furthermore, this project focuses on the mechanisms required to settle and verify transactions that improve grid efficiency by dispatching DERs to reduce peak demand - which, at scale, has the potential to allow distribution, transmission, and generation investments to be deferred.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,042,901	$603,000	$346,905	$353,924	$573,140	$579,666	$586,266
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150699	
Project Name	Station Switchgear Replacement - Shawson MS43 LV1	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Shawson MS in Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Substation Renewal
	Alectra Subcategory	Switchgear Replacement
4. Evaluation Criteria (OEB)	Project Summary	The major power equipment installed at Shawson MS (44 kV-to-13.8 kV) consists of one obsolete conventional low voltage switchgear lineup (LV1), one arc-resistant low voltage switchgear (LV2), two 20 MVA power transformers, one MOCB high voltage (HV1) circuit breaker and one SF6 high voltage (HV2) circuit breaker. The equipment details at Shawson MS are as follows: Low Voltage LV1 (13.8 kV) metal-clad switchgear (not arc resistant) • Manufacturer – Merlin Gerin • Circuit Breaker Type – F200, SF6 (5 units) • Year of Manufacture – 1984 Low Voltage LV2 (13.8 kV) metal-clad switchgear (arc resistant) • Manufacturer – Siemens • Circuit Breaker Type – 15-3AF • Year of Manufacture – 1992 Power transformers (44 kV-to-13.8 kV) • Manufacturer (T1) – Westinghouse • Year of Manufacture (T1) – 1977 • Manufacturer (T2) – Federal Pioneer • Year of Manufacture (T2) – 1991 High Voltage (44 kV) switchgear • Manufacturer (CB1) – Markham Electric (MOCB) • Year of Manufacture (CB1) – 1984 • Manufacturer (CB2) – B&S (SF6) • Year of Manufacture (CB2) – 1992 This substation renewal project consists of replacing the LV1 switchgear and circuit breakers. The scope also includes work associated with ancillary components required to bring the station up to current standards, to improve overall operating control and reliability and to achieve cost savings through bundling of work. This work includes; • Replacing the electromechanical control relays (having no logic/programmable functionality) with modern IED devices to improve event recording and operating control, and • Assessing the condition of the feeder egress cables and replacing those cables that are deemed to be at end of life, from the station switchgear terminations to the distribution system connection points.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Municipal substation assets are integral to the performance of the Alectra Utilities distribution system. They are used to step down sub-transmission voltages to lower distribution voltages. The municipal substation equipment are considered critical and some of the most significant assets to the sustainability of the organization. As such, Alectra Utilities utilizes a replacement strategy to proactively replace their substation assets before they fail or if they are no longer supported by the manufacturer, hence technically obsolescent, approaching end of life or displaying failures. This can help to avoid a major failure which would have a significant impact on customer outage frequency and duration, the environment, safety, and Alectra Utilities' reputation. The LV1 switchgear at Shawson MS includes 1984 Merlin Gerin F200 SF6 circuit breakers. These circuit breakers utilize vintage technology to provide short circuit protection against faults. These circuit breakers are in the obsolete phase of their life cycle, meaning equipment is not available and spare parts are not readily available. The type of circuit breakers in this switchgear lineup is prone to failure, with the most recent failure being in May 2018. The main reasons for replacing the MS54 LV1 switchgear are as follows: • LV1 switchgear inspection results have identified this switchgear as having poor overall performance. • The control cables connecting the circuit breakers to the switchgear have a history of failing, resulting in "fail-to-trip scenarios" causing loss of supply to the switchgear bus. This is an inherent issue with this type of switchgear. • Scarcity of spare parts. Many spare parts are now obsolete and the equipment is no longer supported by the manufacturer. • Lack of arc-resistant capability is a safety hazard to employees. Replacing existing non-arc-resistant switchgear with modern arc-resistant switchgear will serve to facilitate maintenance and repair practices. With the existing equipment, the switchgear must be offloaded prior to racking breakers in or out.

	Customer Attachment / Load (KVA)	The peak load at Shawson MS in 2018 was 17.2 MVA for the LV1 bus and 15.1 MVA for the LV2 bus. Peak loads forecast for 2024 are about 17.7 MVA and 15.5 MVA for the LV1 and LV2 buses, respectively.
	Safety	Existing switchgear does not meet current safety criteria. An explosive failure of the existing switchgear could seriously injure personnel in the proximity. The proposed new metal-clad 15 kV switchgear lineup with arc-resistant construction will meet Alectra Utilities' standards.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	The replacement of obsolete switchgear with new equipment will help modernize the system and facilitate Control Room operations in managing the system.
	Economic Development	Not Applicable.
	Environmental Benefits	Existing switchgear uses SF6 gas as an insulating medium. With the replacement of this switchgear, the risk of leaks of SF6 gas into the environment will be eliminated. SF6 is a potent greenhouse gas.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	An alternative is to do nothing, allowing for random failure-related issues with the end-of-life equipment and replacing under emergency situations. An increasing risk of equipment failure will have a negative impact on Alectra Utilities' customers, safety and its reputation. Shawson MS is a 44 kV to 13.8 kV station. Voltage conversion is not applicable on the 13.8 kV system in Mississauga and there is an ongoing need for supply from this facility. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Alectra Utilities would be forced to purchase new equipment at a premium cost in the event of a failure. System reliability would be affected and restoration of the system to normal conditions could take 8-10 months due to long equipment lead times. These risks are not acceptable to Alectra Utilities. Impact on customers can be minimized with proactive replacement.
	Alternative #1	Refurbish existing equipment. This alternative is not considered as feasible since this equipment is obsolete and no longer supported by the manufacturer, and parts are not readily available.
	Alternative #2	Replace circuit breakers and associated protections in the existing legacy switchgear: This alternative has been rejected because it does not meet Alectra Utilities current safety, design and operational standards. The existing switchgear is not arc resistant, posing a safety concern. While safety risk can be mitigated, in part, by wearing appropriate PPE and following operational protocols, safety concerns remain. Should there be a breaker failure while someone is even present in the station, that person could be seriously injured or killed. Also, an explosive failure may blow out building doors and windows and flying debris may pose a risk to the general public. Such risks are inconsistent with Alectra Utilities' target of maintaining a safe work environment and not replacing the switchgear along with the circuit breakers is a missed opportunity. Operational protocol for non-arc-resistant switchgear involves removing the entire bus, or even the entire station, from service when racking in or out circuit breakers for service or inspection. This would not be required for modern arc-resistant switchgear; hence equipment outage durations and costs associated with maintenance and inspection would be reduced. Moreover, this alternative is not considered to be cost effective. • Replacing breakers and protections and installing into existing non-arc-resistant switchgear can involve considerable customization and can cost a significant portion of the cost to replace the entire switchgear lineup, but does not provide all the advantages of modern equipment. • There may be ongoing issues with the legacy switchgear, requiring maintenance that would not have been required had it been replaced along with the circuit breakers. • Circuit breaker replacement into existing non-arc-resistant switchgear has been performed by the predecessors that formed Alectra Utilities, but with less than favorable outcomes, resulting in the need to prematurely replace breakers and protections when the switchgear performance has proved inadequate. Aside from the safety and operational concerns, issues that have been encountered with retrofitting switchgear with new breakers include: - Obsolescence of the switchgear in that it is no longer supported by the manufacture and parts become difficult to obtain - Instances of corona discharge, which can cause insulation damage, power loss and electromagnetic interference - Requirements for ongoing maintenance of aging components

	Justification for Recommended Alternative	The recommended solution is to replace the LV1 15 kV switchgear at Shawson MS with a new 15 kV metal-clad switchgear lineup with arc-resistant construction that meets Alectra Utilities' standards. It is also recommended that the switchgear replacement be combined with ancillary equipment upgrades and any egress cable replacements required to bring the station up to current standards, improve overall reliability and result in cost savings through bundling of work. The main advantages of installing arc-resistant metal-clad switchgear are as follows: • In the case of a breaker failure, there is minimal damage to adjacent equipment. Thus fewer customers are affected by a failure. • Enhanced safety for personnel and equipment. • The switchgear will be equipped with microprocessor based relays, which can be used in future smart grid projects since they have peer-to-peer communication capability. • The new microprocessor based relays can provide additional useful information not available in the electromechanical or electronic relays such as number of operations of the circuit breakers, fault magnitude and event recording. The relay data and the transformer on-line temperature monitoring information can be imported into a computerized maintenance management system (CMMS) that will help in the future to provide a real time picture of equipment status. Since the new LV switchgear will be equipped with microprocessor relays, there is an opportunity to upgrade the transformer protection with new microprocessor relay as well. The transformer relay also provides control and protection functions for the high voltage breaker and the LV main breaker. If the HV control cabinet has not been upgraded, an additional relay needs to be purchased and installed in the LV switchgear main breaker cell. Thus the entire P&C system is upgraded. Execution of this project will serve to extend the useful life of this station and improve the overall reliability of supply to the Mississauga downtown.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Equipment has a long lead time. This risk would be mitigated by starting preliminary engineering and ordering the equipment in the year prior to replacement. Standard materials are used and field crews have the required experience.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacements have been executed a number of times in recent years. Examples include the LV2 switchgear at Battleford MS and at Shawson MS in Mississauga in 2016.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	From a configuration perspective, this is a like-for-like replacement, however, the proposed replacement equipment is technologically enhanced as compared with the existing equipment. The new equipment is designed to require less maintenance and meets current safety standards.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Existing switchgear has a history of performance issues and is considered to be in poor condition. At the time that this switchgear is proposed to be replaced, it will be 36 years old. This exceeds the typical useful life of 35 years for electromagnetic relays as indicated in Kinectrics Inc. Report No: K-418099-RA-001-R000 “Asset Amortization Study for the Ontario Energy Board”
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1030
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	The replacement of obsolete equipment at Shawson MS will improve reliability in the service area. Assumed failure frequencies and outage durations follow. • Frequency is for breakers of this vintage/condition, assuming spare parts are available. • Frequency of catastrophic breaker failure is assumed to be 0.02 per year • Frequency of a breaker failure to operate is assumed to be 0.05 per year • Any breaker failure would result is loss of supply to the entire bus. • Any breaker failure would result is loss of supply to the entire bus. • It can take 2 to 3 hours to transfer load to another bus or station following a breaker mal-operation or to isolate a breaker that has mal-operated. • It can take a week or so to restore a bus following an explosive breaker failure. • A critically damaged breaker can be replaced in a week or so, assuming a spare is available.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Failure of this equipment would negatively impact the electricity supply to many residential, commercial and industrial customers in the area.
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	1) Equipment delivery times from suppliers 2) Numerous MS switchgear replacement projects in Alectra Central are scheduled over the next several years. Although all are considered to be of high or very high priority, priorities among these projects may shift.
	Consequences for O&M System Costs Including Implications of Not Implementing	Existing switchgear has higher maintenance costs than the proposed replacement equipment. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Replacement of failed equipment is expected to be more costly than proactive replacement. Also, leaving until emergency replacement is required would not allow for efficiencies gained in bundling with other work at this station.
	Reliability and Safety Factors	The proposed replacement equipment is more reliable and safer due to arc-resistant construction.
	Analysis for "Like for Like" Renewal Project	From a configuration perspective, this is a like-for-like replacement but the replacement equipment is more technologically advanced, requiring reduced maintenance and has improved safety features.

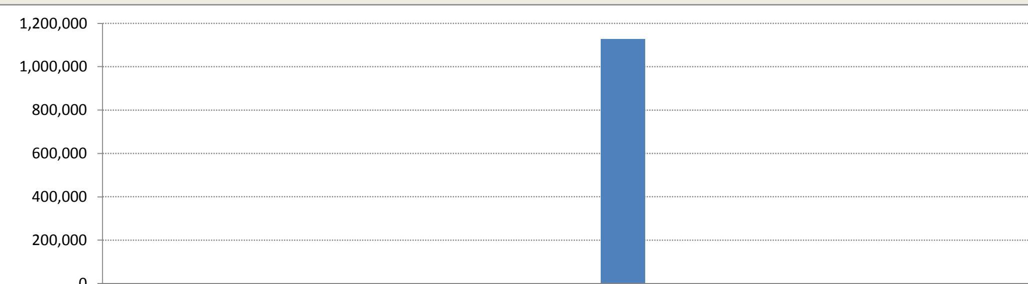
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,398,400	$342,356	$1,056,044	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150716	
Project Name	New build - 42M69 Feeder Extension Williams Pkwy - Main St to Kennedy Rd, Brampton	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Brampton
	Location	Switch Gear Site 428, west of Main St. along Williams Pkwy to Kennedy Rd.
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	27.6kV UG Feeder Extension along Williams Pkwy from Main St to Kennedy Rd OH. Extension currently stops at Switch Gear Site 428 Switch 20-2139, west of Main St. Contingent on road widening of Williams Pkwy.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	This Lines Capacity investment is driven primarily by the rapid expansion of urban development into historically rural greenfield regions.
	Customer Attachment / Load (KVA)	42M69 to be extended. Directly connected to future circuit. 42M47 (247A Peak) Connected through ties on 42M47 42M46 (148A Peak) 42M13 (330A Peak)
	Safety	Alectra Utilities is required to ensure its distribution system can support projected load growth while maintaining reliability and quality of service for customers on both a short-term and long-term basis, as required by the Distribution System Code (DSC). Alectra Utilities must also connect new customers within the timelines prescribed by the OEB's service quality standards without adversely affecting the quality and safety of service to existing customers.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	To maximize the efficiency of the planned work, the Lines Capacity investments are coordinated with other infrastructure projects planned by local authorities. By coordinating Alectra Utilities' expansion and renewal plans with municipal and regional authorities' projects, Alectra Utilities can take advantage of other construction and share infrastructure with other utilities, such as telecommunications providers. Coordination of capital projects also ensures that work can be completed before construction moratoriums are placed on locations by municipal road authorities which would prevent Alectra Utilities from disturbing recently completed roads and streetscapes. Contingent on road widening of Williams Pkwy.
	Economic Development	Investments in Lines Capacity provide Alectra Utilities the ability to support connection of new developments, expedite restoration of outages as well as capability to safely and reliably integrate DER, PV and battery systems.
	Environmental Benefits	Operating feeders within planning criteria maximizes asset life, reduces line losses and ensures required power quality levels.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo These are new development, if new overhead lines are not constructed, it will be physically impossible for Alectra Utilities to connect new customers to the grid. For the reasons stated above, Alectra Utilities rejected the status quo or do-nothing approach.
	Alternative #1	Non-Wires Alternatives For this project these options have not been considered as new feeders are needed to connect the customers to grid. This is not the recommended alternative.
	Alternative #2	Construct New Feeders Execution of this investment will alleviate capacity constraints and as well as ensure the availability of sufficient capacity to efficiently connect customers to Alectra Utilities's distribution system. It will allow Alectra Utilities to maintain supply to customers during contingency events and operation flexibility during maintenance and other capital work. This option will help Alectra Utilities maintain service quality and reliability standards for the existing customers as additional load is added to the system. Alectra Utilities plans to construct and configure feeders to present day technical standards to ensure customer choice for integrating distributed generation, electric vehicles and energy storage solutions. This is the recommended alternative.
	Justification for Recommended Alternative	Construction of new feeders is the only option that allows Alectra Utilities to reliably meet forecast connection requirements, and it forms the basis of the planned Lines Capacity investments.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable

	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Alectra Utilities has identified each proposed Lines Capacity project as required in the proposed timeline and determined that each investment is required to meet the pace of development in each service area to ensure sufficient capacity and reliable service for Alectra Utilities customers. Since larger projects require greater capital investment and take multiple years to build, Alectra Utilities plans to construct large projects in a phased manner to minimize the impact on rates and resources.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not Applicable
	Description of Incorporation of Advanced Technology, if applicable	Not Applicable
	Identify any reliability, efficiency, safety or coordination benefits	The amount of investment required each year is paced to match timing of known development, considering available capacity, and expected load growth, net of conservation and demand side management. Alectra Utilities designs and plans projects using a phased approach based on feeder loading, funding availability and customer development progress, which allows the utility to pace investments just-in-time for connecting new developments while ensuring stable rates and maintenance of reliability for existing customers in the area.

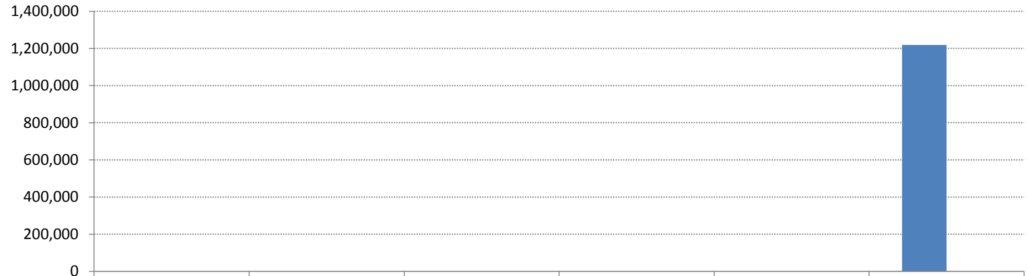


	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,127,730	$0	$0	$0	$1,127,730	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150741	
Project Name	Facilities_2024_Replacement_Patterson Road Roof	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	55 Patterson Road, Barrie
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Non-Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Facilities Management
	Alectra Subcategory	Buildings
4. Evaluation Criteria (OEB)	Project Summary	Pinchin Ltd. was retained by Alectra Utilities to conduct a Baseline Property Condition Assessment (BPCA) in 2018. The report states that the roofing systems are original to the date of their construction in 1990 (i.e., approximately 28 years old) and have exceeded their Projected Useful life (PUL). The report concluded that the Patterson Road service centre building located in Barrie have reached their end of life and that recommended that the roofing systems be replaced to prevent any further damage to the building structure systems and other assets. Replacing this roofing system will result in increased efficiencies, prevent future deterioration of the assets, and reduce repairs and maintenance costs. The roof replacement will include upgrades to the current building code, improvements to the roof insulating values. Alectra will investigate the best replacement roof type for this facility to maximize the useful life of the building. Due to the solar panels located atop the upper roof system, labor costs associated with removal of the solar panels from the roof system prior to the roof replacement program as well as installation of the solar panels subsequent to the roof replacement program.
	Main Driver - General Plant	Capital Investment Support
	Priority and Reasons for Priority	Prevent further deterioration or damage to the building structure, systems and other assets. Maintain building assets to top condition in order to maintain operations/customer support. Maintain low operating costs. Reduce safety risks from detreating roofs.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Reduce damage to assets Safe guard employees
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	Not applicable
	Environmental Benefits	Increased building efficiencies with increased insulation.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Due to the roof system being beyond expected useful life and the poor condition the roof system must be replaced as repairing is not viable.
	Alternative #1	Not applicable
	Alternative #2	Not applicable
	Justification for Recommended Alternative	not applicable
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not Applicable



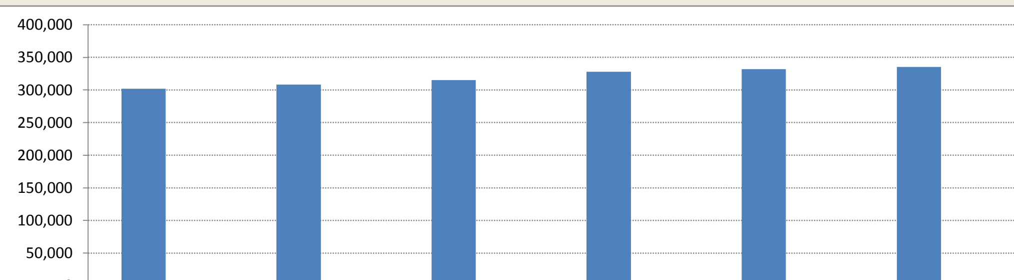
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,218,830	$0	$0	$0	$0	$0	$1,218,830
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	150747	
Project Name	DER Control Platform	
Major Category	System Service	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	
	Units	
	Project Class	No Burden
	Project Includes R&D	Yes
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Distributed Energy Resources (DER)
	Alectra Subcategory	Line Capacity Projs & Add Circ
4. Evaluation Criteria (OEB)	Project Summary	The objective of the DER Control Platform project is to integrate DERs with Alectra Utilities' traditional distribution operation technology systems. It will enable Alectra Utilities to build capabilities that could predict the grid operational impacts of DERs, help mitigate power quality issues associated with DERs and reduce peak demand. These capabilities will be built as part of the overall DER Control Platform, also known as Distributed Energy Resource Management System (DERMS), further enabling a Virtual Power Plant (VPP) with integrated controls and real time signals in order to operationalize DERs as an aggregated source of capacity and storage. The focus of Alectra Utilities' DER Control Platform project is to aggregate, integrate, control and optimize concentrated and dispersed DER, as a source of virtually aggregated deployment, in order to reduce system capacity demand necessary for system optimization and load balancing. Without Alectra Utilities' Control Platform, Alectra Utilities will not be able to realize the full potential of DER integration and also its promise to deliver an efficient and reliable DER integration solution.
	Main Driver - System Service	Reliability
	Priority and Reasons for Priority	Without Alectra Utilities' Control Platform, Alectra Utilities will not be able to realize the full potential of DER integration and also its promise to deliver an efficient and reliable DER integration solution. The optimization of household electricity consumption proposed by this project minimizes the impacts of electrification on distribution, transmission, and generation infrastructure and creates a pathway for widespread adoption of DERs in an affordable and efficient manner, without increasing rates and compromising grid stability.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not applicable
	Cyber-Security, Privacy	Security will be designed into every aspect of the platform and the networks it creates, and lasting security is sustained through ongoing diligence and maintenance. Alectra ensures the security of its networks using best practices, which include the following provisions: All entities (human interaction and computing nodes) connected to the network will be uniquely authenticated. All traffic will be armored, as follows: •Traffic will be protected from eavesdropping, tampering and recording. •Traffic will be authenticated, assuring it is only delivered from/to the intended source/recipient. •Traffic will be encrypted; decrypted traffic is never visible to an unintended party. •Traffic will be checked for integrity—no traffic can be injected, re-routed, delayed, duplicated or corrupted without being detected. •All authentication, encryption and integrity checks will be protected by industry-recognized, robust cryptographic algorithms with no known weaknesses. •End-customer data will be owned by the end-customer •All data will be backed up continuously in real-time to secured backup systems
	Coordination, Interoperability	The project is intended to enable the integration of DERMS with Alectra Utilities system control and operational systems, including Supervisory Control And Data Acquisition (SCADA), Geographical Information System (GIS), Outage Management System (OMS) and Network Simulation Software (such asCYMDIST). The project is leading edge and innovative and will create a pathway for widespread adoption of DERs in an affordable and efficient manner, without increasing rates and compromising grid stability. The project will allow for the widespread and economically-efficient adoption of DERs across Canada. For example, the project requires new coordination between ITs system to optimize and integrate into the grid, allowing for the real-time management of energy generation, distribution and consumption.

	Economic Development	The project will have a direct and positive economic benefit in the community it serves, primarily by reducing electricity costs for households. In turn, this will contribute to the long-term financial stability and prosperity of the community. The project reduces energy costs by allowing for individual's real-time management of their energy consumption. It enables consumers to sell power back to the grid, further offsetting costs. The project will contribute to economic growth and job creation through broadly supporting Canadian innovation, while also providing more access for Distributed Energy Resources. The most central economic benefit this project is that it will help shape and inform future consumer-facing smart grid offerings, and will serve as a useful guide to both industry and government regarding our collective understanding of the barriers that exist with respect to widespread adoption of these technologies including the economic gap, in retail terms, that confronts the enlightened consumer who is interested in pursuing these approaches.
	Environmental Benefits	The project expects to reduce GHG emissions from the DERs included in the pilot by 1,190 Tonnes to the end of 2030. A further 18,600,000 Tonnes of indirect GHG emissions are projected in Ontario from the subsequent adoption of this technology integration that occurs through subsequent market replication of this comprehensive technology integration.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Do nothing. See priority.
	Alternative #1	Not applicable
	Alternative #2	Not applicable
	Justification for Recommended Alternative	Not applicable
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	The technologies won't work as intended or the control architecture won't optimize. Mitigation strategy: begin with small-scale integration work before proceeding with entire suite of DERs. It will be difficult to identify participants to volunteer to have their DERs participate in the demonstration project. Mitigation strategy: Work with corporate communications activities to solicit customer interest; work with project technology partners to identify potential customers.
	Comparative Information on Equivalent Historical Projects (if any)	The current project builds on the Power.House pilot project launched by a key Alectra Utilities legacy company, PowerStream, in 2015. This pilot enabled the deployment of 20 Power.House units – an integrated home power plant of rooftop solar panels, a lithium-ion energy storage battery, a two-way smart meter and a cloud-based energy management system. The pilot resulted in customers from the City of Barrie, City of Vaughan and City of Markham saving on their monthly bills, while Alectra Utilities gained key insights from the integration of usage data.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Customers who participate will have their consumption optimized to use their customer-sited DERs in a way that provides them with a benefit while also providing a benefit to the grid. In the Power.House project, customers were able to re-coup their initial investment in less than 5 years. A second type of benefit is that provided to all ratepayers through making better use of existing infrastructure rather than requiring early maintenance or repair due to excess use.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Where practicable, DERs included in the project will be located in areas that have been identified as requiring future investment. This will provide an early start towards potentially using DERs more in the future to offset infrastructure investments.
	Description of Incorporation of Advanced Technology, if applicable	The DER Control Platform project provides an integration backbone for DERs, including hardware and software services, to be controlled and managed through Alectra Utilities' core operational and control platforms. It will allow Alectra Utilities to assess the integration and operation of its platform before it is used at a larger scale to provide benefits to the distribution system as a whole.
	Identify any reliability, efficiency, safety or coordination benefits	As more DERs are connected to Alectra Utilities' system, the DER Control Platform will allow Alectra Utilities to optimize DER operations to prevent power quality issues and reduce peak demand in real time, in addition to providing valuable data for improving Alectra Utilities' forecast of DER uptake and operation based on customer adoption that can be used for utility planning purposes. The project is expected to enable the integration of DERMS with Alectra Utilities' system control and operational systems, including Supervisory Control And Data Acquisition (SCADA), Geographical Information System (GIS), Outage Management System (OMS) and Network Simulation Software (such asCYMDIST).



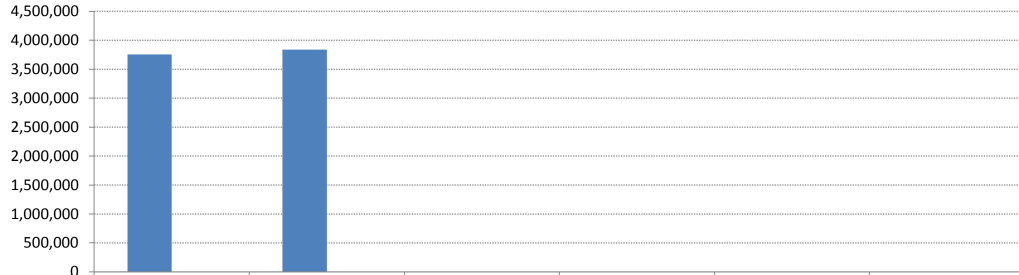
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,920,628	$302,000	$308,473	$315,054	$327,952	$331,686	$335,463
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151066	
Project Name	Cable Replacement Project - Hamilton Mountain URD	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Various locations in Alectra West (legacy Horizon Utilities)
	Units	0
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	Yes
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	This project is part of the multi-year XLPE Renewal Program. Alectra Utilities (Legacy Horizon Utilities) considered the four replacement philosophies for addressing risk inherent in the XLPE asset group: Area; Reactive; Selected; and Refurbishment. The area replacement philosophy for will be utilized for selected areas of the service territory where the asset health analysis and the failure history indicates a substantial risk of continued failures. A reactive replacement philosophy will continued to be used for the remaining areas of the service territory. Alectra Utilities has adopted a selective approach replacing key assets that reduce the number of customers effected, increase visibility on which area is impacted making restoring customers easier, and provides the greatest value in comparison to the other options considered.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	Approximately 5000kVA
	Safety	These projects are not intended to address safety concerns with the distribution system.
	Cyber-Security, Privacy	If automated devices are insalled to communicate back to the control room it will be done via private/secure network. As part of its continuous improvement model, Alectra Utilities performs periodic security assessments to identify opportunities for enhanced system hardening.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	"Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Comparator projects are difficult as each area has unique constraints, this project has been executed in 2016,2017, and 2018.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	XLPE primary cable is the asset group with the largest investment requirement as identified by the Kinectrics ACA. The current backlog volume of XLPE primary cable requiring renewal cannot be addressed in a single year and requires a multiple year investment strategy.
	Condition of Asset vs. Typical Life Cycle and Performance Record	"Cable in this area is 45 years old (installed in 1971), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1600
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	The qualitative customer varies for customers affected by this project.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets at risk of failure. Failures of XLPE primary cable (Alectra West) result in extended service interruptions with 30% of these outages exceeded four hours in duration, while 5% of these outages exceeded twelve hours in duration.
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	• O&M Cost for emergency cable failure repair = $20,000 per failure • O&M Cost for 1 cable failure repairs = $20,000 x 1 = $20,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1 potential cable failures and 44,518 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $7,595,080	$3,757,151	$3,837,929	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

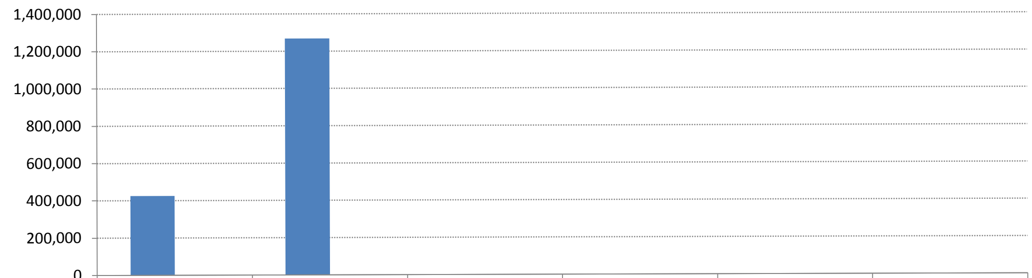
Project Code	151098
Project Name	Station Switchgear Replacement - Battleford MS54 LV1
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Battleford MS in Mississauga.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technolgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Substation Renewal
	Alectra Subcategory	Switchgear Replacement
4. Evaluation Criteria (OEB)	Project Summary	The major power equipment installed at Battleford MS (44 kV-to-13.8 kV) consists of one obsolete conventional low voltage switchgear lineup (LV1), one arc-resistant low voltage switchgear (LV2), two 20 MVA power transformers, and two high voltage (HV1 and HV2) circuit breakers. The equipment details at Battleford MS are as follows: Low Voltage LV1 (13.8 kV) metal-clad switchgear (not arc resistant) and circuit breakers (5 units) • Manufacturer and Circuit Breaker Model and Type – Merlin Gerin, FLUARC FG2, SF6 • Year of Manufacture – 1983 Low Voltage LV2 (13.8 kV) metal-clad switchgear (arc resistant) and circuit breakers (4 units) • Manufacturer and Circuit Breaker Model and Type – Siemens, 8BK20, Vacuum • Year of Manufacture – 1991 Low Voltage protections • Manufacturer and Relay Type – GE, electromechanical • Year of Manufacture – 1983 Power transformers (44 kV-to-13.8 kV) (2 units) • Manufacturer – Federal Pioneer • Year of Manufacture – 1993 (T1), 1991 (T2) High Voltage (44 kV) switchgear • Manufacturer – Markham EI • Year of Manufacture - 1983 (CB1), 1988 (CB2) High Voltage protections • Manufacturer and Relay Type – GE, electromechanical • Year of Manufacture – 1983 This substation renewal project consists of replacing the LV1 switchgear and circuit breakers. The scope also includes work associated with ancillary components required to bring the station up to current standards, to improve overall operating control and reliability and to achieve cost savings through bundling of work. This work includes; • Replacing the electromechanical control relays (having no logic/programmable functionality) with modern IED devices to improve event recording and operating control, and • Assessing the condition of the feeder egress cables and replacing those cables that are deemed to be at end of life, from the station switchgear terminations to the distribution system connection points.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Municipal substation assets are integral to the performance of the Alectra Utilities distribution system. They are used to step down sub-transmission voltages to lower distribution voltages. The municipal substation equipment are considered critical and some of the most significant assets to the sustainability of the organization. As such, Alectra Utilities utilizes a replacement strategy to proactively replace their substation assets before they fail or if they are no longer supported by the manufacturer, hence technically obsolescent, approaching end of life or displaying failures. This can help to avoid a major failure which would have a significant impact on customer outage frequency and duration, the environment, safety, and Alectra Utilities' reputation. The LV1 switchgear at Battleford MS houses 1983 Merlin Gerlin FLUARC FG2 circuit breakers. These circuit breakers utilize vintage technology to provide short circuit protection against faults. These circuit breakers are in the obsolete phase of their life cycle, meaning equipment is not available and spare parts are not readily available. The type of circuit breakers in this switchgear lineup is prone to failure, with the most recent failure being in May 2018. The main reasons for replacing the MS54 LV1 switchgear are as follows: • LV1 switchgear inspection results have identified this switchgear as having poor overall performance. • The control cables connecting the circuit breakers to the switchgear have a history of failing, resulting in "fail- to-trip scenarios" causing loss of supply to the switchgear bus. This is an inherent issue with this type of switchgear. • Scarcity of spare parts. Many spare parts are now obsolete and the equipment is no longer supported by the manufacturer. • Lack of arc-resistant capability is a safety hazard to employees. Replacing existing non-arc-resistant switchgear with modern arc-resistant switchgear will serve to facilitate maintenance and repair practices. With the existing equipment, the switchgear must be offloaded prior to racking breakers in or out.

	Customer Attachment / Load (KVA)	The peak load at Battleford MS in 2018 was 23.2 MVA for the LV1 bus and 12.7 MVA for the LV2 bus. Peak loads forecast for 2024 are about 23.8 MVA and 13.1 MVA for the LV1 and LV2 buses, respectively.
	Safety	Existing switchgear does not meet current safety criteria. An explosive failure of the existing switchgear could seriously injure personnel in the proximity. The proposed new metal-clad 15 kV switchgear lineup with arc-resistant construction will meet Alectra Utilities' standards.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	The replacement of obsolete switchgear with new equipment will help modernize the system and facilitate Control Room operations in managing the system.
	Economic Development	Not Applicable.
	Environmental Benefits	Existing switchgear uses SF6 gas as an insulating medium. With the replacement of this switchgear, the risk of leaks of SF6 gas into the environment will be eliminated. SF6 is a potent greenhouse gas.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	An alternative is to do nothing, allowing for random failure-related issues with the end-of-life equipment and replacing under emergency situations. An increasing risk of equipment failure will have a negative impact on Alectra Utilities' customers, safety and its reputation. Barttleford MS is a 44 kV to 13.8 kV station. Voltage conversion is not applicable on the 13.8 kV system in Mississauga and there is an ongoing need for supply from this facility. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Alectra Utilities would be forced to purchase new equipment at a premium cost in the event of a failure. System reliability would be affected and restoration of the system to normal conditions could take 8-10 months due to long equipment lead times. These risks are not acceptable to Alectra Utilities. Impact on customers can be minimized with proactive replacement.
	Alternative #1	Refurbish existing equipment. This alternative is not considered as feasible since this equipment is obsolete and no longer supported by the manufacturer, and parts are not readily available.
	Alternative #2	Replace circuit breakers and associated protections in the existing legacy switchgear: This alternative has been rejected because it does not meet Alectra Utilities' current safety, design and operational standards. The existing switchgear is not arc-resistant, posing a safety concern. While safety risk can be mitigated, in part, by wearing appropriate PPE and following operational protocols, safety concerns remain. Should there be a breaker failure while someone is even present in the station, that person could be seriously injured or killed. Also, an explosive failure may blow out building doors and windows and flying debris may pose a risk to the general public. Such risks are inconsistent with Alectra Utilities' target of maintaining a safe work environment and not replacing the switchgear along with the circuit breakers is a missed opportunity. Operational protocol for non-arc-resistant switchgear involves removing the entire bus, or even the entire station, from service when racking in or out circuit breakers for service or inspection. This would not be required for modern arc-resistant switchgear; hence equipment outage durations and costs associated with maintenance and inspection would be reduced. Moreover, this alternative is not considered to be cost effective. • Replacing breakers and protections and installing into existing non-arc-resistant switchgear can involve considerable customization and can cost a significant portion of the cost to replace the entire switchgear lineup, but does not provide all the advantages of modern equipment. • There may be ongoing issues with the legacy switchgear, requiring maintenance that would not have been required had it been replaced along with the circuit breakers. • Circuit breaker replacement into existing non-arc-resistant switchgear has been performed by the predecessors that formed Alectra Utilities, but with less than favorable outcomes, resulting in the need to prematurely replace breakers and protections when the switchgear performance has proved inadequate. Aside from the safety and operational concerns, issues that have been encountered with retrofitting switchgear with new breakers include: - Obsolescence of the switchgear in that it is no longer supported by the manufacture and parts become difficult to obtain - Instances of corona discharge, which can cause insulation damage, power loss and electromagnetic interference - Requirements for ongoing maintenance of aging components

	Justification for Recommended Alternative	The recommended solution is to replace the LV1 15 kV switchgear at Battleford MS with a new 15 kV metal-clad switchgear lineup with arc-resistant construction that meets Alectra Utilities' standards. It is also recommended that the switchgear replacement be combined with ancillary equipment upgrades and any egress cable replacements required to bring the station up to current standards, improve overall reliability and result in cost savings through bundling of work. The main advantages of installing arc-resistant metal-clad switchgear are as follows: • In the case of a breaker failure, there is minimal damage to adjacent equipment. Thus fewer customers are affected by a failure. • Enhanced safety for personnel and equipment. • The switchgear will be equipped with microprocessor based relays, which can be used in future smart grid projects since they have peer-to-peer communication capability. • The new microprocessor based relays can provide additional useful information not available in the electromechanical or electronic relays such as number of operations of the circuit breakers, fault magnitude and event recording. The relay data and the transformer on-line temperature monitoring information can be imported into a computerized maintenance management system (CMMS) that will help in the future to provide a real time picture of equipment status. Since the new LV switchgear will be equipped with microprocessor relays, there is an opportunity to upgrade the transformer protection with new microprocessor relay as well. The transformer relay also provides control and protection functions for the high voltage breaker and the LV main breaker. If the HV control cabinet has not been upgraded, an additional relay needs to be purchased and installed in the LV switchgear main breaker cell. Thus the entire P&C system is upgraded. Execution of this project will serve to extend the useful life of this station and improve the overall reliability of supply to the Mississauga downtown.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Equipment has a long lead time. This risk would be mitigated by starting preliminary engineering and ordering the equipment in the year prior to replacement. Standard materials are used and field crews have the required experience.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacements have been executed a number of times in recent years. Examples include the LV2 switchgear at Battleford MS and at Shawson MS in Mississauga in 2016.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	From a configuration perspective, this is a like-for-like replacement, however, the proposed replacement equipment is technologically enhanced as compared with the existing equipment. The new equipment is designed to require less maintenance and meets current safety standards.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Existing switchgear has a history of performance issues and is considered to be in poor condition. At the time that this switchgear is proposed to be replaced, it will be 37 years old. This exceeds the typical useful life of 35 years for electromagnetic relays as indicated in Kinectrics Inc. Report No: K-418099-RA-001-R000 “Asset Amortization Study for the Ontario Energy Board”
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1488
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	The replacement of the obsolete equipment at Battleford MS will improve reliability in the service area. Assumed failure frequencies and outage durations follow. • Frequency is for breakers of this vintage/condition, assuming spare parts are available. • Frequency of catastrophic breaker failure is assumed to be 0.02 per year • Frequency of a breaker failure to operate is assumed to be 0.05 per year • Any breaker failure would result is loss of supply to the entire bus. • Any breaker failure would result is loss of supply to the entire bus. • It can take 2 to 3 hours to transfer load to another bus or station following a breaker mal-operation or to isolate a breaker that has mal-operated. • It can take a week or so to restore a bus following an explosive breaker failure. • A critically damaged breaker can be replaced in a week or so, assuming a spare is available.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Failure of this equipment would negatively impact the electricity supply to many residential, commercial and industrial customers in the area.
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	1) Equipment delivery times from suppliers 2) Numerous MS switchgear replacement projects in Alectra Central are scheduled over the next several years. Although all are considered to be of high or very high priority, priorities among these projects may shift.
	Consequences for O&M System Costs Including Implications of Not Implementing	Existing switchgear has higher maintenance costs than the proposed replacement equipment. Failure of the existing equipment would warrant emergency replacement resulting in non-budgeted funding requirements and could result in lengthy customer interruptions. Replacement of failed equipment is expected to be more costly than proactive replacement. Also, leaving until emergency replacement is required would not allow for efficiencies gained in bundling with other work at this station.
	Reliability and Safety Factors	The proposed replacement equipment is more reliable and safer due to arc-resistant construction.
	Analysis for "Like for Like" Renewal Project	From a configuration perspective, this is a like-for-like replacement but the replacement equipment is more technologically advanced, requiring reduced maintenance and has improved safety features.

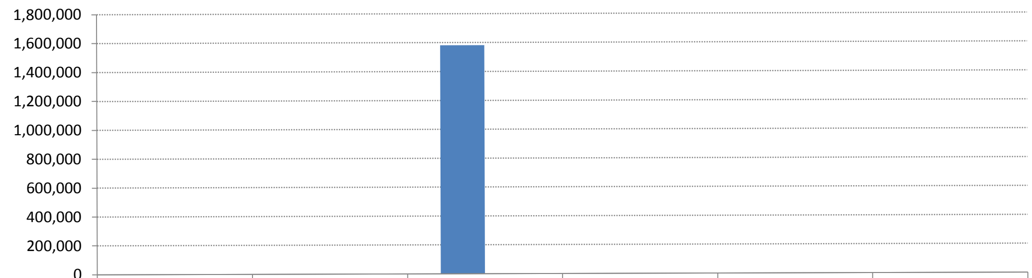


	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,693,897	$426,030	$1,267,867	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151117	
Project Name	Vansickle TS True-up Payment, St.Catharines	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	St. Catherines
	Location	
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Connection & Cost Recovery Agreements
	Alectra Subcategory	CCRA Payments
4. Evaluation Criteria (OEB)	Project Summary	Alectra (former Horizon Utilities) is party to a Connection and Cost Recovery Agreement (CCRA) with Hydro One Networks Inc. (“HONI”) dated May 2008. This agreement provided for the upgrade of the Vansickle Transformer Station (TS) on behalf of Hydro One Networks Inc. for the purpose of meeting anticipated electricity load growth in St.Catharines. A need for new transformation capacity was identified to meet existing and future demand growth in the South-West area of St.Catharines. The proposed station expansion was designed to offload Carlton TS T5/T6 that was exceeding transformation capacity as well as existing Vansickle TS facilities nearing capacity. Under the Transmission System Code (“TSC”), and consequently the CCRA, Alectra was required to provide HONI with an initial capital contribution (“Initial Capital Contribution”) based on the difference (the “Difference”) between the total capital cost of constructing the TS and a projection of transformation revenue (the “HONI Revenue”) earned on the conveyance of electricity through the TS. The Difference represents a contingent debt obligation of Alectra based on the extent that historical actual and forecast HONI Revenue during the CCRA term is less than the amount of HONI revenue projected as a basis for the determination of the Initial Capital Contribution. Conversely, Alectra is entitled to a rebate of the Capital Contribution based on the extent that historical actual and forecast HONI Revenue during the CCRA term is greater than the amount of HONI Revenue projected as a basis for the determination of the Initial Capital Contribution. As per the TSC, and consequently CCRA for low risk connections, HONI is required to complete a true-up on the five, ten and if applicable, fifteen year anniversaries to settle for demand forecast excesses or shortfalls. Based on a review of the CCRA with HONI for Vansickle TS capacity upgrade of T5/T6 on the ten year anniversary, Alectra and HONI determined a shortfall of revenue to HONI versus the forecasted Initial Capital Contribution. The ten-year anniversary true-up for Vansickle TS expansion is due in 2021. Alectra estimates a shortfall of revenue to HONI versus the forecasted Initial Capital Contribution. Request for financial settlement is anticipated from HONI in 2021, in the amount of TBD, with the final amount and payment terms negotiated between HONI and Alectra at that time. The revenue shortfall is largely due to government-driven conservation initiatives, natural conservation and an impact of slower ancillary growth occurring around Niagara Regional Hospital, which have resulted in actual load being lower than forecasted load.
	Main Driver - General Plant	Capital Investment Support
	Priority and Reasons for Priority	As a distributor Alectra has to comply by the TSC and is required to pay contribution amounts per the CCRA.
	Customer Attachment / Load (KVA)	7841 customers and 89,367 connected KVA
	Safety	Not applicable
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable.
	Economic Development	Not applicable.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Not applicable.
	Alternative #1	Payment of true-up amount will be determined by Hydro One as part of the signed CCRA agreement. There is only one option that can be considered with this investment as Alectra is obligated to comply with TSC requirements and provide cost recovery to HONI as required.
	Alternative #2	Not applicable.
	Justification for Recommended Alternative	Signed contract between legacy Horizon and Hydro One.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable.
	Comparative Information on Equivalent Historical Projects (if any)	Pleasant TS CCRA true-up in 2018, in the amount of $6.8 MM.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,580,845	$0	$0	$1,580,845	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151121	
Project Name	Cable Injection Project - (V43) - Hwy 7 and Pine Valley Dr, Vaughan	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V43) - Hwy 7 and Pine Valley Dr, Vaughan
	Units	12129
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $84/m in 2020.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 33 years old (installed in 1986), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	921
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 12129 m of cable in the whole area: Frequency of Failure is: 0.25 x 12129 /1000 = 3 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 3 failures: 307 x 3 = 921 customers affected and 43,131 x 3 = 129393 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 3 potential cable failures and 129393 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,019,505	$0	$1,019,505	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151124	
Project Name	Goreway TS Expansion (CCRA) - 10 Yr True-Up Payment, Brampton	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Brampton
	Location	Goreway TS Brampton 9513 Goreway Dr. Between Queen St and Castlemore Rd
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Connection & Cost Recovery Agreements
	Alectra Subcategory	CCRA Payments
4. Evaluation Criteria (OEB)	Project Summary	For the 10th year true up due in 2020, it is expected that Hydro One True-up calculation will show that Alectra actual load and updated load forecast is lower than the load in the initial load forecast and does not generate the initial forecast connection rate revenues. To account for the shortfall, Hydro One will require Alectra to make a payment in lump sum payment (plus applicable taxes) in 2020. This cost is adjusted appropriately to reflect the time value of money and accounts for any previous True-up payments you have already made. The 5th year True-Up in 2015 was $681k. The lump sum is estimated to be $5.5M in 2020.
	Main Driver - General Plant	Capital Investment Support
	Priority and Reasons for Priority	High In 2010, the construction of Goreway TS Expansion was completed and was put into service. Under the Transmission System Code (“TSC”), and consequently the CCRA, Alectra was required to provide HONI with an initial capital contribution (“Initial Capital Contribution”) based on the difference (the “Difference”) between the total capital cost of constructing the TS and a projection of transformation revenue (the “HONI Revenue”) earned on the conveyance of electricity through the TS. The Difference represents a contingent debt obligation of Alectra based on the extent that historical actual and forecast HONI Revenue during the CCRA term is less than the amount of HONI revenue projected as a basis for the determination of the Initial Capital Contribution. Conversely, Alectra is entitled to a rebate of the Capital Contribution based on the extent that historical actual and forecast HONI Revenue during the CCRA term is greater than the amount of HONI Revenue projected as a basis for the determination of the Initial Capital Contribution. As per the TSC, and consequently CCRA for low risk connections, HONI is required to complete a true-up on the five, ten and if applicable, fifteen year anniversaries to settle for demand forecast excesses or shortfalls. Based on a review of the CCRA with HONI for Pleasant TS on the five year anniversary, Alectra and HONI determined a shortfall of revenue to HONI versus the forecasted Initial Capital Contribution. The 5 year true-up CCRA shortfall payment in accordance of the CCRA for the Goreway TS Expansion was completed in 2015 in the amount of $681k. The ten-year true-up revenue shortfall was largely due to the government-driven conservation initiatives, natural conservation and economic downturn that occurred in 2008 that have resulted in historical actual load being lower than forecasted load. The 10-year anniversary true-up for Goreway TS Expansion is due in 2020. Alectra estimates a shortfall of revenue to HONI versus the forecasted Initial Capital Contribution and the five-year true-up settlement. Request for financial settlement is anticipated from HONI in 2020, with the final amount and payment terms negotiated between HONI and Alectra at that time. The revenue shortfall continues largely due to government-driven conservation initiatives, natural conservation and an impact of economic downturn that occurred in 2008 (and which has not been overcome) which have resulted in historical actual load being lower than forecasted load.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Not Applicable
	Economic Development	Not Applicable
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The peak demand for Pleasant TS continues to be lower than forecasted before it was constructed. This will result in revenue shortfall for HONI. The revenue shortfall continues largely due to government-driven conservation initiatives, natural conservation and an impact of economic downturn that occurred in 2008 (and which has not been overcome) which have resulted in historical actual load being lower than forecasted load.
	Alternative #1	Not Applicable
	Alternative #2	Not Applicable

	Justification for Recommended Alternative	For the 10th year true up due in 2018, Hydro One True-up calculation shows that Alectra actual load and updated load forecast is lower than the load in the initial load forecast and does not generate the initial forecast connection rate revenues. To account for the shortfall, Hydro One required Alectra to make a payment in the amount of $681k in 2015. This cost is adjusted appropriately to reflect the time value of money and accounts for any previous True-up payments you have already made. For the 10th year true up due in 2020, it is expected that Hydro One True-up calculation will show that Alectra actual load and updated load forecast is lower than the load in the initial load forecast and does not generate the initial forecast connection rate revenues. To account for the shortfall, Hydro One will require Alectra to make a payment in lump sum payment (plus applicable taxes) in 2020. This cost is adjusted appropriately to reflect the time value of money and accounts for any previous True-up payments you have already made. The lump sum is estimated to be $5.5M.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not Applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	True Up Payment

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $5,562,624	$0	$5,562,624	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

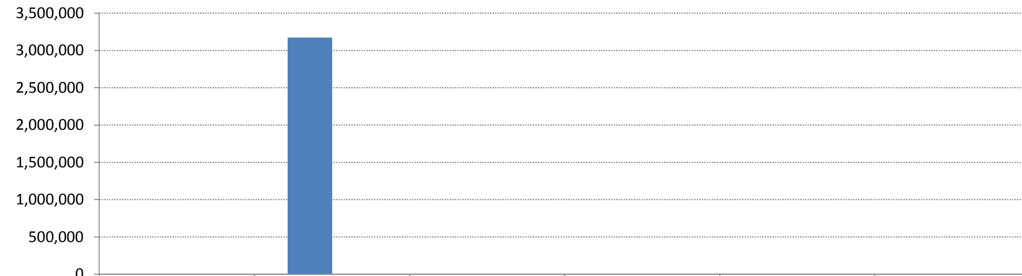
OEB Multi-Project Report

Project Code	151125	
Project Name	Connection Cost Recovery Agreement (CCRA) – Midhurst TS – 15th Anniversary True-up	
Major Category	General Plant	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream North
	Location	Barrie
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Connection & Cost Recovery Agreements
	Alectra Subcategory	CCRA Payments
4. Evaluation Criteria (OEB)	Project Summary	For the 15th year true up covering the period up to December 31st 2019, it is expected that Hydro One true-up calculation will show that Alectra actual load and updated load forecast is lower than the load in the initial load forecast and does not generate the initial forecast connection rate revenues. To account for the shortfall, Hydro One will require Alectra to make a payment in lump sum payment (plus applicable taxes). This cost is adjusted appropriately to reflect the time value of money and accounts for any previous true-up payments already made.
	Main Driver - General Plant	Capital Investment Support
	Priority and Reasons for Priority	High priority. In 2004, the construction of Midhurst TS T3/T4 was completed and was put into service. Under the Transmission System Code ("TSC"), and consequently the CCRA, Alectra was required to provide HONI with an initial capital contribution ("Initial Capital Contribution") based on the difference (the "Difference") between the total capital cost of constructing Midhurst TS T3/T4 and a projection of transformation revenue (the "HONI Revenue") earned on the conveyance of electricity through the TS. The Difference represents a contingent debt obligation of Alectra based on the extent that historical actual and forecast HONI Revenue during the CCRA term is less than the amount of HONI revenue projected as a basis for the determination of the Initial Capital Contribution. Conversely, Alectra is entitled to a rebate of the Capital Contribution based on the extent that historical actual and forecast HONI Revenue during the CCRA term is greater than the amount of HONI Revenue projected as a basis for the determination of the Initial Capital Contribution. As per the TSC, and consequently CCRA for low risk connections, HONI is required to complete a true-up on the five, ten, fifteen, twenty, and twenty-five year anniversaries to settle for demand forecast excesses or shortfalls. The fifteen-year anniversary true-up for Midhurst TS T3/T4 covers the period up to December 31st 2019. Alectra estimates a shortfall of revenue to HONI versus the forecasted initial capital contribution. Request for financial settlement is anticipated from HONI in 2020 with the final amount and payment terms negotiated between HONI and Alectra at that time. The revenue shortfall continues largely due to government-driven conservation initiatives, natural conservation and an impact of economic downturn that occurred in 2008 (and which has not been overcome) which have resulted in historical actual load being lower than forecasted load.
	Customer Attachment / Load (KVA)	Not applicable
	Safety	Not applicable
	Cyber-Security, Privacy	Not applicable
	Coordination, Interoperability	Not applicable
	Economic Development	Not applicable
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The peak demand in Barrie continues to be lower than forecasted before Midhurst TS T3/T4 was constructed. This will result in revenue shortfall for HONI. The revenue shortfall continues largely due to government-driven conservation initiatives, natural conservation, and an impact of economic downturn that occurred in 2008 (and which has not been overcome) which have resulted in historical actual load being lower than forecasted load.
	Alternative #1	There is only one option that can be considered with this investment as Alectra is obligated to comply with TSC requirements and provide cost recovery to HONI as required.
	Alternative #2	Not applicable
	Justification for Recommended Alternative	For the 15th year true up covering the period up to December 31st 2019, it is expected that Hydro One true-up calculation will show that Alectra actual load and updated load forecast is lower than the load in the initial load forecast and does not generate the initial forecast connection rate revenues. To account for the shortfall, Hydro One will require Alectra to make a payment in lump sum payment (plus applicable taxes). This cost is adjusted appropriately to reflect the time value of money and accounts for any previous true-up payments already made.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not applicable
	Comparative Information on Equivalent Historical Projects (if any)	Not applicable
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0

7. Category-Specific Requirements for Each Project/Activity (OEB)	Other Planning Objectives Met	Not applicable



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,175,016	$0	$3,175,016	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

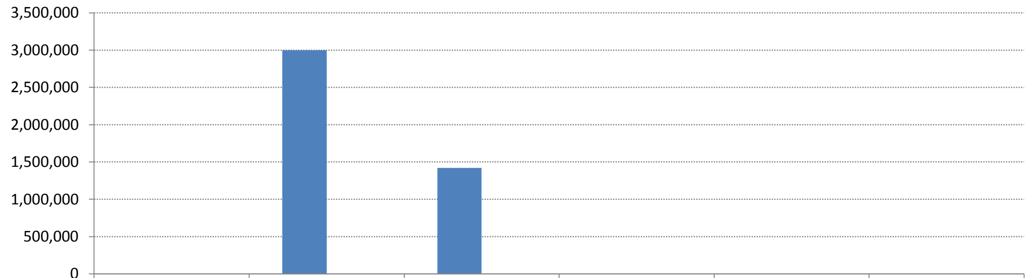
Project Code	151138	
Project Name	Voltage Conversion - MS-2 Church St, Brampton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Brampton
	Location	2b: Frederick St, Main St S & Clarence St 4: Wellington St E, Chapel St, John St, Mary St & Union St 6: West St, Nelson St W, Denison Ave, Park St & Railroad St 7: Queen St W, Mill St N, Elizabeth St N, Nelson St W & Railroad St 8: Mill St N, David St & Thomas St MS-2 44 Church St W
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	Renewal of assets in the area will incorporate conversion of the 4.16kV voltage level to a 27.6kV level. This conversion will allow for the existing substation to be bypassed and allow for it's decommissioning. 4.16kV to 27.6kV Voltage Conversion. Phase 2b, 4, 6, 7, & 8.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	This project mainly addresses aging assets at the station and on the feeders by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the municipal substation and associated equipment. The asset condition assessment indicate that the station transformer is in Poor condition. The priority assets determining the voltage conversion are the substation assets as failure of a critical component can cause a major outage for an extensive timeframe impacting a large number of customers. Furthermore due to system design and construction in the 1950's, feeder redundancy is minimal and loss of a station would result in stranded load and increased cost as generators would be required The legacy substation equipment is • No longer supported by the manufacturer; • Parts are difficult to come by or must be custom made; • Difficult or costly to maintain; • Functional and Operational Obsolesces; (e.g. safety restrictions on operation circuit breakers) • Unable to meet current safety standards (e.g., switchgears that are not arc resistance); • Unable to meet current performance standards Feeder Assets Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of other investments.
	Customer Attachment / Load (KVA)	MS-2 5000kVA 643 Customers
	Safety	Modern equipment reduces safety risks associated with older aging equipment.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Coordination of substation decommissioning must be done with conversion of associated distribution equipment in order to allow for contingency.
	Economic Development	Not Applicable
	Environmental Benefits	Conversion to 27.6kV from 4.16kV will result in less line losses on the circuits.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Run to Failure Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as many of the breaker assets have reached functional obsolescence and there are no parts available. This is not the recommended alternative.

	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings Under the like-for-like replacement option, existing 4.16 kV infrastructure would be replaced with new 4.16 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels. This is not the recommended alternative.
	Alternative #2	Full conversion of the lines to new 27.6 kV primary system voltage Renewal investments already would need to be undertaken based on the asset health condition for many of the station assets, poles and distribution transformers. Under this alternative, assets will be aligned to modern standards and practices. Unification of voltage levels across large sections of the system further improves the operability and should lead to reliability gains. Converting to higher-voltages will also create opportunities for Alectra Utilities to reconfigure the grid to add new switching points and automation, and to phase-out trouble areas like rear-lot construction. These improvements will allow Alectra Utilities to improve service to customers by conducting isolation, sectionalizing and restoration activities much faster. This is the recommended alternative.
	Justification for Recommended Alternative	The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Decommissioning of MS-8 in Brampton is similar to the nature of this project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Transformer has high DGA values, Breakers are in Good condition and new , but recently had an issue with the breaker's control card that required the entire station be taken out of service while the cards were replaced. Aging assets increase the risk of unplanned maintenance and system faults, resulting in customer outages. MS-2 is a 1964 Ferranti Packard vintage transformer which currently supplies the it's own feeders and an additional 3 feeders from MS-1. Contingency of the remaining 4.16kV is done merely by MS-12, and a failure in MS-2 will place full contingency dependence on MS-12.
	Condition of Asset vs. Typical Life Cycle and Performance Record	The 4.16kV asset class represents the oldest vintage in the Brampton area. Testing for the connected feeders from MS-1: 1F1 and 1F2 Feeders indicated worse case results in Hi-Pot testing. Poor results indicated as >0.5mA. 1F1 Blue phase tested 16.0mA, and 1F2 White phase tested 8.5mA.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	643
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	MS-2 currently provides supply for the old MS-1 feeders. 643 total customers are connected to the combined MS-1/MS-2 feeders., however this solution is not desired long-term without conversion to 27.6kV. 11 outages 20,372 customer minutes (3 year) 3.67 outages 0.53 hours (per year)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Aging assets increase the risk of unplanned maintenance and system faults, resulting in customer outages. Previous MS removal as part of the voltage conversion program results in increased contingency risk for the remaining 4.16kV substation transformers. Each substation removal results in further contingency risk until the program ultimately completes.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Halting voltage conversion would result in the loss of any additional benefits such as: • Reduction in OPEX costs (from eliminated station maintenance); • Increased reliability from feeder ties at 13.8 kV for both 4 kV customers and customers already on 13.8 kV feeders; • Automation (reduction in outage duration) for legacy 4 kV customers and some 13.8 kV customers; • Reduction in reactive costs triggered by asset failure; and • Reduction in line losses. If Alectra were to renew the deteriorated lower-voltage assets without converting to a higher voltage, it would lose the opportunity to economically transition to higher voltage equipment for a long period.
	Reliability and Safety Factors	Since there are a large population of feeder assets, the condition of feeder assets tends to be diverse. While the overall condition shows the average, this can be a case of diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment. Even if the assets in the worst condition were replaced, the rest of the system would continue to deteriorate and continue to pose reliability risk and eventually need to be replaced.

Analysis for "Like for Like" Renewal Project

Like-for-like renewal of lower-voltage assets would increase Alectra Utilities' stations capital requirements during the first three years of the DSP period by approximately $22M.

If Alectra Utilities decided to take an opportunistic approach, where only during rebuilds would conversion take place, in a piece-meal style approach, this would actually introduce more risk to customers. Stations in general are normally backed up by one or more stations in the same geographical area. Similarly feeders themselves are also backed up by other feeders in the surrounding geographical area. Removing any feeder as part of a rebuild could create gaps in the resiliency of the network and increase the risk and exposure to the remaining customers to prolonged outages.



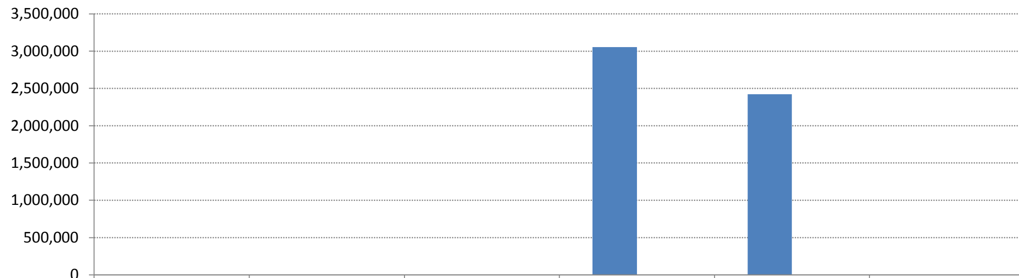
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,419,994	$0	$3,000,000	$1,419,994	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151139	
Project Name	Voltage Conversion - MS-12 Hansen Rd, Brampton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Brampton
	Location	Phase 9: Sophia St, Beech St, McCaul St & Woodward Ave Phase 10: Cumberland Dr, Brisco St, McCulla Ave, Edgemont Dr Phase 11: Centre St, Wilson Ave, Lynch St, John St & Queen St E Phase 12: MS12 & MS1 Loop Church St, Market St, Main St N, Vodden St E, Garfield Cres & Kennedy Rd N MS-12 149 Hansen Rd. N
	Units	
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Overhead Asset Renewal
	Alectra Subcategory	Voltage Conversion
4. Evaluation Criteria (OEB)	Project Summary	4.16kV to 27.6kV Voltage Conversion. Phase 9, 10, 11, & 12. Renewal of assets in the area will incorporate conversion of the 4.16kV voltage level to a 27.6kV level. This conversion will allow for the existing substation to be bypassed and allow for it's decommissioning. This project is part of a continued 4.16kV voltage conversion program in place for the city of Brampton.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	This project mainly addresses aging assets at the station and on the feeders by performing a renewal of the assets and converting the voltage to a higher class, thereby avoiding any future costs in upgrading the municipal substation and associated equipment. The asset condition assessment indicate that the breakers are in Poor condition. The priority assets determining the voltage conversion are the substation assets as failure of a critical component, such as the breaker lineup, can cause a major outage for an extensive timeframe impacting a large number of customers. Furthermore due to system design and construction in the 1950's, feeder redundancy is minimal and loss of a station would result in stranded load and increased cost as generators would be required The legacy substation equipment is •No longer supported by the manufacturer; •Parts are difficult to come by or must be custom made; •Difficult or costly to maintain; •Functional and Operational Obsolesces; (e.g. safety restrictions on operation circuit breakers) •Unable to meet current safety standards (e.g., switchgears that are not arc resistance); •Unable to meet current performance standards Feeder Assets Since there is large population of feeder assets, the condition of feeder assets is diverse. While the overall condition shows the average, as diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment.
	Customer Attachment / Load (KVA)	MS-12 15,000kVA
	Safety	Modern equipment reduces safety risks associated with older aging equipment.
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Coordination of substation decommissioning must be done with conversion of associated distribution equipment in order to allow for contingency.
	Economic Development	Not Applicable
	Environmental Benefits	Conversion to 27.6kV from 4.16kV will result in less line losses on the circuits.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status Quo / Run to Failure Under the status quo option, Alectra Utilities would only replace these legacy assets should they fail reactively. Under this scenario, there would be no opportunity to convert these assets to the standardized voltage levels, as assets would have to be replaced in a like-for-like manner. Replacing assets reactively tends to lead to the highest per-unit cost, and greatest impact to customer outage times. Furthermore, the reliability and safety risks associated with this infrastructure would continue to persist. Alectra Utilities would also be required to continue to maintain, and possibly replace or upgrade the legacy substations that supply these lower voltage levels, as many of the breaker assets have reached functional obsolescence and there are no parts available. This is not the recommended alternative.

	Alternative #1	Like-for-like replacement of existing assets with new assets at the same voltage ratings Under the like-for-like replacement option, existing 4.16 kV infrastructure would be replaced with new 4.16 kV infrastructure respectively. This approach is very similar to the status quo option, with the exception that customer outages can be avoided by replacing assets before they fail. By planning ahead to perform the replacements, the added benefit of like-for-like over the status quo is lower per-unit costs given that multiple assets can be addressed at a time. However, by keeping these system voltages intact, the functional obsolescence issues associated with these assets will continue to persist and eventually significant substation investments will be required. Should a future outage occur, it will likely be longer and create a larger customer impact, due to the lack of contingency options available at these voltage levels. This is not the recommended alternative.
	Alternative #2	Full conversion of the lines to new 27.6 kV primary system voltage Renewal investments already would need to be undertaken based on the asset health condition for many of the station assets, poles and distribution transformers. Under this alternative, assets will be aligned to modern standards and practices. Unification of voltage levels across large sections of the system further improves the operability and should lead to reliability gains. Converting to higher-voltages will also create opportunities for Alectra Utilities to reconfigure the grid to add new switching points and automation, and to phase-out trouble areas like rear-lot construction. These improvements will allow Alectra Utilities to improve service to customers by conducting isolation, sectionalizing and restoration activities much faster. This is the recommended alternative.
	Justification for Recommended Alternative	The full conversion option presents the best value long-term by having conversion completed in a planned manner while also avoiding the substation investment costs, as well as benefits to the operability of the system, which ultimately benefits the customers.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Not Applicable
	Comparative Information on Equivalent Historical Projects (if any)	Decommissioning of MS-8 in Brampton is similar to the nature of this project.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Breakers are obsolete and in Poor condition. MS12 is a 1970 Westinghouse 7.5 MVA transformer and the last in line of 4 decommissioned transformers. There is no contingency for MS12 and the area should be converted to the 27.6kV where contingency exists.
	Condition of Asset vs. Typical Life Cycle and Performance Record	The 4.16kV asset class represents the oldest vintage in the Brampton area. Failure of the assets increases as the vintage grows.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	521
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	521 Customers 29 outages 94267 customer minutes (3 year) 9.67 outages @ 3 hours (per year)
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Aging assets increase the risk of unplanned maintenance and system faults, resulting in customer outages. Previous MS removal as part of the voltage conversion program results in increased contingency risk for the remaining 4.16kV substation transformers. Each substation removal results in further contingency risk until the program ultimately completes.
	Value of Customer Impact	Low
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Halting voltage conversion would result in the loss of any additional benefits such as: • Reduction in OPEX costs (from eliminated station maintenance); • Increased reliability from feeder ties at 13.8 kV for both 4 kV customers and customers already on 13.8 kV feeders; • Automation (reduction in outage duration) for legacy 4 kV customers and some 13.8 kV customers; • Reduction in reactive costs triggered by asset failure; and • Reduction in line losses. • If Alectra were to renew the deteriorated lower-voltage assets without converting to a higher voltage, it would lose the opportunity to economically transition to higher voltage equipment for a long period.
	Reliability and Safety Factors	Since there are a large population of feeder assets, the condition of feeder assets tends to be diverse. While the overall condition shows the average, this can be a case of diverse populations masking the impact of deteriorated assets. If the Voltage Conversion projects were not to proceed, significant renewal investments would still be required to renew these deteriorated assets as part of the Overhead Renewal investment. Even if the assets in the worst condition were replaced, the rest of the system would continue to deteriorate and continue to pose reliability risk and eventually need to be replaced.
	Analysis for "Like for Like" Renewal Project	Like-for-like renewal of lower-voltage assets would increase Alectra Utilities' stations capital requirements during the first three years of the DSP period by approximately $22M. If Alectra Utilities decided to take an opportunistic approach, where only during rebuilds would conversion take place, in a piece-meal style approach, this would actually introduce more risk to customers. Stations in general are normally backed up by one or more stations in the same geographical area. Similarly feeders themselves are also backed up by other feeders in the surrounding geographical area. Removing any feeder as part of a rebuild could create gaps in the resiliency of the network and increase the risk and exposure to the remaining customers to prolonged outages.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $5,475,260	$0	$0	$0	$3,054,088	$2,421,172	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151141
Project Name	Cable Replacement and Transformers replacement - Project - Windjammer, Mississauga
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Subdivision in the Winston Churchill Blvd and The College Way area.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	Total connected transformation totals 3587kVA
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensures all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar projects would include - BoughBeeches for $2MM, Gananoque for $2.5MM
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable. Based on recently increasing failure trends in the area, Alectra Utilities anticipates further failures in the near term. In addition, continued failure of this cable may result in the cable and elbows being ultimately inoperable and would require substantial resources to replace segments in an emergency manner.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 45 years old (installed in 1971), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	40
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	This area has seen 32 cable faults since 2005, 9 of those failures in the last 3 years. One cable segement has seen seven (7) cable failures, two (2) other segments have seen three (3) cables failures, five (5) segments have seen 2 failures, and several others with 1 cable fault.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets that are experiencing failures. Furthermore, transformers well beyond their useful life with greater risk of failure will also be replaced. This renewal investment will provide customers in this area with better reliability.
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	• O&M Cost for emergency cable failure repair = $20,000 per failure • O&M Cost for 1 cable failure repairs = $20,000 x 1 = $20,000.
	Reliability and Safety Factors	Reliability benefits are found in the form of installing duct structure where none exists today, minimizing outage time for future interruptions and reducing capital costs for future asset renewal projects.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required). .

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,709,530	$0	$2,709,530	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151143	
Project Name	Cable Replacement and Transformers Replacement -Project - Shelter Bay Rd. Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Area of Winston Churchull Blvd. , Aquitane Ave, Shelter Bay Road, and Derry Road West.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults." .
	Customer Attachment / Load (KVA)	Total connected transformation totals 2025kVA
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensures all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Keep the cable in place and fix any defective section as reactive work.
	Alternative #1	Only replace the cables which have had failures. And inject the other segments.
	Alternative #2	Replace all the transformers not just those over typical useful life

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	This project is significantly smaller in size to the closest comparators. Appledore $1.8MM.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable. Based on recently increasing failure trends in the area, Alectra Utilities anticipates further failures in the near term. In addition, continued failure of this cable may result in the cable and elbows being ultimately inoperable and would require substantial resources to replace segments in an emergency manner.
	Condition of Asset vs. Typical Life Cycle and Performance Record	The 7 transformers being replaced have an average age of 37 years, average health index of 46%. However, when pulling the elbows based on the age many of the bushing will be prone to failure. Average age of the cable is 37 years, well beyond the life expectancy for Non-TR XLPE.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	30
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	This area has seen 16 cable faults since 2005, 4 of those failures in the last 3 years. One cable segement has seen three (4) cable failures, four (4) other segments have seen two (2) cables failures, and several others with 1 cable fault.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets that are experiencing failures. Furthermore, transformers well beyond their useful life with greater risk of failure will also be replaced. This renewal investment will provide customers in this area with better reliability.
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	Local approvals and weather
	Consequences for O&M System Costs Including Implications of Not Implementing	This project will have no material impact on planned O&M costs.
	Reliability and Safety Factors	Reliability benefits are found in the form of installing duct structure where none exists today, minimizing outage time for future interruptions and reducing capital costs for future asset renewal projects.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,075,454	$0	$1,075,454	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151144	
Project Name	Cable Replacement Project and Transformers Replacement - Rathburn Rd. W, Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Area of Creditview Rd, Rathburn Road West, Burnhamthorpe Road West and Perivale Road.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."?
	Customer Attachment / Load (KVA)	Total connected transformation totals 9000kVA
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensures all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.?
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar projects would include - BoughBeeches for $2MM, Gananoque for $2.5MM
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable. Based on recently increasing failure trends in the area, Alectra Utilities anticipates further failures in the near term. In addition, continued failure of this cable may result in the cable and elbows being ultimately inoperable and would require substantial resources to replace segments in an emergency manner.
	Condition of Asset vs. Typical Life Cycle and Performance Record	The 4 transformers are being replaced all have a health index below 50%. However, when pulling the elbows based on the age many of the bushing will be prone to failure. Average age of the cable is 30 years, which is around the life expectancy for Non-TR XLPE cable.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	40
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	This area has seen 23 cable faults since 2005, 10 of those failures in the last 3 years. Two (2) segments have had 3 failures with numerous more having had a single failure.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	• O&M Cost for emergency cable failure repair = $20,000 per failure • O&M Cost for 1 cable failure repairs = $20,000 x 1 = $20,000.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1 potential cable failures and 44,518 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,857,719	$3,681,922	$1,175,797	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

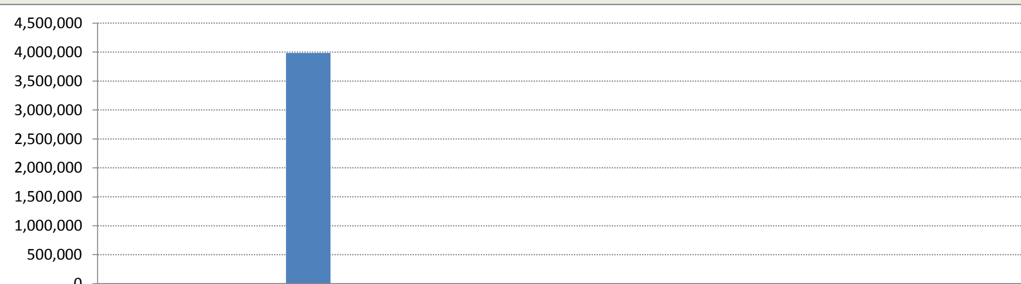
OEB Multi-Project Report

Project Code	151146
Project Name	Cable Replacement and Transformers Replacement - Project - Folkway, Mississauga
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Area of Winston Churchill Blvd. , Highway 403, Burnhamthorpe Rd W, and Glen Erin Drive
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Replacing 15 transformers which are well beyond typical useful life (41 years), and rebuilding the subdivison with all cables in duct. This area has seen 34 cable faults since 2005, 9 of those failures in the last 3 years. One cable segement has seen five (5) cable failures, seven (7) other segments have seen two (2) cables failures, and several others with 1 cable fault. During the rebuild a padmounted switchgear will be abandoned and a junction placed instead. Additional redundency will be built in during the rebuild to provide flexiabilty for outage management in the future.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	This area has seen 34 cable faults since 2005, 9 of those failures in the last 3 years. One cable segement has seen five (5) cable failures, seven (7) other segments have seen two (2) cables failures, and several others with 1 cable fault.
	Customer Attachment / Load (KVA)	Total connected transformation totals 6100kVA
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensures all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Keep the cable in place and fix any defective section as reactive work.
	Alternative #1	Only replace the cables which have had failures. And inject the other segments. Only replace transformers if they fail during the rebuild.
	Alternative #2	Replace all cables in duct and replace all the transformers not just those over typical useful life
	Justification for Recommended Alternative	Base on the existing data and past expierence by replacing the whole cable , it would prove to be the best and most economical solution in the long run. Since this subdivision was built at the same time, replacing only certain segments would not prevent cable faults on the non-replaced segments which would still have a high likely hood of failure. Alectra Mississauga has in the past reviewed the possibility of rehabilitating the cable with cable injection technology but has determined that this location was not a candidate due to the higher number of cable faults, large portion of solid type conductors, which cannot be injected, high probability of corroded neutrals, and uncertainty of the large number of splice locations in the area. Upon the investigation of 124 cable faults in 2014-2015, 62.1% of the failed cables were solid conductors, thus, cable injection is not a possibility for these types of cables. Moreover, 95.2% of the failed cables were direct buried (not in ducts) and unjacketed; some of these outages were the result of corroded neutrals. Replacing all the transformers is not economical as some have resently been replaced and others are still in good condition.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Alectra Utilities considers the following as general risks to project schedule and cost: - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar projects would include - BoughBeeches for $2MM, Gananoque for $2.5MM
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0

7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable. Based on recently increasing failure trends in the area, Alectra Utilities anticipates further failures in the near term. In addition, continued failure of this cable may result in the cable and elbows being ultimately inoperable and would require substantial resources to replace segments in an emergency manner.
	Condition of Asset vs. Typical Life Cycle and Performance Record	The 15 transformers being replaced have an average age of 41 years, average health index of 54%. However, when pulling the elbows based on the age many of the bushing will be prone to failure. Average age of the cable is years, well beyond the life expectancy for Non-TR XLPE.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	40
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	This area has seen 34 cable faults since 2005, 9 of those failures in the last 3 years. One cable segement has seen five (5) cable failures, seven (7) other segments have seen two (2) cables failures, and several others with 1 cable fault.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	This project will address aging assets that are experiencing failures. Furthermore, transformers well beyond their useful life with greater risk of failure will also be replaced. This renewal investment will provide customers in this area with better reliability.
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	This project will have no material impact on planned O&M costs.
	Reliability and Safety Factors	Reliability benefits are found in the form of installing duct structure where none exists today, minimizing outage time for future interruptions and reducing capital costs for future asset renewal projects.
	Analysis for "Like for Like" Renewal Project	Like for like renewal would address the issue of equipment failure due to end-of-life assets in the area, but there is no system benefit in rebuilding the fedeer as "direct buried". Future replacment would be more costly then the additonal cost to place in duct now.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,980,999	$0	$3,980,999	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151176	
Project Name	Cable Replacement Project - MS Argentia distribution feeder(s) upgrade	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Area of Creditview Rd, Falconer Drive, Campobello Road and Argentia Road.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	Total connected transformation totals 6000kVA
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensures all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	"Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	This project is significantly smaller in size to the closest comparators. Appledore $1.8MM.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Without investment the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable. Based on recently increasing failure trends in the area, Alectra Utilities anticipates further failures in the near term. In addition, continued failure of this cable may result in the cable and elbows being ultimately inoperable and would require substantial resources to replace segments in an emergency manner.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 45 years old (installed in 1971), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years. Some of the cables are over 30 years old and the health index is 0.00109
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1700
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	All the cable in this area had one failure. B7020 to B134480, 121m (58F2), 2004 B7325 to B126100 , 110m (58F4), 1997 B7613 to B124468, 120m (58F4), 1994 B7049 to C74011, 285m (58F4), 1997 Tx7470 to Tx 7471, 50m (58F3), 2007 Tx7471 to Tx7468, 99m (58F3), 1973 Tx7472 to Tx7469, 176m (58F3), 1973 B129851 to Tx12472, 272m (58 F1), 2010 Tx7384 to Tx 7385, 84m (58F1) - 2005 Tx5990 to Tx5991, 115m (58F3) - 1973 Tx7383 to Tx7943, 255m (58F3) - 1973
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	Medium
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	• O&M Cost for emergency cable failure repair = $20,000 per failure • O&M Cost for 1 cable failure repairs = $20,000 x 1 = $20,000.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1 potential cable failures and 44,518 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

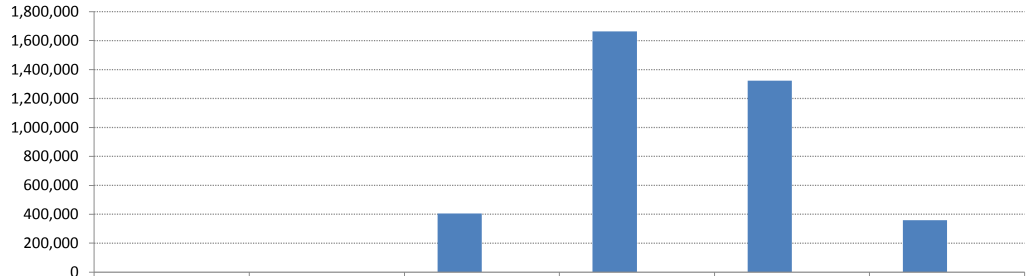
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,566,566	$0	$1,566,566	$0	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151286	
Project Name	Cable Replacement Project - (H2) - Wanless - Heart Lake - Bovaird - Kennedy, Brampton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Brampton
	Location	Brampton (H2) - Wanless - Heart Lake - Bovaird - Kennedy
	Units	10714
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 11 cable and splice failures since 2000. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 42 years old (installed in 1977), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	829
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 10714 m of cable in the whole area: Frequency of Failure is: 0.25 x 10714 /1000 = 2.7 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 2.7 failures: 307 x 2.7 = 829 customers affected and 43,131 x 2.7 = 116454 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 2.7 potential cable failures and 116454 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,749,900	$0	$0	$404,950	$1,663,200	$1,323,000	$358,750
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

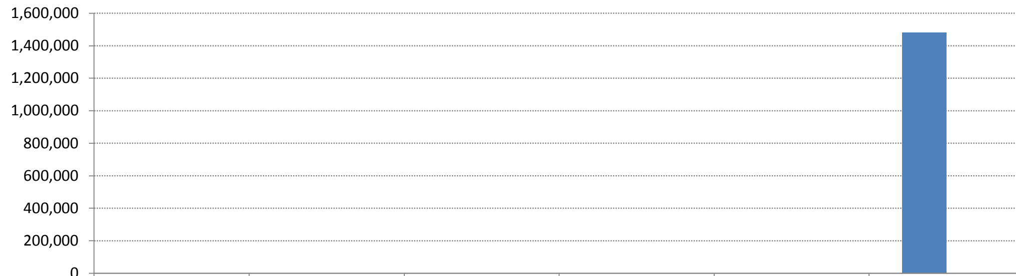
OEB Multi-Project Report

Project Code	151291	
Project Name	Cable Replacement Project - (I4) - Queen - Dixie - Steeles - Hwy 410, Brampton	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Brampton
	Location	(I4) - Queen - Dixie - Steeles - Hwy 410, Brampton
	Units	4230
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 1 cable and splice failures since 2000. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 43 years old (installed in 1976), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	338
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 4230 m of cable in the whole area: Frequency of Failure is: 0.25 x 4230 /1000 = 1.1 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.1 failures: 307 x 1.1 = 338 customers affected and 43,131 x 1.1 = 47444 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.1 potential cable failures and 47444 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,480,500	$0	$0	$0	$0	$0	$1,480,500
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151292
Project Name	Cable Replacement Project- (K4) - Queen - Torbram - Steeles - Bramalea
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

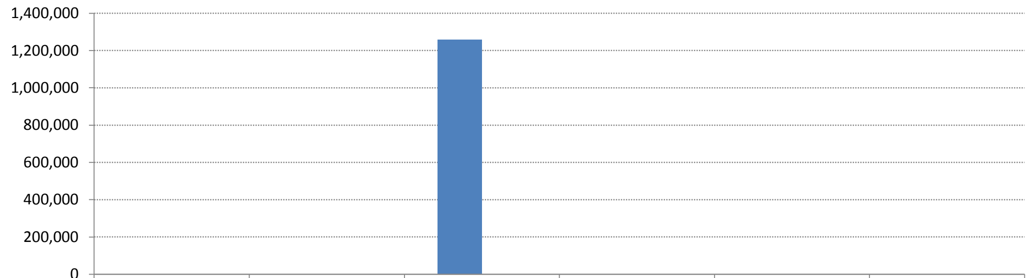
Project Overview

2. Additional Information	Service Territory	Brampton
	Location	(K4) - Queen - Torbram - Steeles - Bramalea , Brampton
	Units	3595
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 1 cable and splice failures since 2000. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 43 years old (installed in 1976), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	276
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 3595 m of cable in the whole area: Frequency of Failure is: 0.25 x 3595 /1000 = 0.9 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 0.9 failures: 307 x 0.9 = 276 customers affected and 43,131 x 0.9 = 38818 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 0.9 potential cable failures and 38818 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



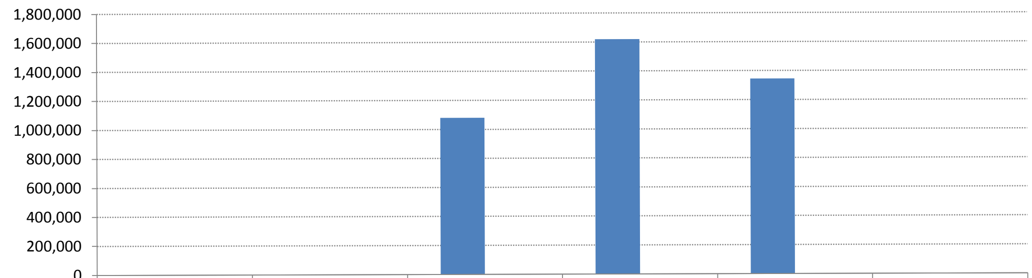
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,258,250	$0	$0	$1,258,250	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151299	
Project Name	Cable Replacement Project - (HAM) - Millen - Barton - Fruitland	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Millen - Barton - Fruitland (Hamilton)
	Units	12708
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not applicable.
	Safety	Not applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform cable replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects in 2015, 2016, and 2017 were $328/m on average. This project is forecasted to be $312/m, $318/m and $325/m in 2021, 2022, and 2023 respectively. The difference is based on the assumption that the unit cost is to be $300/m in the base year of 2019 (less complicated than projects already completed in prior years) and increased with inflation at 2% each year.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	There are 16 failures in this project scope. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area ranges from 26 to 69 years old (installed in 1993 and 1950 respectively), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1065
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable: Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 12,708m of cable in the whole area: Frequency of Failure is: 0.25 x 12,708 /1000 = 3.18 failures Annually on average over the past five years (2014, 2015, 2016, 2017, and 2018), there were 504 cable and cable accessory failures (XLPE) affecting 168,999 customers and 12,120,180 CMI Impact of 1 failure: 168,999/504 = 335 customers affected and 12,120,180/504 = 24,048 CMI Impact of 3.18 failures: 335 x 3.18 = 1,065 customers affected and 24,048 x 3.18 = 7,6473 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not applicable.
	Reliability and Safety Factors	This project is part of the long-term cable remediation program. The project will help avoid a total of 3.18 potential cable failures and 7,6473 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition, it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



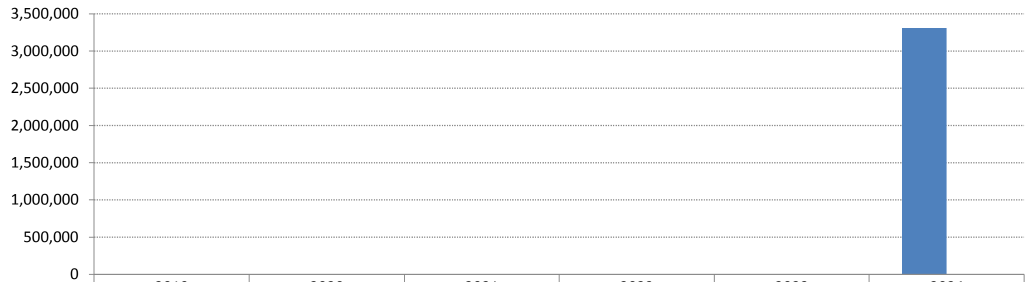
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,044,419	$0	$0	$1,079,286	$1,619,453	$1,345,680	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151301	
Project Name	Cable Replacement Project - (HAM) - Rymal - Mud - Upper Centennial - Upper Red Hill Valley	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Rymal - Mud - Upper Centennial - Upper Red Hill Valley (Hamilton)
	Units	32108
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not applicable.
	Safety	Not applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform cable replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects in 2015, 2016, and 2017 were $328/m on average. This project is forecasted to be $331/m, $338/m and $3245/m in 2024, 2025, and 2026 respectively. The difference is based on the assumption that the unit cost is to be $300/m in the base year of 2019 (less complicated than projects already completed in prior years) and increased with inflation at 2% each year.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	There are 8 failures in this project scope. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area ranges from 26 to 69 years old (installed in 1993 and 1950 respectively), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years. In addition, this project scope contains feeder (331X and 341X) which were identified as 2018 Worst Performing Feeders in the West.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	2690
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable: Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 32,108m of cable in the whole area: Frequency of Failure is: 0.25 x 32,108 /1000 = 8.03 failures Annually on average over the past five years (2014, 2015, 2016, 2017, and 2018), there were 504 cable and cable accessory failures (XLPE) affecting 168,999 customers and 12,120,180 CMI Impact of 1 failure: 168,999/504 = 335 customers affected and 12,120,180/504 = 24,048 CMI Impact of 8.03 failures: 335 x 8.03 = 2,690 customers affected and 24,048 x 8.03 = 193,105 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not applicable.
	Reliability and Safety Factors	This project is part of the long-term cable remediation program. The project will help avoid a total of 8.03 potential cable failures and 193,105 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition, it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



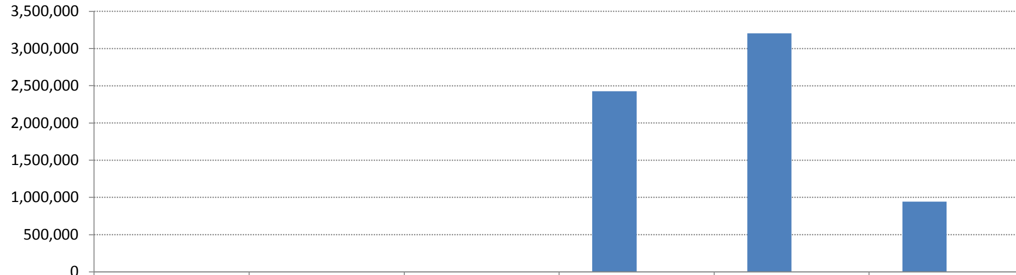
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,312,242	$0	$0	$0	$0	$0	$3,312,242
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151303	
Project Name	Cable Replacement Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Hamilton
	Location	Stone Church - Garth - Lincoln M. Alexander (Hamilton)
	Units	20343
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not applicable.
	Safety	Not applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform cable replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects in 2015, 2016, and 2017 were $328/m on average. This project is forecasted to be $318/m, $325/m and $331/m in 2022, 2023, and 2024 respectively. The difference is based on the assumption that the unit cost is to be $300/m in the base year of 2019 (less complicated than projects already completed in prior years) and increased with inflation at 2% each year.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	There are 5 failures in this project scope. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area ranges from 26 to 69 years old (installed in 1993 and 1950 respectively), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1705
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable: Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 20,343m of cable in the whole area: Frequency of Failure is: 0.25 x 20,343 /1000 = 5.09 failures Annually on average over the past five years (2014, 2015, 2016, 2017, and 2018), there were 504 cable and cable accessory failures (XLPE) affecting 168,999 customers and 12,120,180 CMI Impact of 1 failure: 168,999/504 = 335 customers affected and 12,120,180/504 = 24,048 CMI Impact of 5.09 failures: 335 x 5.09 = 1,705 customers affected and 24,048 x 5.09 = 122,404 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not applicable.
	Reliability and Safety Factors	This project is part of the long-term cable remediation program. The project will help avoid a total of 5.09 potential cable failures and 122,404 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition, it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $6,575,921	$0	$0	$0	$2,428,274	$3,204,320	$943,327
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

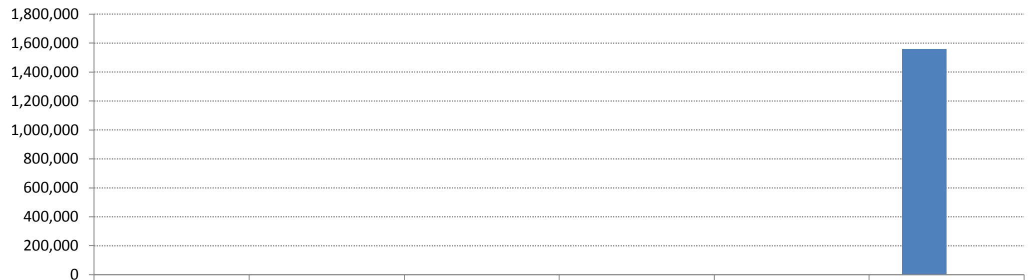
OEB Multi-Project Report

Project Code	151315
Project Name	Cable Injection Project - (G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Brampton
	Location	(G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton
	Units	24923
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.

	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $63/m. The difference is based on the assumption that this project is less complicated (has fewer splices to replace) than projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 3 cable and splice failures since 2000. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 35 years old (installed in 1984), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1903
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 24923 m of cable in the whole area: Frequency of Failure is: 0.25 x 24923 /1000 = 6.2 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 6.2 failures: 307 x 6.2 = 1903 customers affected and 43,131 x 6.2 = 267412 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 6.2 potential cable failures and 267412 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,557,688	$0	$0	$0	$0	$0	$1,557,688
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

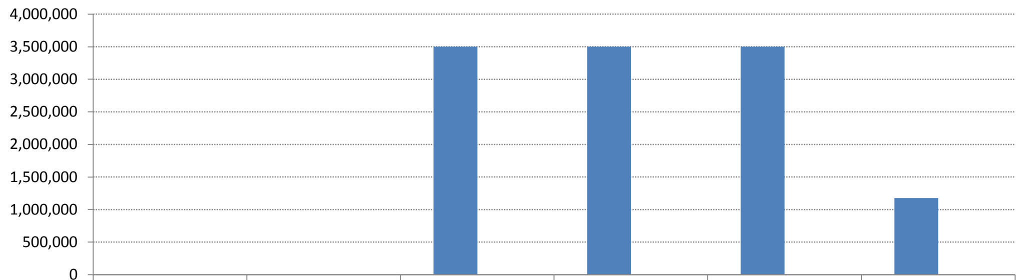
OEB Multi-Project Report

Project Code	151325
Project Name	Cable Replacement Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(M31) - 14th - Old Kennedy - Steeles - Warden, Markham
	Units	33367
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 38 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 40 years old (installed in 1979), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	2548
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 33367 m of cable in the whole area: Frequency of Failure is: 0.25 x 33367 /1000 = 8.3 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 8.3 failures: 307 x 8.3 = 2548 customers affected and 43,131 x 8.3 = 357987 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 8.3 potential cable failures and 357987 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $11,678,450	$0	$0	$3,500,000	$3,500,000	$3,500,000	$1,178,450
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

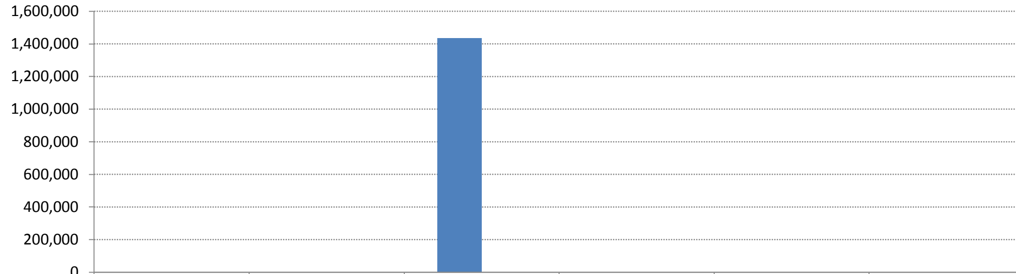
OEB Multi-Project Report

Project Code	151328	
Project Name	Cable Replacement Project- (21a) Darcel & Brandon Gate, Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	(21a) Darcel & Brandon Gate, Mississauga
	Units	2956
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 2650 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 2,956 m which totals to approximately $0.74 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.7 M will be required to replace other deteriorating assets. Thus, the total cost for this project is approximately $1.44 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 14 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable. Based on recently increasing failure trends in the area, Alectra Utilities anticipates further failures in the near term. In addition, continued failure of this cable may result in the cable and elbows being ultimately inoperable and would require substantial resources to replace segments in an emergency manner.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 46 years old (installed in 1973), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	324
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 4,087 m of cable: • Frequency of Failure Rate is: 0.25 x 4087/1000 = 1.022 failures, rounded to 1 failure per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 14 cable failure repairs = $20,000 x 14 = $280,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 14 potential cable faults and 336,700 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,436,431	$0	$0	$1,436,431	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

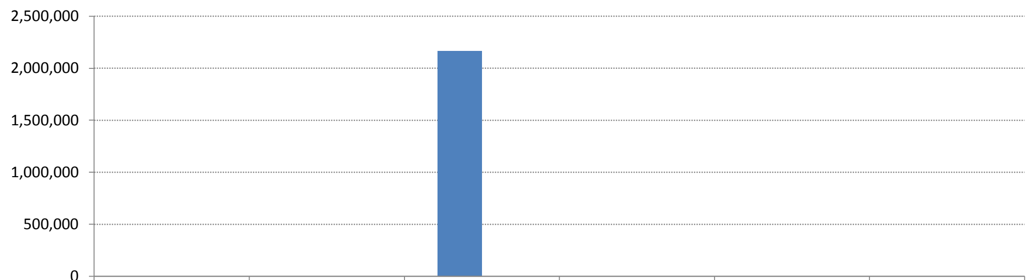
OEB Multi-Project Report

Project Code	151329	
Project Name	Cable Replacement Project - (V51) - Langstaff - Kipling - Hwy 7 - Hwy 27, Vaughan	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V51) - Langstaff - Kipling - Hwy 7 - Hwy 27, Vaughan
	Units	6192
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 5 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 41 years old (installed in 1978), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	461
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 6192 m of cable in the whole area: Frequency of Failure is: 0.25 x 6192 /1000 = 1.5 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.5 failures: 307 x 1.5 = 461 customers affected and 43,131 x 1.5 = 64697 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.5 potential cable failures and 64697 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



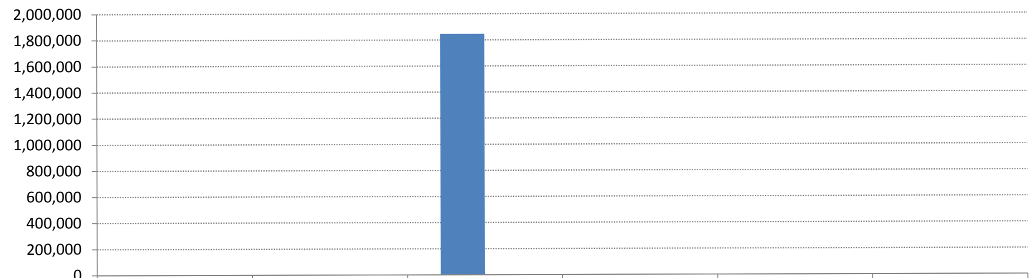
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,167,200	$0	$0	$2,167,200	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151330	
Project Name	Cable Replacement Project - (A01) - Henderson - Yonge - Bloomington - Bathurst, Aurora	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(A01) - Henderson - Yonge - Bloomington - Bathurst, Aurora
	Units	5273
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 3 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 41 years old (installed in 1978), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	399
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 5273 m of cable in the whole area: Frequency of Failure is: 0.25 x 5273 /1000 = 1.3 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.3 failures: 307 x 1.3 = 399 customers affected and 43,131 x 1.3 = 56070 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.3 potential cable failures and 56070 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,845,550	$0	$0	$1,845,550	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

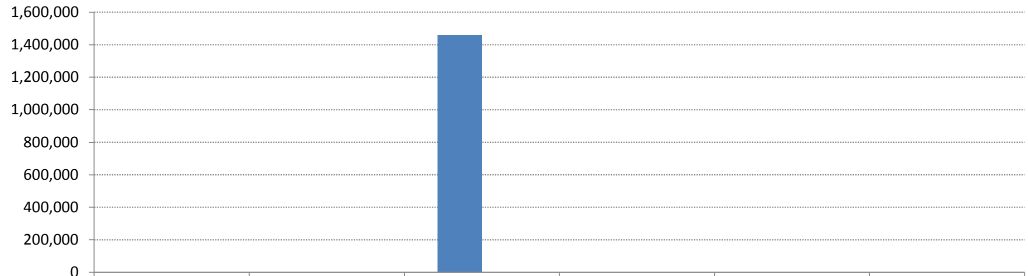
OEB Multi-Project Report

Project Code	151331	
Project Name	Cable Replacement Project - (V41) - Stephanie Blvd, Vaughan	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V41) - Stephanie Blvd, Vaughan
	Units	4174
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 2 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 39 years old (installed in 1980), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	307
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 4174 m of cable in the whole area: Frequency of Failure is: 0.25 x 4174 /1000 = 1 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1 failures: 307 x 1 = 307 customers affected and 43,131 x 1 = 43131 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1 potential cable failures and 43131 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,460,900	$0	$0	$1,460,900	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

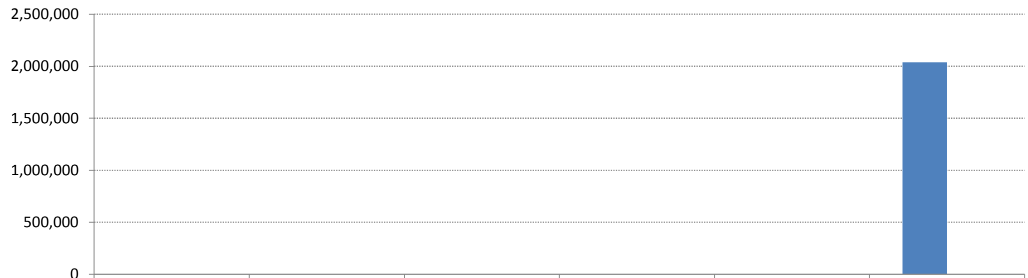
OEB Multi-Project Report

Project Code	151332	
Project Name	Cable Replacement Project - (BA20) - Bayfield and Simcoe, Barrie	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	(BA20) - Bayfield and Simcoe, Barrie
	Units	5811
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 29 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 49 years old (installed in 1970), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	461
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 5811 m of cable in the whole area: Frequency of Failure is: 0.25 x 5811 /1000 = 1.5 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.5 failures: 307 x 1.5 = 461 customers affected and 43,131 x 1.5 = 64697 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.5 potential cable failures and 64697 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,033,850	$0	$0	$0	$0	$0	$2,033,850
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

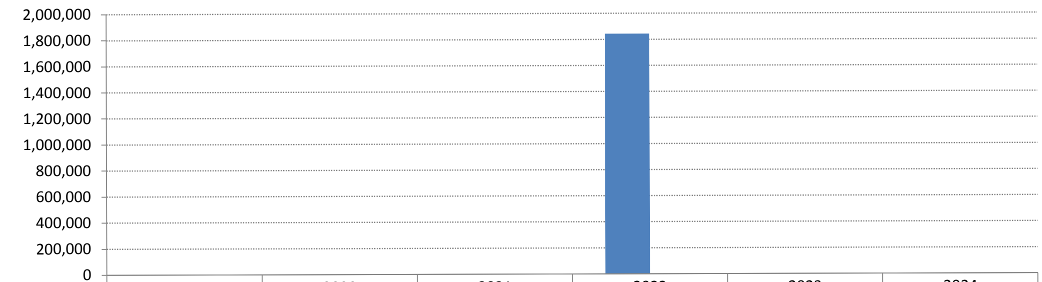
OEB Multi-Project Report

Project Code	151333
Project Name	Cable Replacement Project - (BA9) - Little - Fairview - Harvie - Ferndale, Barrie
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream North
	Location	(BA9) - Little - Fairview - Harvie - Ferndale, Barrie
	Units	5268
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 29 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 47 years old (installed in 1972), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	399
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 5268 m of cable in the whole area: Frequency of Failure is: 0.25 x 5268 /1000 = 1.3 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.3 failures: 307 x 1.3 = 399 customers affected and 43,131 x 1.3 = 56070 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.3 potential cable failures and 56070 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,843,800	$0	$0	$0	$1,843,800	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

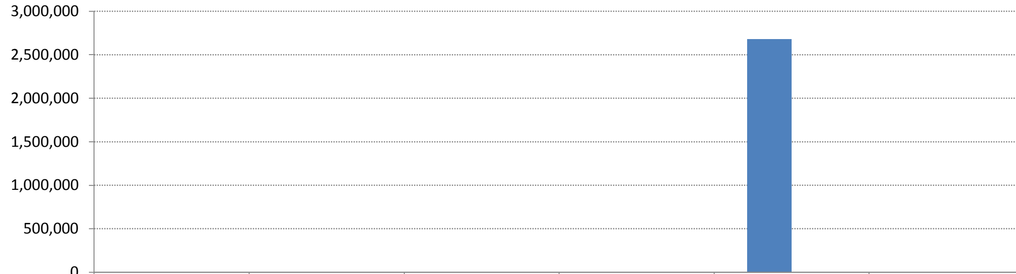
OEB Multi-Project Report

Project Code	151335	
Project Name	Cable Replacement Project - (BA14) - Tifffin and Hwy 400, Barrie	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	(BA14) - Tifffin and Hwy 400, Barrie
	Units	7663
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 29 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 47 years old (installed in 1972), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	583
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 7663 m of cable in the whole area: Frequency of Failure is: 0.25 x 7663 /1000 = 1.9 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.9 failures: 307 x 1.9 = 583 customers affected and 43,131 x 1.9 = 81949 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.9 potential cable failures and 81949 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,682,050	$0	$0	$0	$0	$2,682,050	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

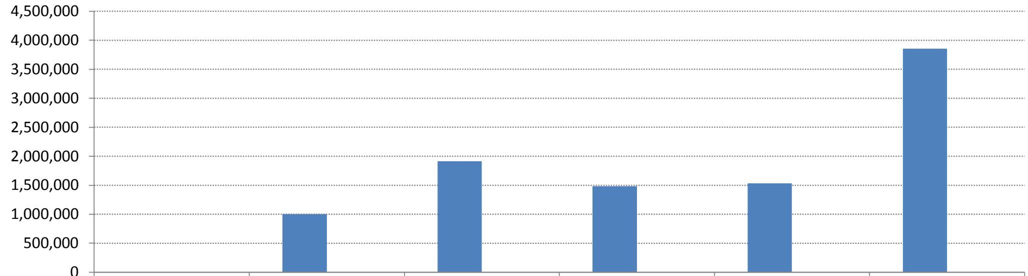
Currency scale is in literal

OEB Multi-Project Report

Project Code	151336	
Project Name	Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	(BA22) - Sunnidale and Anne, Barrie
	Units	27961
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 29 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 45 years old (installed in 1974), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	2180
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 27961 m of cable in the whole area: Frequency of Failure is: 0.25 x 27961 /1000 = 7.1 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 7.1 failures: 307 x 7.1 = 2180 customers affected and 43,131 x 7.1 = 306230 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 7.1 potential cable failures and 306230 potential CMI.

Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $9,786,021	$0	$1,000,194	$1,915,677	$1,482,600	$1,530,900	$3,856,650
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

alectra utilities

OEB Multi-Project Report

Project Code	151337
Project Name	Cable Replacement Project - (BA18) - Ferndale and Benson, Barrie
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream North
	Location	(BA18) - Ferndale and Benson, Barrie
	Units	2923
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 29 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 41 years old (installed in 1978), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	215
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 2923 m of cable in the whole area: Frequency of Failure is: 0.25 x 2923 /1000 = 0.7 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 0.7 failures: 307 x 0.7 = 215 customers affected and 43,131 x 0.7 = 30192 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 0.7 potential cable failures and 30192 potential CMI.
	Analysis for "Like for Like" Renewal Project	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 0.7 potential cable failures and 30192 potential CMI.

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,023,050	$0	$0	$0	$0	$1,023,050	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

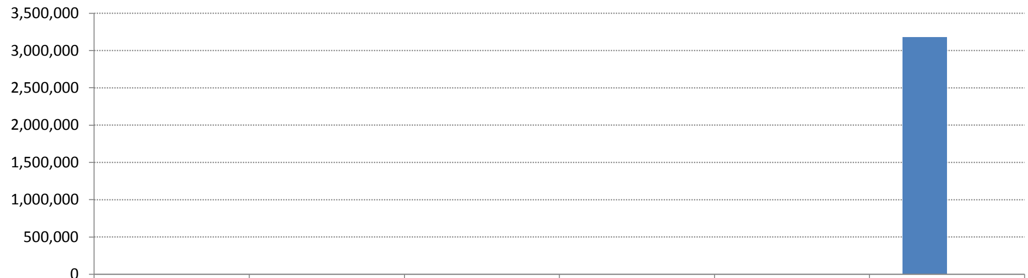
OEB Multi-Project Report

Project Code	151338	
Project Name	Cable Replacement Project- (BA15) - Burton - Huronia - Little - Bayview, Barrie	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	(BA15) - Burton - Huronia - Little - Bayview, Barrie
	Units	9082
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 29 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 44 years old (installed in 1975), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	706
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 9082 m of cable in the whole area: Frequency of Failure is: 0.25 x 9082 /1000 = 2.3 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 2.3 failures: 307 x 2.3 = 706 customers affected and 43,131 x 2.3 = 99201 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 2.3 potential cable failures and 99201 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



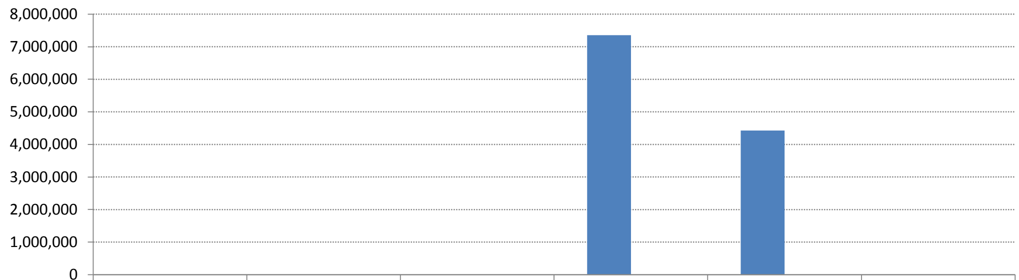
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,178,700	$0	$0	$0	$0	$0	$3,178,700
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151339	
Project Name	Cable Replacement Project - (BA19) - Letitia - Anne - Edgehill - Ferndale, Barrie	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream North
	Location	(BA19) - Letitia - Anne - Edgehill - Ferndale, Barrie
	Units	33645
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 29 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 45 years old (installed in 1974), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	2610
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 33645 m of cable in the whole area: Frequency of Failure is: 0.25 x 33645 /1000 = 8.5 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 8.5 failures: 307 x 8.5 = 2610 customers affected and 43,131 x 8.5 = 366614 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 8.5 potential cable failures and 366614 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $11,775,755	$0	$0	$0	$7,349,941	$4,425,814	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151340
Project Name	Cable Replacement Project - (V29) - Hwy 7 - Jane - Steeles - Weston, Vaughan
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

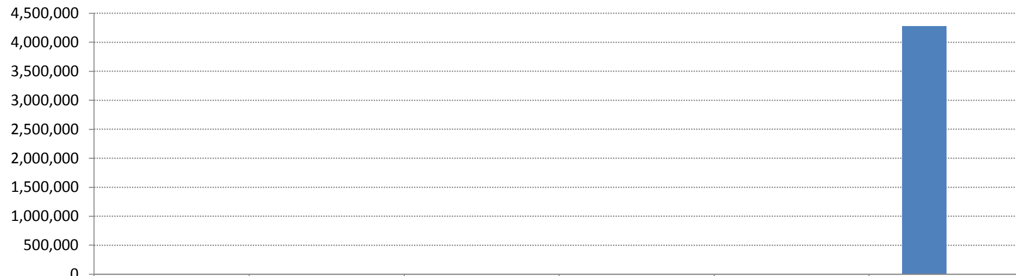
Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V29) - Hwy 7 - Jane - Steeles - Weston, Vaughan
	Units	12221
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (fewer obstruction, better clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 5 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 2019 years old (installed in), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1842
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 24000 m of cable in the whole area: Frequency of Failure is: 0.25 x 24000 /1000 = 6 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 6 failures: 307 x 6 = 1842 customers affected and 43,131 x 6 = 258786 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 6 potential cable failures and 258786 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,277,350	$0	$0	$0	$0	$0	$4,277,350
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151361	
Project Name	Cable Injection Project - (V26) - Teston - Keele - Major Mackenzie - Jane, Vaughan	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V26) - Teston - Keele - Major Mackenzie - Jane, Vaughan
	Units	18953
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.

	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $63/m. The difference is based on the assumption that this project is less complicated (has fewer splices to replace) than projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 8 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 38 years old (installed in 1981), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	1443
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 18953 m of cable in the whole area: Frequency of Failure is: 0.25 x 18953 /1000 = 4.7 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 4.7 failures: 307 x 4.7 = 1443 customers affected and 43,131 x 4.7 = 202716 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 4.7 potential cable failures and 202716 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable.

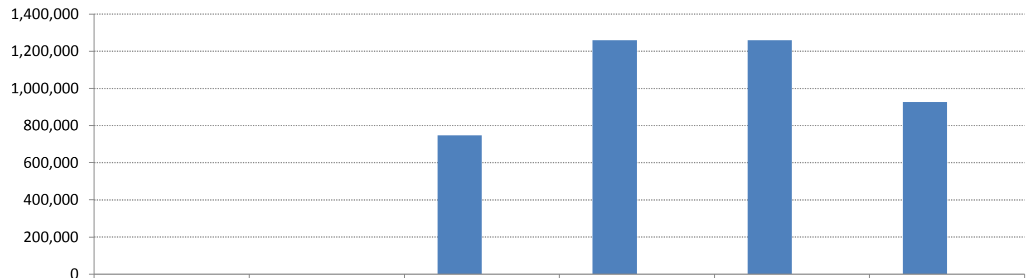
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,194,039	$0	$0	$0	$0	$0	$1,194,039
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151362	
Project Name	Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(M39) - 16th - Warden - Hwy 7 - Woodbine, Markham
	Units	66593
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.

	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $63/m. The difference is based on the assumption that this project is less complicated (has fewer splices to replace) than projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 8 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 37 years old (installed in 1982), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	5127
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 66593 m of cable in the whole area: Frequency of Failure is: 0.25 x 66593 /1000 = 16.7 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 16.7 failures: 307 x 16.7 = 5127 customers affected and 43,131 x 16.7 = 720288 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 16.7 potential cable failures and 720288 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable.



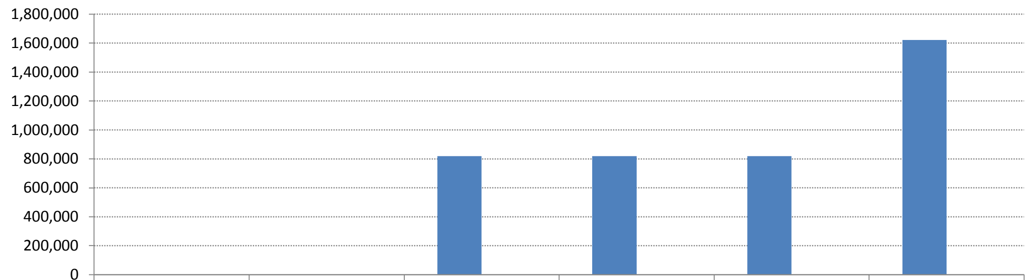
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,195,655	$0	$0	$747,845	$1,260,235	$1,260,000	$927,575
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151363	
Project Name	Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(M25) - 14th - McCowan - Steeles - Old Kennedy, Markham
	Units	64737
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.

	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $63/m. The difference is based on the assumption that this project is less complicated (has fewer splices to replace) than projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 14 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 32 years old (installed in 1987), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	5004
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 64737 m of cable in the whole area: Frequency of Failure is: 0.25 x 64737 /1000 = 16.3 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 16.3 failures: 307 x 16.3 = 5004 customers affected and 43,131 x 16.3 = 703035 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 16.3 potential cable failures and 703035 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable.



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $4,078,431	$0	$0	$819,000	$819,000	$819,000	$1,621,431
Actuals: $0	$0	$0	$0	$0	$0	$0

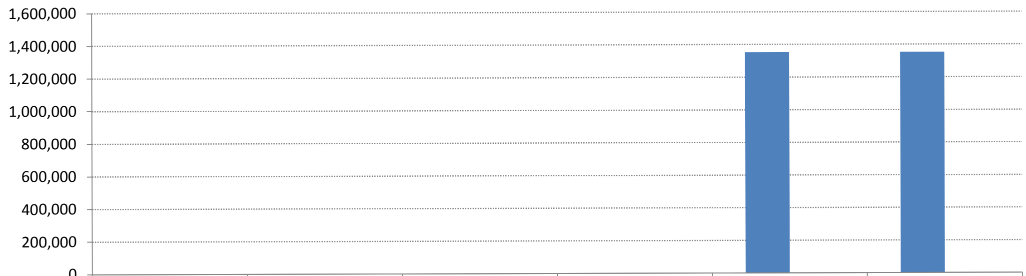
Currency scale is in literal

OEB Multi-Project Report

Project Code	151366	
Project Name	Cable Injection Project - (M19) - Markham - Steeles - McCowan - 14th, Markham	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(M19) - Markham - Steeles - McCowan - 14th, Markham
	Units	42960
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.

	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.
	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $63/m. The difference is based on the assumption that this project is less cvomplicated (has fewer splices to replace) than projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 7 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 31 years old (installed in 1988), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	3316
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 42960 m of cable in the whole area: Frequency of Failure is: 0.25 x 42960 /1000 = 10.8 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 10.8 failures: 307 x 10.8 = 3316 customers affected and 43,131 x 10.8 = 465815 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 10.8 potential cable failures and 465815 potential CMI.

Analysis for "Like for Like" Renewal Project Not Applicable



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,706,480	$0	$0	$0	$0	$1,353,240	$1,353,240
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

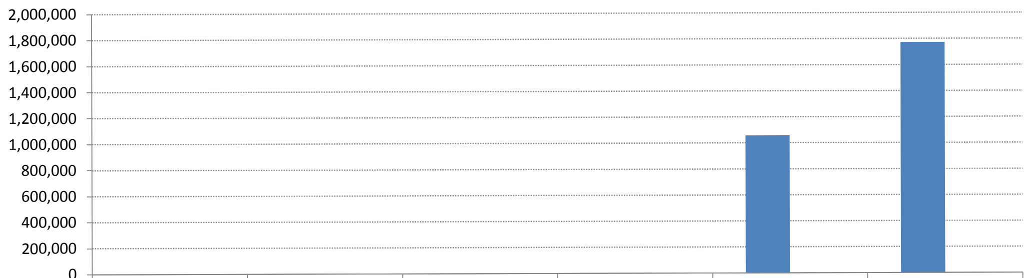
OEB Multi-Project Report

Project Code	151367	
Project Name	Cable Injection Project - (M21) - Hwy 7 - Markham - 16th - McCowan, Markham	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(M21) - Hwy 7 - Markham - 16th - McCowan, Markham
	Units	44909
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.

	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $63/m. The difference is based on the assumption that this project is less complicated (has fewer splices to replace) than projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 6 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 34 years old (installed in 1985), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	0
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 44909 m of cable in the whole area: Frequency of Failure is: 0.25 x 44909 /1000 = 11.2 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 11.2 failures: 307 x 11.2 = 3438 customers affected and 43,131 x 11.2 = 483067 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 11.2 potential cable failures and 483,067 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,829,336	$0	$0	$0	$0	$1,057,494	$1,771,842
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

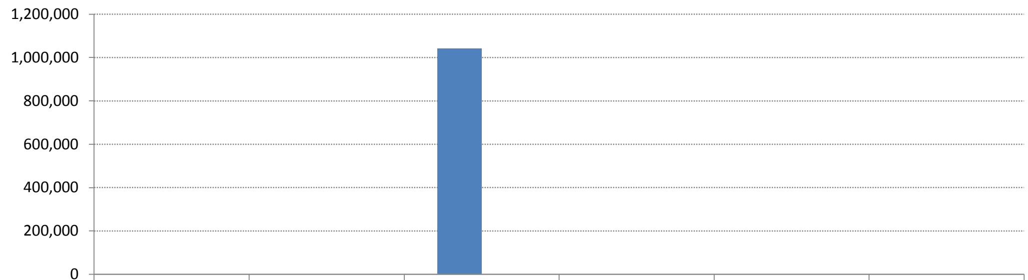
OEB Multi-Project Report

Project Code	151401	
Project Name	Cable Replacement Project- (21b) Sigsbee & Morning Star, Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	(21b) Sigsbee & Morning Star, Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technolgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 2,730 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 2,956 m which totals to approximately $0.74 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.3 M will be required to replace other deteriorating assets. Thus, the total cost for this project is approximately $1.04 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 15 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 46 years old (installed in 1973), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	328
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 2, 956 m of cable: • Frequency of Failure Rate is: 0.25 x 2956/1000 = 0.74 failures, rounded to 1 failure per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 15 cable failure repairs = $20,000 x 15= $300,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 15 potential cable faults and 360,750 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,040,591	$0	$0	$1,040,591	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

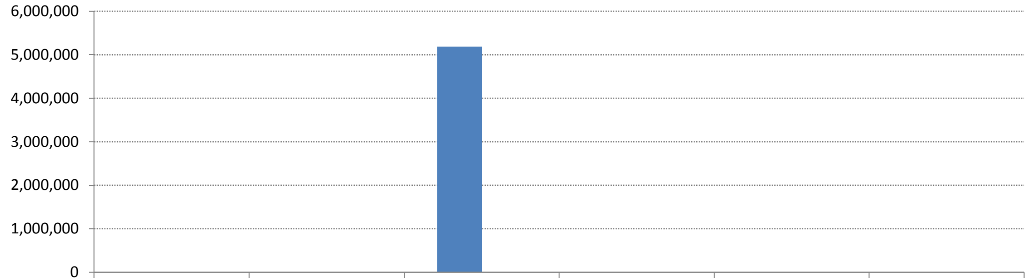
OEB Multi-Project Report

Project Code	151402	
Project Name	Cable Replacement Project- Montevideo & Treviso (19a), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	(19a) Montevideo & Treviso, Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 5,273 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 14,151 m which totals to approximately $3.54 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $1.64 M will be required to replace other deteriorating assets. Thus, the total cost for this project is approximately $5.18 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 10 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 34 years old (installed in 1985), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	366
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 14,151 m of cable: • Frequency of Failure Rate is: 0.25 x 14151/1000 = 3.54 failures, rounded to 4 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 10 cable failure repairs = $20,000 x 10= $200,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 10 potential cable faults and 240,050 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



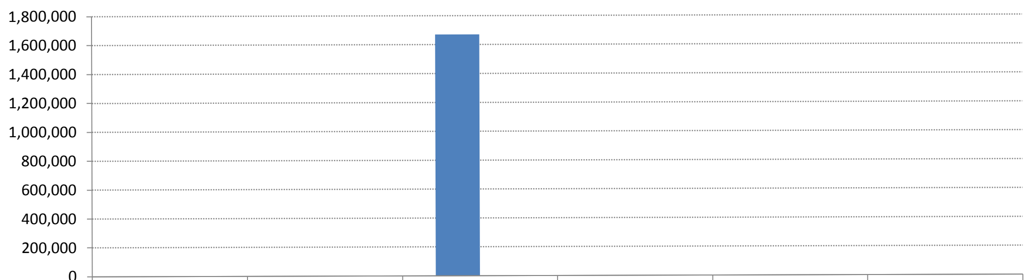
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $5,182,782	$0	$0	$5,182,782	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151403	
Project Name	Cable Replacement Project- Montevideo & Battleford (19b), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	(19b) Montevideo & Battleford, Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 2624 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for \$3.6 M, and Copenhagen Cable Replacement in 2019 for \$3.9 M. This project is forecasted to be at an average of \$250/m for a total of 22,109 m which totals to approximately \$5.53 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately \$1.8 M will be required to replace other deteriorating assets as well as Backlot transformers in the surrounding area. Thus, the total cost for this project is approximately \$7.33 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 12 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 39 years old (installed in 1980), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	380
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 5, 013 m of cable: • Frequency of Failure Rate is: 0.25 x 5013/1000 = 1.25 failures, rounded to 1 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = \$20,000 per failure - Cost for 12 cable failure repairs = \$20,000 x 12= \$240,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 12 potential cable faults and 288,600 potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,669,839	$0	$0	$1,669,839	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

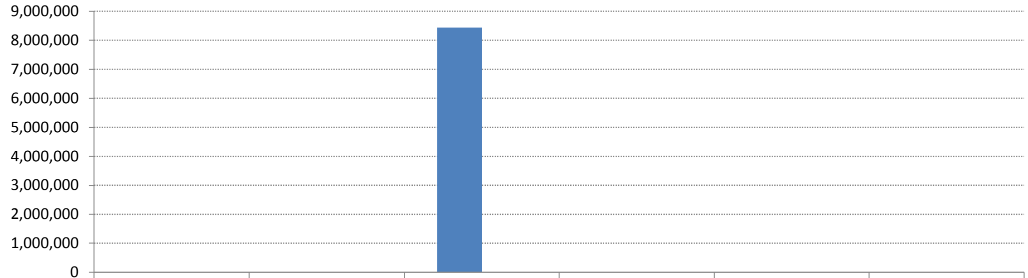
OEB Multi-Project Report

Project Code	151404	
Project Name	Cable Replacement Project- Central Pk E & Miss. Valley (28)	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Central Pk E & Miss. Valley (28), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 1,092kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $300/m for a total of 7,100 m which totals to approximately $2.13 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $6.31 M will be required to replace other deteriorating assets as well as Backlot transformers in the surrounding area. Thus, the total cost for this project is approximately $8.44 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 11 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 39 years old (installed in 1985), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	238
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 7,100 m of cable: • Frequency of Failure Rate is: 0.25 x 7100/1000 = 1.78 failures, rounded to 2 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 11 cable failure repairs = $20,000 x 11= $220,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 11 potential cable faults and 264,550 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $8,440,370	$0	$0	$8,440,370	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

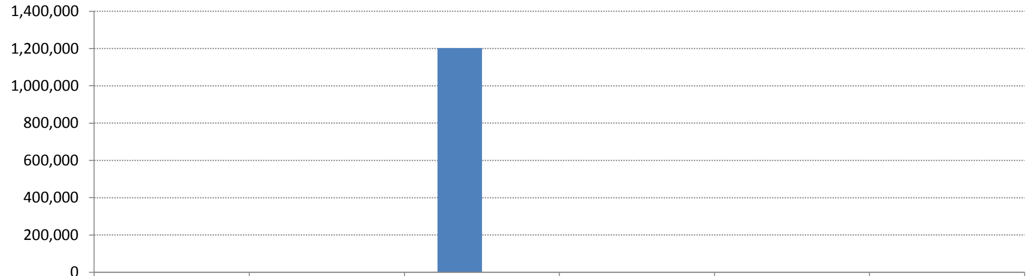
OEB Multi-Project Report

Project Code	151405	
Project Name	Cable Replacement Project- Erin Mills & N.Sheridan (16), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Erin Mills & N.Sheridan (16)
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities’ service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities’ system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960’s. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of “direct-buried” cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities’ customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 1142 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don’t unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $300/m for a total of 3,326 m which totals to approximately $1.0 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.2 M will be required to replace other deteriorating assets. Thus, the total cost for this project is approximately $1.2 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 8 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 45 years old (installed in 1974), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	88
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 3,326 m of cable: • Frequency of Failure Rate is: 0.25 x 3326/1000 = 0.83 failures, rounded to 1 failure per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 8 cable failure repairs = $20,000 x 8= $160,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 8 potential cable faults and 192,400 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,200,942	$0	$0	$1,200,942	$0	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

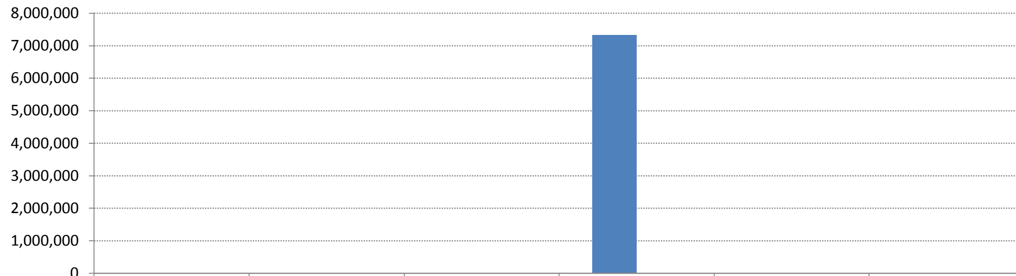
OEB Multi-Project Report

Project Code	151407	
Project Name	Cable Replacement Project- Glen Erin & Burnhamthorpe (12), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Glen Erin & Burnhamthorpe (12)
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 3934 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 22,109 m which totals to approximately $5.53 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $1.8 M will be required to replace other deteriorating assets as well as Backlot transformers in the surrounding area. Thus, the total cost for this project is approximately $7.33 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 10 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 34 years old (installed in 1985), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	290
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For22,109 m of cable: • Frequency of Failure Rate is: 0.25 x 22109/1000 = 5.53 failures, rounded to 6 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 10 cable failure repairs = $20,000 x 10= $200,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 10 potential cable faults and 240,050 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $7,335,760	$0	$0	$0	$7,335,760	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151408	
Project Name	Cable Replacement Project- Burnhamthorpe & Miss. Road (13), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Burnhamthorpe & Miss. Road (13)
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 2,059 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

Justification for Recommended Alternative

This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."

6. General Information on the Project/Activity (OEB)

Risks to Completion and Risk Management

Risk:

Alectra Utilities considers the following as general risks to project schedule and cost:
- fluctuation in cost and staff resources (internal and external) to complete high annual volume of work.
- customer delays or restricted access to work sites
- inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms
- delays to material shipment from vendors
- general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms

Risk Management:

Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track.

Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.

Comparative Information on Equivalent Historical Projects (if any)

Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 7,311 m which totals to approximately $1.83 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.62 M will be required to replace other deteriorating assets in the surrounding area. Thus, the total cost for this project is approximately $2.45 M.

Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)

0

7. Category-Specific Requirements for Each Project/Activity (OEB)

Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:

In this area, there have been 11 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers.

Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.

Condition of Asset vs. Typical Life Cycle and Performance Record

Cable in this area is 40 years old (installed in 1979), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.

Number of Customers in Each Customer Class Potentially Affected by Asset Failure

186

Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)

"For 1000 m of cable (applicable to the selected cable replacement candidates):
• Frequency of Failure is: 0.25 failures per 1000 m of cable per year
For 7,311m of cable:
• Frequency of Failure Rate is: 0.25 x 7311/1000 = 1.83 failures, rounded to 2 failures per year

According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.

Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)

Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).

Value of Customer Impact

High

Factors Affecting Project Timing, if any

Local approvals and weather.

Consequences for O&M System Costs Including Implications of Not Implementing

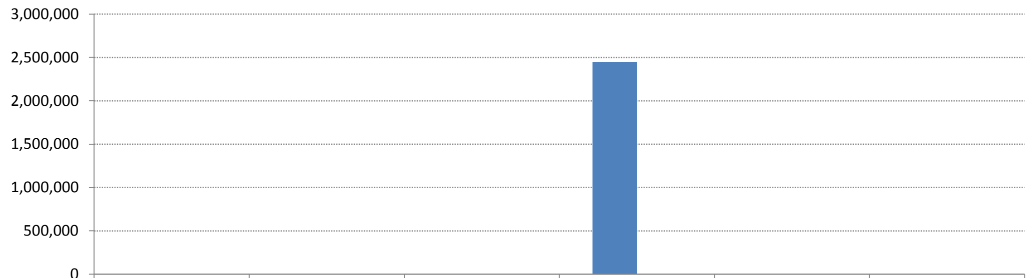
- Cost for emergency cable failure repair = $20,000 per failure
- Cost for 11 cable failure repairs = $20,000 x 11= $220,000."

Reliability and Safety Factors

This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 11 potential cable faults and 264,550 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,448,427	$0	$0	$0	$2,448,427	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

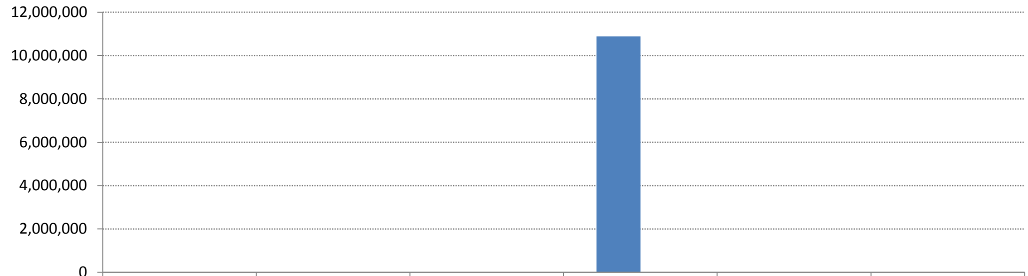
OEB Multi-Project Report

Project Code	151409	
Project Name	Cable Replacement Project- Central Parkway & Bloor (29), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Central Parkway & Bloor (29), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 4,025kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 12,462 m which totals to approximately $3.12 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $7.78 M will be required to replace other deteriorating assets as well as many back-lot transformers in the surrounding area. Thus, the total cost for this project is approximately $10.90 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 9 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 48 years old (installed in 1971), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	636
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 12,462 m of cable: • Frequency of Failure Rate is: 0.25 x 12462/1000 = 3.12 failures, rounded to 3 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 9 cable failure repairs = $20,000 x 9= $180,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 9 potential cable faults and 216,450 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $10,885,113	$0	$0	$0	$10,885,113	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151410
Project Name	Cable Replacement Project-Roselle & Priority Cres (2), Mississauga
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

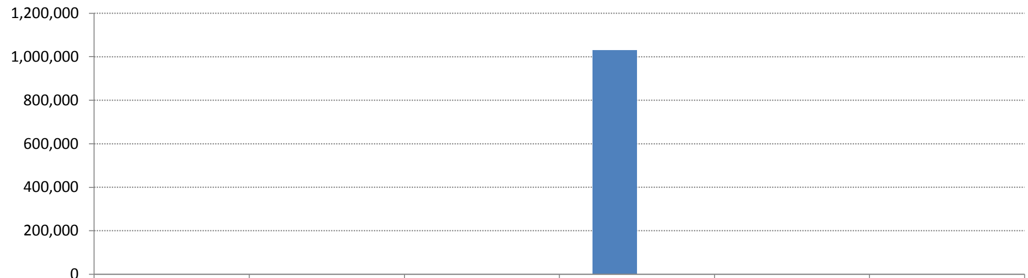
Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Roselle & Priority Cres (2), Mississauga.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 1,713 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 3,006 m which totals to approximately $0.75 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.28M will be required to replace other deteriorating assets in the surrounding area. Thus, the total cost for this project is approximately $1.03 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 7 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 43 years old (installed in 1976), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	274
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 3,006 m of cable: • Frequency of Failure Rate is: 0.25 x 3006/1000 = 0.75 failures, rounded to 1 failure per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 7 cable failure repairs = $20,000 x 7= $140,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 7 potential cable faults and 168,350 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,030,700	$0	$0	$0	$1,030,700	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151411
Project Name	Cable Replacement Project- Queensway & Mavis (31), Mississauga
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Queensway & Mavis (31), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 3100 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 8,488 m which totals to approximately $2.12 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $1.44 M will be required to replace other deteriorating assets in the surrounding area. Thus, the total cost for this project is approximately $3.56 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 8 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 42 years old (installed in 1977), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	335
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 8,488 m of cable: • Frequency of Failure Rate is: 0.25 x 8488/1000 = 2.12 failures, rounded to 2 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 8 cable failure repairs = $20,000 x 8= $160,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 8 potential cable failures. and 5,611 potential CMI (based on Alectra wide Reliability 5-year average data).
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,555,338	$0	$0	$0	$0	$3,555,338	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

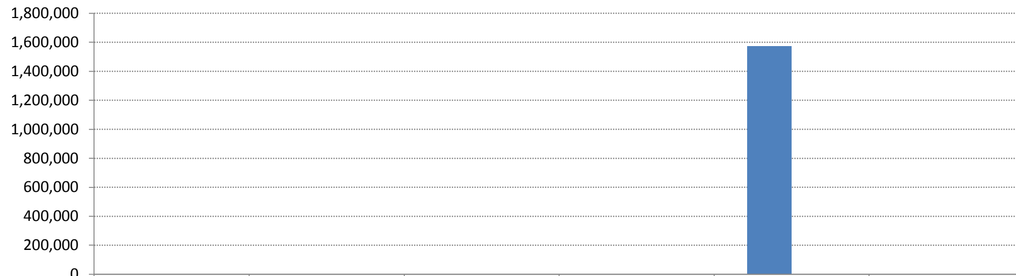
Currency scale is in literal

OEB Multi-Project Report

Project Code	151413	
Project Name	Cable Replacement Project- Rathburn Rd W & Elora Dr (9), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Rathburn Rd W & Elora Dr (9), Mississauga.
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities’ service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities’ system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960’s. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of “direct-buried” cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities’ customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 1,550 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don’t unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 3,270 m which totals to approximately $0.82 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.75 M will be required to replace other deteriorating assets in the surrounding area. Thus, the total cost for this project is approximately $1.57 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 8 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 27 years old (installed in 1992), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	164
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 3,270 m of cable: • Frequency of Failure Rate is: 0.25 x 3270/1000 = 0.82 failures, rounded to 1 failure per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 8 cable failure repairs = $20,000 x 8= $160,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 8 potential cable faults and 192,400 potential CMI.

Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,573,665	$0	$0	$0	$0	$1,573,665	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

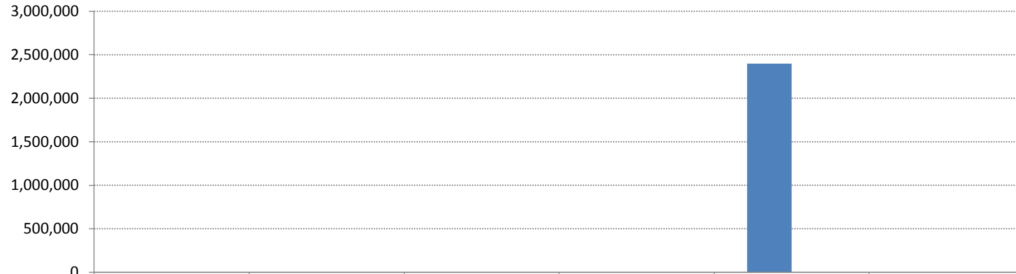
OEB Multi-Project Report

Project Code	151416	
Project Name	Cable Replacement Project- Woodchester & Thorn Lodge (34), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Woodchester & Thorn Lodge (34)
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 1,575 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 6,669 m which totals to approximately $1.67 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.73 M will be required to replace other deteriorating assets in the surrounding area. Thus, the total cost for this project is approximately $2.40 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 7 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 49 years old (installed in 1970), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	148
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 4,411 m of cable: • Frequency of Failure Rate is: 0.25 x 6669/1000 = 1.67 failures, rounded to 2 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 7 cable failure repairs = $20,000 x 7= $140,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 7 potential cable faults and 168,350 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,395,600	$0	$0	$0	$0	$2,395,600	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

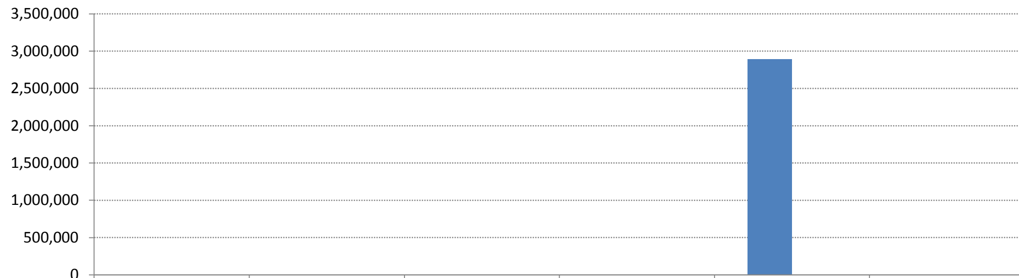
Currency scale is in literal

alectra utilities

OEB Multi-Project Report

Project Code	151418	
Project Name	Cable Replacement Project- Innovator & Courtney Park E (4), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Innovator & Courtney Park E (4), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities’ service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities’ system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960’s. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of “direct-buried” cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities’ customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 12,325kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don’t unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 7,263 m which totals to approximately $1.82 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $1.07M will be required to replace other deteriorating assets in the surrounding area. Thus, the total cost for this project is approximately $2.89 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 7,263 m which totals to approximately $1.82 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $1.07 M will be required to replace other deteriorating assets in the surrounding area. Thus, the total cost for this project is approximately $2.89 M.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 35 years old (installed in 1984), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	25
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 7,263 m of cable: • Frequency of Failure Rate is: 0.25 x 1106/1000 = 1.82 failures, rounded to 2 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 7 cable failure repairs = $20,000 x 7= $140,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 7 potential cable faults and 168,350potential CMI.
	Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,890,298	$0	$0	$0	$0	$2,890,298	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

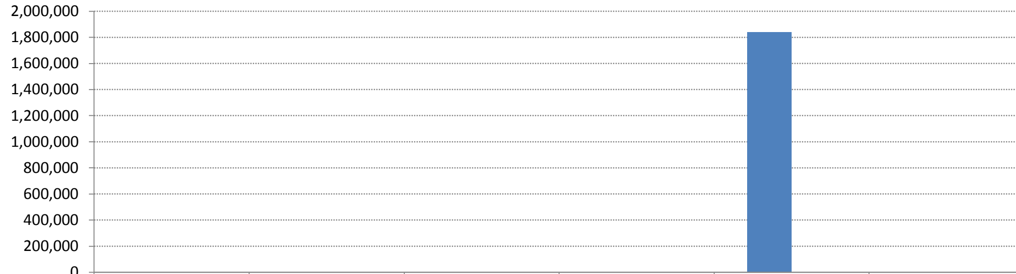
OEB Multi-Project Report

Project Code	151419	
Project Name	Cable Replacement Project- Thomas St & Hillside (24), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities’ service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities’ system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960’s. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of “direct-buried” cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities’ customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 1,825 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don’t unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 4,089 m which totals to approximately $1.02 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.82 M will be required to replace other deteriorating assets in the surrounding area. Thus, the total cost for this project is approximately $1.84 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 6 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 30 years old (installed in 1989), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	224
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 4,089 m of cable: • Frequency of Failure Rate is: 0.25 x 4089/1000 = 1.02 failures, rounded to 1 failure per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 6 cable failure repairs = $20,000 x 6= $120,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 6 potential cable faults and 144,300 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,837,911	$0	$0	$0	$0	$1,837,911	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

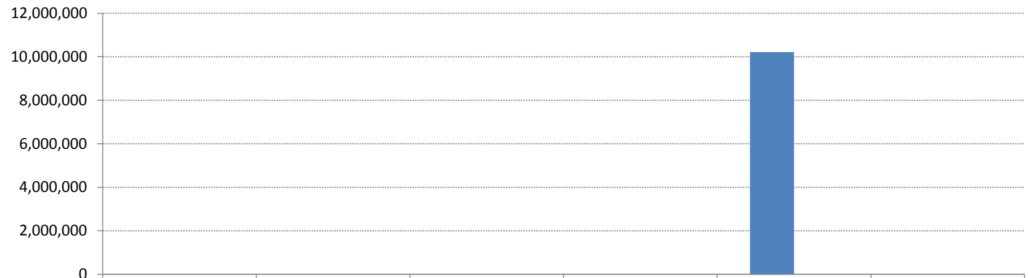
OEB Multi-Project Report

Project Code	151420	
Project Name	Cable Replacement Project-Eglinton & Credit Valley (5), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Eglinton & Credit Valley (5), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 8,834 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 27,821 m which totals to approximately $6.96 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $3.25 M will be required to replace other deteriorating assets as well as any re-routing of transformers for efficiency in the surrounding area. Thus, the total cost for this project is approximately $10.21 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 6 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 35 years old (installed in 1984), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	685
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 27,821 m of cable: • Frequency of Failure Rate is: 0.25 x 27821/1000 = 6.95 failures, rounded to 7 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 6 cable failure repairs = $20,000 x 6= $120,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 6 potential cable faults and 144,300 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $10,210,572	$0	$0	$0	$0	$10,210,572	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151421	
Project Name	Cable Replacement Project-Rathkeale Rd & Edenrose St (6), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Rathkeale Rd & Edenrose St (6), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 2,900 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 8,577 m which totals to approximately $2.14 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.57 M will be required to replace other deteriorating assets in the surrounding area. Thus, the total cost for this project is approximately $2.81 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 6 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 31 years old (installed in 1988), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	685
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 8,577 m of cable: • Frequency of Failure Rate is: 0.25 x 27821/1000 = 2.14 failures, rounded to 2 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 6 cable failure repairs = $20,000 x 6= $120,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 6 potential cable faults and 144,300 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,810,000	$0	$0	$0	$0	$0	$2,810,000
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

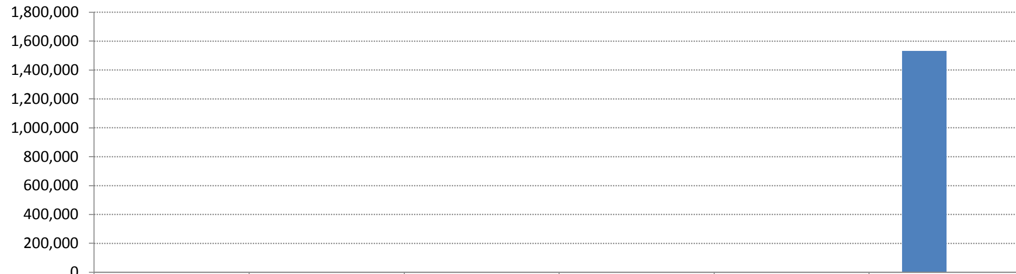
OEB Multi-Project Report

Project Code	151422	
Project Name	Cable Replacement Project-Queen St W & Paisley (30), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Queen St W & Paisley (30), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 1,900 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 3,992 m which totals to approximately $1.0 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.53 M will be required to replace other deteriorating assets as well as any re-routing of transformers for efficiency in the surrounding area. Thus, the total cost for this project is approximately $1.53 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 6 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 36 years old (installed in 1983), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	199
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 3,992 m of cable: • Frequency of Failure Rate is: 0.25 x 3992/1000 = 0.998 failures, rounded to 1 failure per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 6 cable failure repairs = $20,000 x 6= $120,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 6 potential cable faults and 144,300 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,533,331	$0	$0	$0	$0	$0	$1,533,331
Actuals: $0	$0	$0	$0	$0	$0	$0

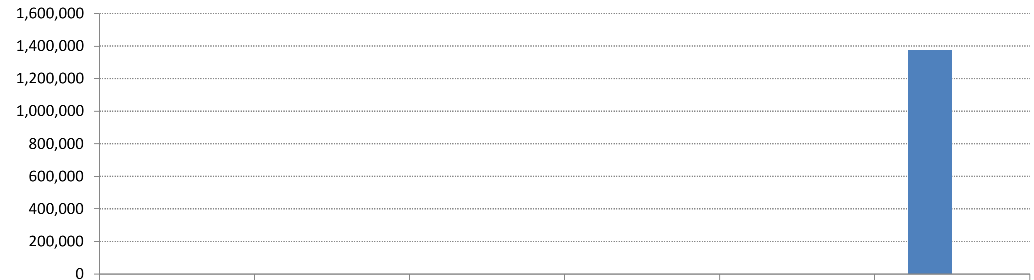
Currency scale is in literal

OEB Multi-Project Report

Project Code	151423	
Project Name	Cable Replacement Project-Old Carriage Road (33), Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Old Carriage Road (33), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 1,138 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 2,229 m which totals to approximately $0.56 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.81 M will be required to replace other deteriorating assets as well as any replacing back-lot transformers in the surrounding area. Thus, the total cost for this project is approximately $1.37 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 5 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 45 years old (installed in 1974), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	120
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 2,229 m of cable: • Frequency of Failure Rate is: 0.25 x 2229/1000 = 0.556 failures, rounded to 1 failure per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 6 cable failure repairs = $20,000 x 5= $100,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 5 potential cable faults and 120,250 potential CMI.

Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,371,716	$0	$0	$0	$0	$0	$1,371,716
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151424	
Project Name	Cable Replacement Project-Miss. Valley & Bloor (15) Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Miss. Valley & Bloor (15), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 4,538 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 10,780 m which totals to approximately $2.70 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $7.16 M will be required to replace other deteriorating assets as well as removing back-lot transformers & re-routing of transformers for efficiency in the surrounding area. Thus, the total cost for this project is approximately $9.87 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 6 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 48 years old (installed in 1971), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	887
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 10,780 m of cable: • Frequency of Failure Rate is: 0.25 x 10780/1000 = 2.69 failures, rounded to 3 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 6 cable failure repairs = $20,000 x 6= $120,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 6 potential cable faults and 144,300 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $9,872,101	$0	$0	$0	$0	$0	$9,872,101
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151425
Project Name	Cable Replacement Project-Rathburn Rd E & Tomken (10), Mississauga
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

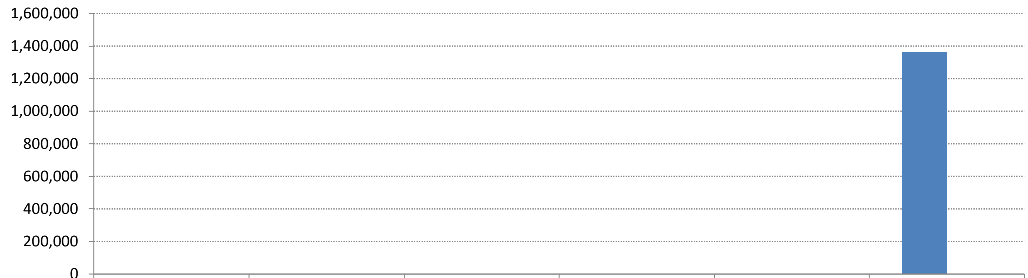
Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Rathburn Rd E & Tomken (10), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 1,650 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 3,180 m which totals to approximately $0.8 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $0.56 M will be required to replace other deteriorating assets. Thus, the total cost for this project is approximately $1.36 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 5 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 38 years old (installed in 1981), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	160
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 3,180 m of cable: • Frequency of Failure Rate is: 0.25 x 3180/1000 = 0.795 failures, rounded to 1 failure per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 5 cable failure repairs = $20,000 x 5= $100,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 5 potential cable faults and 120,250 potential CMI.

Analysis for "Like for Like" Renewal Project

When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,363,086	$0	$0	$0	$0	$0	$1,363,086
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

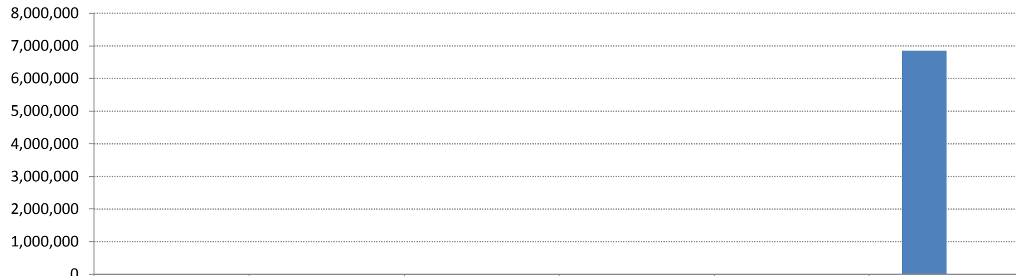
Project Code	151426
Project Name	Cable Replacement Project-Southdown & Lakeshore (35), Mississauga
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Southdown & Lakeshore (35), Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accessories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total connected Transformer Load is 7,375 kVA.
	Safety	Not Applicable
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were Rathburn Rd W Cable Replacement in 2019 for $3.6 M, and Copenhagen Cable Replacement in 2019 for $3.9 M. This project is forecasted to be at an average of $250/m for a total of 8,126 m which totals to approximately $2.03 M. The difference is based on the number of cable faults in the surrounding area. The remaining cost of approximately $4.82M will be required to replace other deteriorating assets as well as back-lot transformers in the surrounding area. Thus, the total cost for this project is approximately $6.85 M.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there have been 3 cable failures since 2005. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers. Under this option, the underground cables will continue to experience faults and will lead to power outages, resulting in deteriorating service reliability for the area. It is also possible that the cable may no longer be repairable and useable which poses a significant amount of operational risk and cost to Alectra Utilities. Reactive repair of cables in an emergency situation is very time consuming and costly. Given the history of cables failing in this area, Alectra Utilities has determined the looped supply cables, which provide an alternative supply upon a system fault, are also no longer reliable.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 48 years old (installed in 1971), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	160
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	"For 1000 m of cable (applicable to the selected cable replacement candidates): • Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 8,126 m of cable: • Frequency of Failure Rate is: 0.25 x 8126/1000 = 2.0315 failures, rounded to 2 failures per year According to the Alectra wide Reliability data, the 5-year average outage data states that there have been 504 events, 168,999 customers affected, and 202,003 Customer Hour Interruptions per year related to Cable & Accessories XLPE.
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 3 cable failure repairs = $20,000 x 3= $60,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. Based on the Alectra wide 5-year average Reliability, 1 cable fault causes approximately 24,050 CMI. Thus, this project will help avoid a total of 3 potential cable faults and 72,150 potential CMI.

Analysis for "Like for Like" Renewal Project	When the direct buried cable is replaced, the new cable will be installed according to new Standards - cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



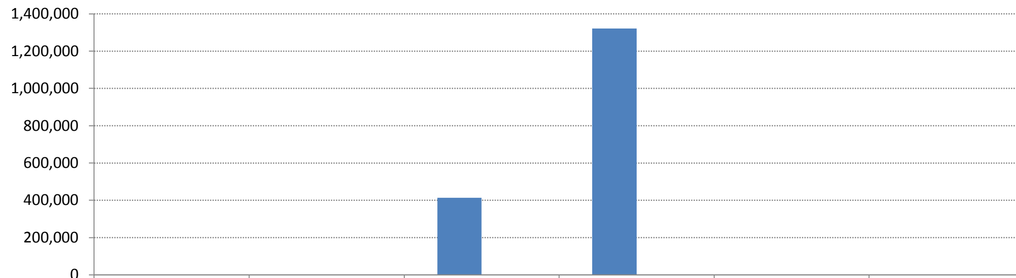
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $6,849,765	$0	$0	$0	$0	$0	$6,849,765
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151427	
Project Name	Cable Injection- 001- AREA 11- Truscott & Southdown, Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Truscott & Southdown- AREA 11 (001), Mississauga
	Units	21576
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total Customer Attachment/Load (KVA) is 3,430 KVA including directly & indirectly affecting the customers.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide Cable TV, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	"Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were worth $76/m in the area of Erin Mills Parkway & Battleford (Section 1) which had a total estimated cost of $328,441. This project is estimated at $79/m for a total of 5,226 m resulting in approximately $413,874 in 2021 & $81/m for a total of 16,350 m resulting in approximately $1,320,739 in 2022. The difference is based on the number of cables to be injected in the surrounding area.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there are 58 segments marked by their individual Feature IDs (FIDs) which have failed a maximum of two times which equates to 9 failures/100km and would need to be rehabilitated through cable injection. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is on average 32 years old (installed in 1987), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	363
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	• Frequency of Failure is: 2 failures post 2005. For 21,576 m of cable: • Frequency of Failure Rate is: 2/3 = 0.67 failures (rounded to 1 failure) per year According to Control Room data, there were 123, 133 and 113 Cable and Splice failures in 2012, 2013 and 2014 respectively. Average for the last 3 years (2012, 2013 and 2014) is used for calculations. Annually on an average there were 123 Cable and Splice failures affecting 44,682 Customers and 6,221,764 CMI. • Average number of customers affected by 1 failure is: 44,682/123 = 363 customers • Projected number of customers affected by 2 failures is: 363 x 3 = 726 customers • Average CMI for 1 failure is: 6,221,764/123 = 50,583 CMI • Projected CMI for 3 failures is: 50,583 x 2 = 101,166 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 2 cable failure repairs = $20,000 x 2= $40,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation (injection) program. Based on the Alectra wide 5-year average Reliability, 1 cable failure causes approximately 50,583 CMI. Thus, this project will help avoid a total of 2 potential cable faults and 101,166 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,734,603	$0	$0	$413,874	$1,320,729	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

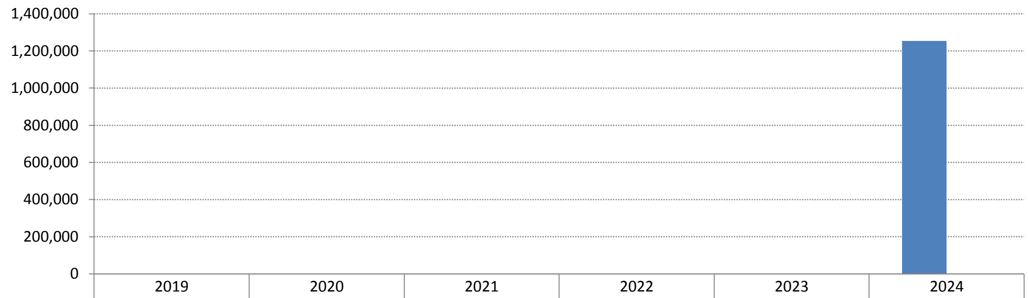
OEB Multi-Project Report

Project Code	151429
Project Name	Cable Injection- 003- AREA36 -Matheson & Kennedy, Mississauga
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Matheson & Kennedy, Mississauga
	Units	14541
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total Customer Attachment/Load (KVA) is 4979 KVA including directly & indirectly affecting the customers.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide Cable TV, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	"Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were worth $76/m in the area of Erin Mills Parkway & Battleford (Section 1) which had a total estimated cost of $328,441. This project is estimated at $84/m for a total of 14,907 m resulting in approximately $1,252,823 in 2024. The difference is based on the number of cables to be injected in the surrounding area.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there are 35 segments marked by their individual Feature IDs (FIDs) which have failed a maximum of two times and would need to be rehabilitated through cable injection. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is on average 31 years old (installed in 1988), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	363
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	• Frequency of Failure is: 2 failures post 2005. For 14,907 m of cable: • Frequency of Failure Rate is: 2/3 = 0.67 failures (rounded to 1 failure) per year According to Control Room data, there were 123, 133 and 113 Cable and Splice failures in 2012, 2013 and 2014 respectively. Average for the last 3 years (2012, 2013 and 2014) is used for calculations. Annually on an average there were 123 Cable and Splice failures affecting 44,682 Customers and 6,221,764 CMI. • Average number of customers affected by 1 failure is: 44,682/123 = 363 customers • Projected number of customers affected by 2 failures is: 363 x 2 = 726 customers • Average CMI for 1 failure is: 6,221,764/123 = 50,583 CMI • Projected CMI for 2 failures is: 50,583 x 3 = 101,166 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 2 cable failure repairs = $20,000 x 2= $40,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation (injection) program. Based on the Alectra wide 5-year average Reliability, 1 cable failure causes approximately 50,583 CMI. Thus, this project will help avoid a total of 2 potential cable faults and 101,166 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable



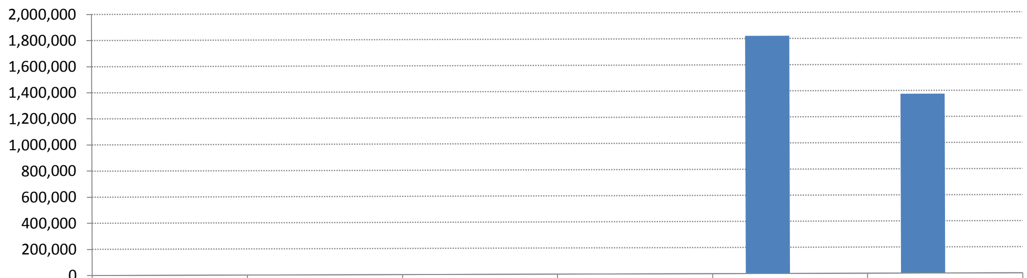
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,252,820	$0	$0	$0	$0	$0	$1,252,820
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151431	
Project Name	Cable Injection- 006- AREA 39- Erin Mills Pkway & Thomas St, Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Erin Mills Pkway & Thomas St, Mississauga
	Units	56370
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total Customer Attachment/Load (KVA) is 2,314 KVA including directly & indirectly affecting the customers.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide Cable TV, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	"Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were worth $76/m in the area of Erin Mills Parkway & Battleford (Section 1) which had a total estimated cost of $328,441. This project is estimated at $82/m for a total of 22,094 m resulting in approximately $413,874 in 2023 & $84/m for a total of 16,353 m resulting in approximately $1,320,739 in 2024. The difference is based on the number of cables to be injected in the surrounding area.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there are 101 segments marked by their individual Feature IDs (FIDs) which have failed a maximum of 0 times which equates to 0 failures/100 km and would need to be rehabilitated through cable injection. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is on average 30 years old (installed in 1989), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	363
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	• Frequency of Failure is: 2 failures post 2005. For 56,370 m of cable: • Frequency of Failure Rate is: 0/3 = 0.67 failures (rounded to 0 failures) per year According to Control Room data, there were 123, 133 and 113 Cable and Splice failures in 2012, 2013 and 2014 respectively. Average for the last 3 years (2012, 2013 and 2014) is used for calculations. Annually on an average there were 123 Cable and Splice failures affecting 44,682 Customers and 6,221,764 CMI. • Average number of customers affected by 1 failure is: 44,682/123 = 363 customers • Projected number of customers affected by 0 failures is: 363 x 3 = 0 customers • Average CMI for 1 failure is: 6,221,764/123 = 50,583 CMI • Projected CMI for 0 failures is: 50,583 x 0 = 0 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 2 cable failure repairs = $20,000 x 0= $0."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation (injection) program. Based on the Alectra wide 5-year average Reliability, 0 cable failure causes approximately 0 CMI. Thus, this project will help avoid a total of 0 potential cable faults and 0 potential CMI. However, this cable is past its average lifetime so can fail at anytime causing large outages.
	Analysis for "Like for Like" Renewable Project	Not Applicable



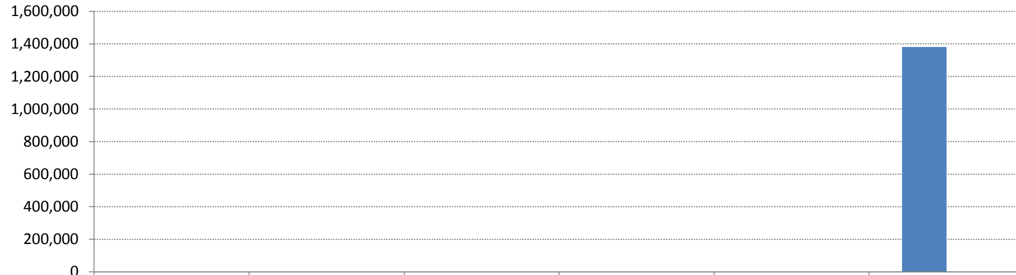
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,194,824	$0	$0	$0	$0	$1,820,464	$1,374,360
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151432	
Project Name	Cable Injection- 007- AREA 43 & 51- Hurontario & Derry Rd W, Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Hurontario & Derry Rd W, Mississauga
	Units	16419
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities’ service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities’ system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960’s. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of “direct-buried” cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities’ customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total Customer Attachment/Load (KVA) is 4,770 KVA including directly & indirectly affecting the customers.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide Cable TV, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don’t unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	"Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were worth $76/m in the area of Erin Mills Parkway & Battleford (Section 1) which had a total estimated cost of $328,441. This project is estimated at $84/m for a total of 16,419 m resulting in approximately $1,379,896 in 2024.The difference is based on the number of cables to be injected in the surrounding area.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there are 36 segments marked by their individual Feature IDs (FIDs) which have failed a maximum of three times which equates to 18 failures/100km and would need to be rehabilitated through cable injection. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is on average 28 years old (installed in 1991), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	8451
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	• Frequency of Failure is: 2 failures post 2005. For 16,419 m of cable: • Frequency of Failure Rate is: 3/3 = 1 failure per year According to Control Room data, there were 123, 133 and 113 Cable and Splice failures in 2012, 2013 and 2014 respectively. Average for the last 3 years (2012, 2013 and 2014) is used for calculations. Annually on an average there were 123 Cable and Splice failures affecting 44,682 Customers and 6,221,764 CMI. • Average number of customers affected by 1 failure is: 44,682/123 = 363 customers • Projected number of customers affected by 2 failures is: 363 x 3 = 1,089 customers • Average CMI for 1 failure is: 6,221,764/123 = 50,583 CMI • Projected CMI for 3 failures is: 50,583 x 2 = 151,749 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 3 cable failure repairs = $20,000 x 3= $60,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation (injection) program. Based on the Alectra wide 5-year average Reliability, 1 cable failure causes approximately 50,583 CMI. Thus, this project will help avoid a total of 3 potential cable faults and 151,749 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $1,379,896	$0	$0	$0	$0	$0	$1,379,896
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151434	
Project Name	Cable Injection- 009- AREA 54- Highway 401 & Argentia, Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Highway 401 & Argentia, Mississauga
	Units	30642
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total Customer Attachment/Load (KVA) is 2,100 KVA including directly & indirectly affecting the customers.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide Cable TV, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	"Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were worth $76/m in the area of Erin Mills Parkway & Battleford (Section 1) which had a total estimated cost of $328,441. This project is estimated at $82/m for a total of 30,642 m resulting in approximately $2,524,740 in 2023.The difference is based on the number of cables to be injected in the surrounding area.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there are 70 segments marked by their individual Feature IDs (FIDs) which have failed a maximum of 0 times which equates to 0 failures/100km and would need to be rehabilitated through cable injection. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is on average 29 years old (installed in 1990), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	363
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	• Frequency of Failure is: 0 failures post 2005. For 30,256 m of cable: • Frequency of Failure Rate is: 6/3 = 2 failures (rounded to 2 failures) per year According to Control Room data, there were 123, 133 and 113 Cable and Splice failures in 2012, 2013 and 2014 respectively. Average for the last 3 years (2012, 2013 and 2014) is used for calculations. Annually on an average there were 123 Cable and Splice failures affecting 44,682 Customers and 6,221,764 CMI. • Average number of customers affected by 1 failure is: 44,682/123 = 363 customers • Projected number of customers affected by 0failures is: 363 x 2 = 0customers • Average CMI for 1 failure is: 6,221,764/123 = 50,583 CMI • Projected CMI for 0failures is: 50,583 x 2 = 0 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 0 cable failure repairs = $20,000 x 0= $0.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation (injection) program. Based on the Alectra wide 5-year average Reliability, 1 cable failure causes approximately 50,583 CMI. Thus, this project will help avoid a total of 0 potential cable faults and 0 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,524,740	$0	$0	$0	$0	$2,524,740	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

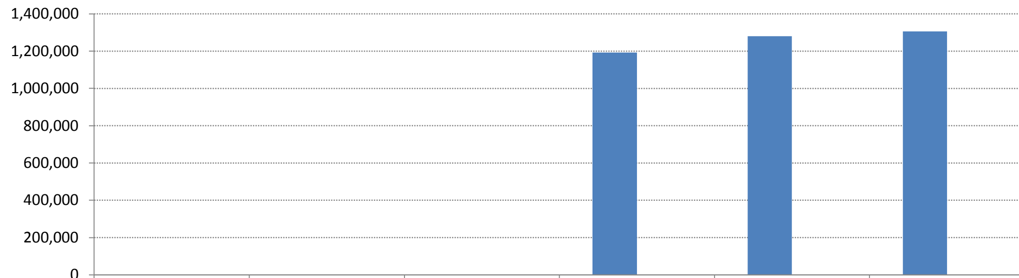
OEB Multi-Project Report

Project Code	151435
Project Name	Cable Injection- 010 - Area 56- Derry Rd W & Ninth Line, Mississauga
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Mississauga
	Location	Derry Rd W & Ninth Line, Mississauga
	Units	45837
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total Customer Attachment/Load (KVA) is 3,234 KVA including directly & indirectly affecting the customers.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide Cable TV, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	"Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were worth $76/m in the area of Erin Mills Parkway & Battleford (Section 1) which had a total estimated cost of $328,441. This project is estimated at $81/m for a total of 14,772 m resulting in approximately $1,193,242 in 2022 & $82/m for a total of 15,533 m resulting in approximately $1,279,796 in 2023 & $84/m for a total of 15,533 m resulting in approximately $1,304,421 in 2024 . The difference is based on the number of cables to be injected in the surrounding area.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there are 54 segments marked by their individual Feature IDs (FIDs) which have failed a maximum of 3 times which equates to 7 failures/100km and would need to be rehabilitated through cable injection. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is on average 30 years old (installed in 1989), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	363
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	• Frequency of Failure is: 6 failures post 2005. For 45,837 m of cable: • Frequency of Failure Rate is: 3/3 = 1 failure (rounded to 1 failure) per year According to Control Room data, there were 123, 133 and 113 Cable and Splice failures in 2012, 2013 and 2014 respectively. Average for the last 3 years (2012, 2013 and 2014) is used for calculations. Annually on an average there were 123 Cable and Splice failures affecting 44,682 Customers and 6,221,764 CMI. • Average number of customers affected by 1 failure is: 44,682/123 = 363 customers • Projected number of customers affected by 3 failures is: 363 x 3 = 1,089 customers • Average CMI for 1 failure is: 6,221,764/123 = 50,583 CMI • Projected CMI for 3 failures is: 50,583 x 3 = 151,749 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 2 cable failure repairs = $20,000 x 3= $60,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation (injection) program. Based on the Alectra wide 5-year average Reliability, 1 cable failure causes approximately 50,583 CMI. Thus, this project will help avoid a total of 3 potential cable faults and 151,749 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable



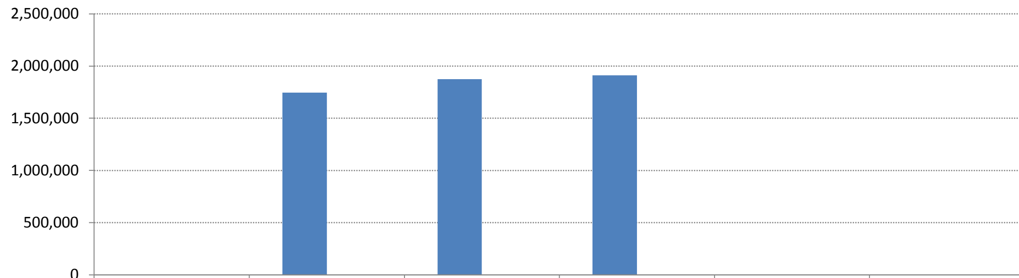
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $3,778,217	$0	$0	$0	$1,193,000	$1,279,796	$1,305,421
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151436	
Project Name	Cable Injection-011 - Area 58 & 59- Winston Churchill & The Collegeway, Mississauga	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Winston Churchill & The Collegeway, Mississauga
	Units	69795
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totaling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	"Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults."
	Customer Attachment / Load (KVA)	The total Customer Attachment/Load (KVA) is 2,194 KVA including directly & indirectly affecting the customers.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Cyber-Security and Security is not Applicable for this investment.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide Cable TV, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.
	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.

	Justification for Recommended Alternative	"This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project)."
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	"Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar replacement projects were worth $76/m in the area of Erin Mills Parkway & Battleford (Section 1) which had a total estimated cost of $328,441. This project is estimated at $78/m for a total of 47,303 m resulting in approximately $1,746,320 in 2020& $79/m for a total of 23,652 m resulting in approximately $1,873,086 in 2021 & $81/m for a total of 23,652 m resulting in approximately $1,910,548 in 2022 . The difference is based on the number of cables to be injected in the surrounding area.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there are 127 segments marked by their individual Feature IDs (FIDs) which have failed a maximum of 14 times which equates to 20 failures/100km and would need to be rehabilitated through cable injection. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is on average 30 years old (installed in 1989), which exceeds the Kinectrics Report ""Asset Amortization Study for the Ontario Energy Board"" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	363
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	• Frequency of Failure is: 6 failures post 2005. For 69,795m of cable: • Frequency of Failure Rate is: 14/3= 4.67 failure (rounded to 5 failures) per year According to Control Room data, there were 123, 133 and 113 Cable and Splice failures in 2012, 2013 and 2014 respectively. Average for the last 3 years (2012, 2013 and 2014) is used for calculations. Annually on an average there were 123 Cable and Splice failures affecting 44,682 Customers and 6,221,764 CMI. • Average number of customers affected by 1 failure is: 44,682/123 = 363 customers • Projected number of customers affected by 14 failures is: 363 x 3 = 5,082 customers • Average CMI for 1 failure is: 6,221,764/123 = 50,583 CMI • Projected CMI for 3 failures is: 50,583 x 14 = 708,162 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	- Cost for emergency cable failure repair = $20,000 per failure - Cost for 14 cable failure repairs = $20,000 x 14= $280,000."
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation (injection) program. Based on the Alectra wide 5-year average Reliability, 1 cable failure causes approximately 50,583 CMI. Thus, this project will help avoid a total of 14 potential cable faults and 708,162 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable



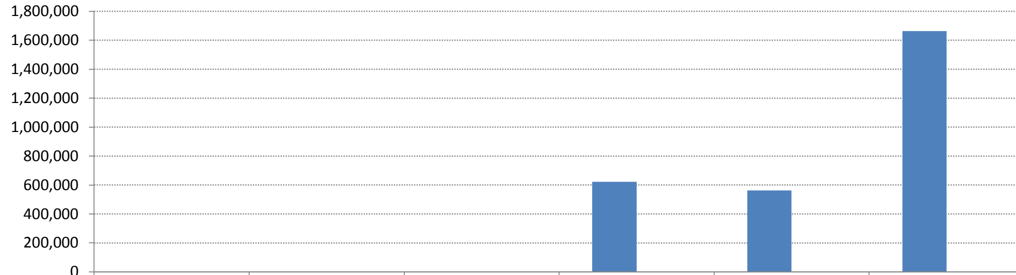
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $5,529,954	$0	$1,746,320	$1,873,086	$1,910,548	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151460	
Project Name	Cable Injection Project - (V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan
	Units	45555
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation – Injection
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will inject failing direct-buried Cross-Linked Polyethylene (XLPE) cables and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults
	Customer Attachment / Load (KVA)	Not Applicable.
	Safety	Not Applicable.
	Cyber-Security, Privacy	Not Applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under emergency condition.
	Alternative #1	Perform the injection in this area.

	Alternative #2	Replace the cable - this will be a higher cost and is not the preferred approach as injections can be performed in this area.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable injection as the method for remediation (injection is technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has a multi-year Master Service Agreement with the cable injection contractor. The unit prices are kept constant during the term of the Master Service Agreement. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable injection projects over the past three years (2016, 2017, and 2018) were $78/m. This project is forecasted to be $63/m. The difference is based on the assumption that this project is less complicated (has fewer splices to replace) than projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In this area, there were 3 cable and splice failures since 2013. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 31 years old (installed in 1988), which exceeds the Kinectrics Report "Asset Amortization Study for the Ontario Energy Board" results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	3531
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 45555 m of cable in the whole area: Frequency of Failure is: 0.25 x 45555 /1000 = 11.5 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 11.5 failures: 307 x 11.5 = 3531 customers affected and 43,131 x 11.5 = 496007 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable.
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 11.5 potential cable failures and 496007 potential CMI.
	Analysis for "Like for Like" Renewal Project	Not Applicable.



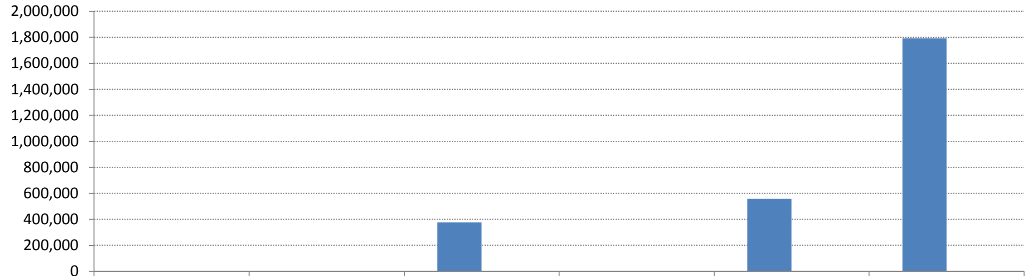
	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,847,590	$0	$0	$0	$621,976	$562,594	$1,663,020
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151465	
Project Name	Cable Replacement - Mississauga Left Behind Cable	
Major Category	System Renewal	
Scenario	2019-2024 - Optimized for DSP CE v2	
Project Overview		
2. Additional Information	Service Territory	Mississauga
	Location	Various locations in Alectra Mississauga
	Units	1
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.

	Alternative #2	Injection of the cables - these cable segments are not technically viable for injection.
	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra Central South, there were 40, 38, 24, 30, 28, 32 and 20 primary cable failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 30 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this project exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	737
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 9000 m of cable: Frequency of Failure is: 0.25 x 9000 /1000 = 2.4 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 2.4 failures: 307 x 2.4 = 737 customers affected and 43,131 x 2.4 = 103514 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Not Applicable
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 2.4 potential cable failures and 103514 potential CMI.
	Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).



	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,726,352	$0	$0	$376,815	$0	$557,769	$1,791,768
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

OEB Multi-Project Report

Project Code	151467
Project Name	Cable Replacement Project - (V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan
Major Category	System Renewal
Scenario	2019-2024 - Optimized for DSP CE v2

Project Overview

2. Additional Information	Service Territory	Legacy PowerStream South
	Location	(V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan
	Units	6918
	Project Class	Regular
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Contributed Capital	Contributed Capital 0%
	Expenditure Type	Controllable
	Rates ID	Rate Base Funded
	Alectra Grouping	Underground Asset Renewal
	Alectra Subcategory	Cable Remediation –Replacement
4. Evaluation Criteria (OEB)	Project Summary	Alectra Utilities' service area currently contains a population of underground cables totalling approximately 21 million linear meters of cable, which are continuing to degrade. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Failing cable and cable accessory failures account for 50% of all equipment-related outages. Alectra Utilities plans to gradually but significantly increase its spending to rejuvenate or replace XLPE cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried Cross-Linked Polyethylene (XLPE) cables and cable accesories with new cable in conduit and will mitigate outage frequencies to customers.
	Main Driver - System Renewal	Mitigate Failure Risks
	Priority and Reasons for Priority	Cable manufactures introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems due to the nature of the manufacturing processes, which led to impurities developing over time in the insulating medium. These impurities are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period. XLPE cables also fail because of the way they installed. Decades ago, utilities buried cable directly in the ground. Over time, the construction standard shifted to installing cable in protective conduits, but much of the system still consists of "direct-buried" cable. When more modern cable-in-conduit fails, it can typically be entirely removed and replaced with brand-new cable with relative ease. In contrast, direct-buried cables can only be repaired by excavating the cable and splicing in a replacement segment. This approach is fundamentally reactive and introduces further complications, since the installed splice may itself become a future failure point. Nor does it solve the underlying issue, since the older, direct-buried cable remains installed and increasingly likely to fail again. Failing direct-buried cables are causing an increasing number of outages, and when buried cables fail it can take a significant amount of time to restore service. Failing cables are significantly and increasingly impacting the quality of service received by Alectra Utilities' customers. Alectra Utilities must increase spending not only to halt the increasing trend, but to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without the proposed expenditures, cables will continue to degrade and Alectra Utilities expects reliability to decline further as deteriorated cables begin to fail at greater rates, having been stressed from historical faults.
	Customer Attachment / Load (KVA)	Not Applicable
	Safety	Not Applicable
	Cyber-Security, Privacy	Not Applicable
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Utilities constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Utilities participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra Utilities also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.
	Economic Development	Alectra Utilities ensure all policies and practices don't unnecessarily create barriers to economic development which are primarily focused within our communities.
	Environmental Benefits	Not Applicable
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	The status quo is to do nothing, allowing the end-of-life cable to run to failure, and respond to outages under reactive capital. This would lead to an unacceptable level of outages and customer satisfaction.
	Alternative #1	Perform the replacement in this area.
	Alternative #2	Injection of the cables - these cable segemnts are not technically viable for injection.

	Justification for Recommended Alternative	This project is part of Alectra Utilities annual investment initiative for cable remediation (cable replacement and cable injection) to maintain system reliability. The oldest cables are at end-of-life and are failing. Since cables are the main component of the underground electrical distribution system, when a cable segment fails, system reliability and customer service are negatively affected. For small-scale outages, Alectra Utilities has the capability to replace or repair the faulted cable segments under reactive capital, however, if too many cable failures occur at the same time, Alectra Utilities would not have sufficient resources to manage the large-scale and cascading outages - system integrity will be compromised and reliability will be unacceptable to the customers. To manage the risk of large-scale cable failures,Alectra Utilities must implement proactive cable remediation projects. These projects are a result of continuous assessments, prioritizing, and remediating the worst cable segments by a combination of cable injection and cable replacement. This project addresses cable replacement as the method for remediation (injection is not technically feasible for the segments within this project).
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Risk: Alectra Utilities considers the following as general risks to project schedule and cost: - fluctuation in cost and staff resources (internal and external) to complete high annual volume of work. - customer delays or restricted access to work sites - inclement weather, either in the form of extreme temperatures or due to restoration activities following major storms - delays to material shipment from vendors - general unforeseen delays such as striking rock when digging, tree conservation, municipal/regional consent forms Risk Management: Alectra Utilities has multi-year Master Service Agreement with external contractors. Regular progress meetings are held to ensure technical and operational issues are resolved promptly; budget performance is monitored; and projects are on track. Alectra Utilities has utilized coordination with third parties to mitigate some of the issues where possible, with municipalities/region/suppliers/customers. Alectra Utilities has implemented a Planning and Scheduling solution to track projects and resources. The Program Delivery department allows Alectra Utilities to manage schedule and cost risks and improve the overall efficiency of implementation. Alectra Utilities is able to reduce controllable cost impacts on the project due to these risk mitigation strategies.
	Comparative Information on Equivalent Historical Projects (if any)	Similar cable replacement projects over the past 3 years (2016, 2017, and 2018) were $389/m. This project is forecasted to be $350/m. The difference is based on the assumption that this project is less complicated (less obstruction, long clearance from other utilities) than the projects already completed in prior years.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	In Alectra East, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.
	Condition of Asset vs. Typical Life Cycle and Performance Record	Cable in this area is 31 years old (installed in 1988), which exceeds the Kinectrics Report ''Asset Amortization Study for the Ontario Energy Board'' results for Typical Useful Life of non-tree retardant XLPE of 25 years.
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	522
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	For 1000 m of cable (applicable to the selected cable remediation candidates): Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 6918 m of cable in the whole area: Frequency of Failure is: 0.25 x 6918 /1000 = 1.7 failure(s) According to Alectra East Control Room data, there were 123, 133, 113, 126, 131, 131 and 138 Cable and Splice failures in 2012, 2013, 2014, 2015, 2016, 2017 and 2018 respectively (7-year average is 128 failures per year). Annually on average there were 128 Cable and Splice failures affecting 39,280 customers and 5,520,782 CMI Impact of 1 failure: 39,280/128 = 307 customers affected and 5,520,782/128 = 43,131 CMI Impact of 1.7 failures: 307 x 1.7 = 522 customers affected and 43,131 x 1.7 = 73323 CMI
	Qualitative Customer Impacts (customer satisfaction, customer migration and associated risk level)	Cable failures have negative impact to system reliability and customer service. Outages cause inconvenience and financial loss to customers (office closing, production stoppage).
	Value of Customer Impact	High
	Factors Affecting Project Timing, if any	Local approvals and weather.
	Consequences for O&M System Costs Including Implications of Not Implementing	Not Applicable
	Reliability and Safety Factors	This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.7 potential cable failures and 73323 potential CMI.
	Analysis for "Like for Like" Renewal Project	When direct buried cable is replaced, the new cable installed according to new Standards. Which call for the cable to be put in conduit. The conduit provides additional mechanical protection for the cable. In addition it will also facilitate for future cable replacement (faulted cable can be pulled out and new cable be pulled in, no digging is required).

	2019	2020	2021	2022	2023	2024
2019-2024 - Optimized for DSP CE v2: $2,421,259	$0	$0	$0	$0	$0	$2,421,259
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

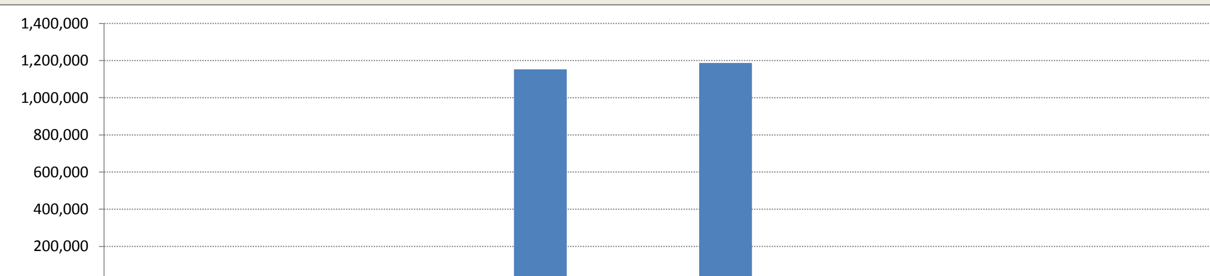
OEB Multi-Project Report

Project Code	151233
Project Name	New Construction - Campbell TS 36M63 Feeder PHASE 1 & 2, Guelph
Major Category	System Service
Scenario	Submitted

Project Overview

2. Additional Information	Service Territory	Guelph
	Location	
	Units	
	Project Class	No Burden
	Project Includes R&D	No
	Technology Project or has Technololgy Component	No
	Project Will Generate Ongoing IT OM&A Costs	No
3. General Project Information (OEB)	Rates ID	Rate Base Funded
	Alectra Grouping	Capacity (Lines)
	Alectra Subcategory	Line Capacity Projs & Add Circ
	Contributed Capital	*Entered Manually in Forecast
	Expenditure Type	Controllable
4. Evaluation Criteria (OEB)	Project Summary	There is a requirement to provide additional capacity support to the NW area of the City of Guelph. This project identifies a new 13.8kV feeder required from Campbell TS to bring additional load support to NW section of the city as the existing 13.8kV feeders in the area are unable to accommodate the additional load growth. The new feeder will also have load transferred to it from the existing 13.8kV feeders in the area, to alleviate the capacity constraints in the vicinity. Investments in this project will provide capacity to new and existing customers and increase the security and reliability of supply to customers. New civil infrastructure is needed from HONI owned Campbell TS to the first manhole on south side of Campbell Rd/Dawson Rd (MH390) with HONI civil work involved at the station and requiring an easement on adjacent property for new GHESI duct structure with new cable splice manhole. From MH390, existing civil infrastructure with spare ducts can be utilized up to Lewis Rd/Massey Rd across on the Hanlon Expressway. The feeder would be from Campbell TS, ZE Bus, Feeder 36M63 which is being redirected from NE to NW section of the city. A new pole line will be required on the south side of Massey Rd from Lewis to Imperial Rd to bring this express feeder up to Imperial Rd to provide support to existing loads connected on 36M22, 36M23, 36M34 and 36M42. A new pad-switch and two SCADAmate switches are required to create the appropriate inter-ties at Imperial Rd. In Phase 2 of the project in 2022, a new pole line is required between Imperial Rd and Elmira Rd to accommodate load growth and support existing loads connected. The Imperial Rd N pole line between Massey Rd and Speedvale Ave W needs to be rebuilt with 556ASC overhead conductor to meet existing construction standards and to increase the feeder current rating to 600A.
	Main Driver - System Service	Support Capacity Delivery
	Priority and Reasons for Priority	The new feeder circuit will be used to transfer load out of Campbell JQ yard and also accommodate possible feeder outages required for a MTO project at Woodlawn Rd and Hanlon Pkwy. Campbell TS J and Q busses have hard limits of 46 MVA and 50 MVA instead of the standard Campbell TS 63 MVA LTR ratings. This requires GHESI to implement a control action that prevents HONI from planning any bulk system or equipment outages between the months of May to September for the following equipment : 230 kV circuits D6V/D7V, Campbell B, Campbell Y, Campbell J, Campbell Q, Campbell Z and Campbell E busses. New industrial connections from customer Linamar connecting to the JQ Bus pair require additional feeder capacity to transfer load out of the Campbell JQ yard and even with the HONI control action in place continued load growth in the Northwest Business Park will exceed the Campbell TS bus ratings in the near future (2-3 years). Planned or emergency bus outages at Campbell TS result in a loss of N-1 switching capability for the majority of customers supplied from Campbell TS. Alectra has already installed scada switches to enable System Control Operators the ability to remotely transfer feeders 36M33, 36M44 and 36M52 (20 MVA) out of Campbell TS to Cedar TS to accommodate planned or emergency Campbell TS Bus outages.
	Customer Attachment / Load (KVA)	Linamar Camtac # 2 (Campbell J Bus 36M31) 4000 KVA energized in fourth quarter 2017, Linamar Quadrad # 2 (Campbell Q Bus 36M43) 1500 KVA to 4000 KVA upgrade in 3rd quarter 2018, Linamar Linergy # 2 (Campbell Q Bus 36M42) 4000 KVA energized 4th quarter 2018. Linamar corporation has either added or upgraded the transformer at a minimum of one manufacturing plant to 4000 or 5000 KVA every year for the past 5 years. Normal loading for a Linamar plant is 40 to 60 percent of connected transformation. Alectra is also required to provide 6 MVA of emergency standby for PolyCon (Campbell Q Bus 36M41).
	Safety	Not applicable.
	Cyber-Security, Privacy	Not applicable.
	Coordination, Interoperability	Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra constructs all new projects using approved construction standards complying with ESA Regulation 22/04. Alectra Guelph participates in regional planning, both at an infrastructure level with local municipalities and regions, as well as at an electrical infrastructure level with Hydro One and other participants in the Regional Planning Process. Alectra also attends Public Utility Coordinating Committee (PUCC) meetings which jointly allows for the coordination and planning of investments with other utilities who provide cable tv, internet, phone and natural gas services.

	Economic Development	By improving capacity in the North West section of the city, future development and intensification that is likely occur due to Linamar plants - can be more adequately supplied with existing infrastructure, mitigating cost barriers to attracting new load growth.
	Environmental Benefits	Not applicable.
5. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	Status Quo	Status quo is to leave the circuits as they are and not build anything. This is not a viable option as the existing Campbell TS feeders are already near their planning limit and cannot accommodate future load growth and load relief under contingency scenarios.
	Alternative #1	Build a new circuit out of 36M63 ZE Bus as described in the project summary.
	Alternative #2	There is no viable alternate solution, as 36M63 needs to be an express circuit until the Hanlon crossing. There is no existing pole lines that can accommodate an additional circuit to be strung on Campbell Road and Dawson Road, as they already have overhead pole lines on both sides of the road. Re-building the pole lines on those roads to accommodate an additional circuit is not feasible due to outages required and the constraints that it would put on the system.
	Justification for Recommended Alternative	Alternative #1 is the recommended alternative as it provides feeder capacity relief to existing adjacent feeders in the area and there is no viable alternative. However, the project cost includes estimated HONI Civil work costs and easement costs at 171 Dawson Rd and Alectra 2018 labour/contractor pricing.
6. General Information on the Project/Activity (OEB)	Risks to Completion and Risk Management	Timing of the project due to the unknown construction schedule for MTO Hwy 7 work and HONI timelines to install underground duct structure at Campbell TS. Linamar is currently considering taking three of their plants off-grid, thus reducing 10-12MW of load in NW section of City of Guelph. Some additional factors might increase the overall project cost.
	Comparative Information on Equivalent Historical Projects (if any)	There are no recent comparable projects.
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (if any)	0
7. Category-Specific Requirements for Each Project/Activity (OEB)	Benefits to Customers of Project Expressed in terms of Cost Impact, where practicable	Not applicable.
	Regional Electricity Infrastructure Requirements which affect Project, if applicable	Not applicable.
	Description of Incorporation of Advanced Technology, if applicable	Not applicable.
	Identify any reliability, efficiency, safety or coordination benefits	Alectra Utilities requires to prepare the distributions system to address the system capacity need driven by intensification. This project will also help reliability and security of supply to the North West Section of the city, especially during the expansion of Hwy 7 by MTO at Woodlawn Rd.



	2019	2020	2021	2022	2023	2024
Submitted: $2,339,703	$0	$0	$1,152,813	$1,186,890	$0	$0
Actuals: $0	$0	$0	$0	$0	$0	$0

Currency scale is in literal

Appendix C

Customer Engagement

Alectra Utilities

Distribution System Plan (2020-2024)

Customer Engagement Planning Placemat

Identifying Customer Needs & Preferences

Rate Zone	Residential	Small Business	Mid-Market	Large Use
What are customer needs? The clear majority of Alectra Utilities' customers in all rate zones are satisfied with the current service they receive. When asked how Alectra Utilities can improve service, top responses were either "nothing" or "lower rates".				
Enersource RZ	1. Lower rates 2. Nothing	1. Lower rates 2. Nothing	1. Nothing 2. Lower rates	Nothing/Don't know (4 of 9)
PowerStream RZ	1. Lower rates 2. Nothing	1. Lower rates 2. Nothing	1. Nothing 2. Lower rates	Nothing/Don't know (8 of 13)
Brampton RZ	1. Lower rates 2. Nothing	1. Lower rates 2. Nothing	1. Nothing 1. Lower rates	Nothing/Don't know (8 of 11)
Horizon RZ	1. Lower rates 2. Nothing	1. Lower rates 2. Nothing	1. Nothing 2. Lower rates	Nothing/Don't know (6 of 12)
Overall, what outcomes do customer prioritize? The top two priorities for Alectra Utilities as identified by the three smaller customer classes in both the Enersource and PowerStream rate zones are: 1. Delivering reasonable distribution rates; and 2. Ensuring reliable electrical service. These are also the top two priorities for large use customers, however, these customers rank reliability over price. Residential and GS<50kW customers rank minimizing the impact on the environment as their third priority. GS>50kW and Large Use customers are split on their third priority - with some focusing on helping customers to reduce or manage consumption and others on safety or customer service.				
Enersource RZ	1. Price 2. Reliability 3. Environmental impact	1. Price 2. Reliability 3. Environmental impact	1. Price 2. Reliability 3. Reduce/manage consumption	1. Reliability 2. Price 3. Safety
PowerStream RZ	1. Price 2. Reliability 3. Environmental impact	1. Price 2. Reliability 3. Environmental impact	1. Price 2. Reliability 3. Reduce/manage consumption	1. Reliability 2. Price 3. Reduce/manage consumption
Brampton RZ	1. Price 2. Reliability 3. Reduce/manage consumption	1. Price 2. Reliability 3. Reduce/manage consumption	1. Price 2. Reliability 3. Customer service	1. Reliability 1. Price 3. Reduce/manage consumption
Horizon RZ	1. Price 2. Reliability 3. Environmental impact	1. Price 2. Reliability 3. Reduce/manage consumption	1. Price 2. Reliability 3. Reduce/manage consumption	1. Reliability 2. Price 3. Safety
What reliability outcomes do customers prioritize? The top reliability concern for customers is the overall number of outages. Five out of 8 GS>50kW and Large Use groups rank this as their number one priority, while residential customers place it second. The second concern is reducing the length of outages during extreme events. This is the top concern for the residential customers and a top three concern for all small and mid-market businesses The third concern is the overall length of day-to-day outages, with the majority of customers ranking it as their third priority. Large Use customers generally rank power quality as their second or third most important priority.				
Enersource RZ	1. Extreme weather restoration 2. SAIFI 3. SAIDI	1. SAIFI 2. Extreme weather restoration 3. SAIDI	1. SAIFI 2. SAIDI 3. Extreme weather restoration	1. SAIFI 2. SAIDI 3. Power quality
PowerStream RZ	1. Extreme weather restoration 2. SAIFI 3. SAIDI	1. SAIFI 2. Extreme weather restoration 3. SAIDI	1. SAIFI 2. Extreme weather restoration 3. Power quality	1. SAIFI 2. Power quality 3. SAIDI
Brampton RZ	1. Extreme weather restoration 2. SAIFI 3. SAIDI	1. SAIFI 2. SAIDI 3. Extreme weather restoration	1. SAIDI 2. Extreme weather restoration 3. SAIFI	1. SAIFI 2. Power quality 3. SAIDI
Horizon RZ	1. Extreme weather restoration 2. SAIFI 3. SAIDI	1. Extreme weather restoration 2. SAIFI 3. SAIDI	1. SAIDI 2. SAIFI 3. Extreme weather restoration	1. SAIDI 1. SAIFI 3. Power quality
What investment trade offs do customers value most? Despite price concerns, customers are generally willing to consider paying more to maintain a reliable system.				
System Renewal: The majority of Alectra Utilities customers believe that the utility should invest in renewal now, rather than defer to the future. *% of customers who say Alectra Utilities "should invest what it takes to replace the system's aging infrastructure to maintain system reliability"*				
Enersource RZ	61%	60%	74%	7/9
PowerStream RZ	50%	62%	66%	6/13
Brampton RZ	53%	52%	72%	9/11
Horizon RZ	59%	58%	56%	8/12
General Plant: Residential customers and most business customers support investing in general plant now, rather than finding ways to make do with existing equipment and tools. Large Use customers are more evenly divided *% of customers who say Alectra Utilities "should make the investments necessary to ensure its staff have the equipment and IT systems they need to manage the system efficiently and reliably"*				
Enersource RZ	69%	55%	64%	4/9
PowerStream RZ	63%	59%	61%	4/13
Brampton RZ	61%	54%	65%	5/11
Horizon RZ	68%	61%	64%	6/12
System Service: The clear majority of customers support investments in system service. Support for these investments is strongest among the large use customers in the Enersource, PowerStream and Brampton RZs. *% of customers who say Alectra Utilities "should proactively invest in system capacity infrastructure to ensure customers in high growth areas do not experience a decrease in reliability, even if this adds a small increase to customer bills."*				
Enersource RZ	58%	57%	73%	8/9
PowerStream RZ	57%	56%	64%	6/13
Brampton RZ	51%	54%	61%	7/11
Horizon RZ	58%	55%	60%	4/12
Modernization: Customers generally agree that modernization can wait for the normal renewal process. There is no immediate pressure to proactively invest in modernization, however, support for specific programs could exceed general support. *% of customers who say Alectra Utilities "should invest in the benefits of modernization now, even if that means customers will have to pay bit more on their distribution rates in the near future."*				
Enersource RZ	34%	34%	41%	3/9
PowerStream RZ	31%	37%	32%	4/13
Brampton RZ	30%	38%	36%	4/11
Horizon RZ	33%	41%	28%	3/12

Source: Innovative Research Group (Customer Engagement Research - May & August - October 2018)

Customer Engagement Methodologies

Alectra Utilities Corporation (Alectra Utilities) engaged Innovative Research Group Inc. (INNOVATIVE) to assist in meeting Alectra Utilities' customer engagement commitments under the Renewed Regulatory Framework for Electricity Distributors. Below is a summary of those customer engagement efforts.

For detailed survey methodologies, please consult complete Customer Engagement Reports.

Rate Zone	Methodology	Field	n-size
Enersource RZ Residential	Telephone	May 2018	n=501
Enersource RZ Small Business (GS < 50 kW)	Telephone	May 2018	n=202
Enersource RZ Mid-Market (GS > 50 kW)	Telephone	May 2018	n=200
Enersource RZ Large Use	Online	May 2018	9 of 36
PowerStream RZ Residential	Telephone	May 2018	n=505
PowerStream RZ Small Business (GS < 50 kW)	Telephone	May 2018	n=205
PowerStream RZ Mid-Market (GS > 50 kW)	Telephone	May 2018	n=200
PowerStream RZ Large Use	Online	May 2018	13 of 47
Horizon RZ Residential	Telephone	August 2018	n=508
Horizon RZ Small Business (GS < 50 kW)	Telephone	August 2018	n=203
Horizon RZ Mid-Market (GS > 50 kW)	Telephone	Aug-Sept 2018	n=53
Horizon RZ Large Use	Online	Aug-Sept 2018	12 of 28
Brampton RZ Residential Telephone	Telephone	August 2018	n=508
Brampton RZ Small Business (GS < 50 kW)	Telephone	August 2018	n=200
Brampton RZ Mid-Market (GS > 50 kW)	Telephone	Aug-Oct 2018	n=45
Brampton RZ Large Use	Online	Aug-Sept 2018	11 of 22

Additional Information

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Legend

Above average support within category

Average support within category

Below average support within category

INNOVATIVE RESEARCH GROUP

Customer Engagement

2020-2024 Distribution System Plan

May 2019

Prepared for:

Alectra Utilities
2185 Derry Road West
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alectra utilities

Customer Engagement Overview

May 2019

Confidentiality

This Overview and all the information and data contained within it may <u>not</u> be released, shared or otherwise disclosed to any other party, without the prior, written consent of Alectra Utilities Corporation ("Alectra Utilities").

Acknowledgement

This overview has been prepared by Innovative Research Group Inc. ("INNOVATIVE") for Alectra Utilities. The conclusions drawn, and opinions expressed are those of the authors.

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INNOVATIVE
RESEARCH GROUP

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Executive Summary

Innovative Research Group Inc. (INNOVATIVE) was engaged by Alectra Utilities Corporation (Alectra Utilities) to assist in meeting Alectra Utilities' customer engagement commitments under the Renewed Regulatory Framework for Electricity Distributors.

Alectra Utilities is developing its first consolidated Distribution System Plan. Development of this Plan requires input of the needs of customers, the outcomes customers care about and their preferences on program pacing and balancing outcomes.

With over 32,000 customers fully completing engagement workbooks, the second Phase of Alectra Utilities Distribution System Plan customer engagement was the largest public consultation ever conducted in Ontario's electricity sector.

Each customer received a workbook customised to their rate zone and class for a total of 20 different versions. Customers provided their feedback on between seven and thirteen key business choices relevant to their needs. Where possible, the results of customers directly impacted by a potential investment are shown separately from those who are not affected. The views of vulnerable Ontarians are also provided.

The work was completed in two phases.

The first phase took place over the spring and summer of 2018 at the start of the planning process and was focused on two objectives:

1. To provide input on customers needs and preferences for outcomes at the start of Alectra Utilities' first consolidated Distribution System Plan (DSP) for the period covering 2020 to 2024.
2. To provide input into process for assessing the appropriateness of various projects for a 2018 ICM application including customer views on bill impacts.

Using that input, Alectra Utilities' managers reviewed each part of the utility's business. Business units submitted business cases for the proposed projects. Those cases were assessed using a common set of criteria to establish the relative benefit of each project, so it could be compared to all other projects.

In that planning process, Alectra Utilities identified more investment needs than the current approved rates can support. This reality required that any follow-up engagement be able to inform three distinct needs:

1. customer views on the relative priority of various spending priorities within existing rates;
2. customer views on individual projects, and
3. customer views on an overall capital rate rider which would be sufficient to fund a final version of the DSP that reflects customer priorities across the range of spending areas.

The second phase took place in the Spring of 2019 and asked customers to provide feedback on a final set of choices for Alectra Utilities' DSP. As detailed in the following pages, Alectra Utilities gathered feedback through both a voluntary engagement and a representative sampling process. Both processes used an online workbook to collect feedback.

The choices covered the full scope of Alectra Utilities' DSP. In order to keep the workbook to a reasonable length, choices vary in terms of the breath of projects covered. For each choice, Alectra Utilities identified an option to stay within existing rates under the Price Cap Formula. It also identified options to increase investments. Where practical, options were offered to reduce investments to enable lower rates or make room for increased investments in more pressing areas. The workbook identified options that, in the view of the planners, provide the best balance between any potential rate increase with the intention to maintain reliability and to fix or avoid pockets of customers experiencing significantly below average service.

This document covers the result of the second phase of this customer engagement and focuses on the generalizable results of the representative sample.

Key Findings

A strong majority of Alectra Utilities customers across all rate classes and in all rate zones support additional investments in infrastructure that most directly serve customers. These investments include:

- Overhead renewal;
- Underground renewal;
- Transformer replacement;
- Monitoring and control equipment; and
- Converting rear lot services.

The table below illustrates the typical reaction for underground investment options.

Percentage of Customers Who Chose Recommended or Higher Option for Underground System Investments

Rate Zone Breakdown *% Recommended or higher* *n-size for sample sizes <60*	ERZ	HRZ	PRZ
Residential	74%	77%	68%
Small Business	67%	74%	57%
GS > 50 kW – 4,999	34/51	17/24	46/62
Large Use	4/5	5/7	1/1

For overhead, underground and rear lot projects, extra analysis was completed to examine potential differences between those who directly benefit from the projects and those who do not. There are remarkably few differences. The table below shows differences in pacing preferences for rear lot conversion between customers with rear lot service and those without. In all cases, a majority of customers support at least the recommended pace of investment. Customers support these projects whether or not they directly benefit.

Customer Preferences for Pacing of Rear Lot Conversion

Rate Zone Breakdown	**HRZ**		**PRZ**		**GRZ**	
Service Type	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot
Accelerated Pace	15%	9%	14%	8%	13%	13%
Moderate Pace	16%	11%	10%	7%	13%	15%
Recommended Pace	49%	51%	50%	47%	50%	47%
Base Pace	20%	29%	26%	38%	24%	25%

There is also strong support for establishing a budget allocation to cover unplanned repairs and replacements rather than to rely on delaying planned projects to fund that unplanned spending.

A clear majority of Alectra Utility customers across most rate classes support the remaining investments in grid infrastructure. These investments include:

- Expansion, intensification, and back-up investments
- Voltage conversion
- Additional station investments
- Distribution station capacity

The chart below illustrates this pattern of support with the results on *planning for expansion, intensification, and back-up*. Only two rate classes out of 20 fall below majority support. Most strongly support the recommended or higher level of investment.

Percentage Who Support Recommended Pace or Higher for Expansion, Intensification, and Back-up

Rate Zone Breakdown *% Recommended or higher* *n-size for sample sizes <60*	**ERZ**	**BRZ**	**HRZ**	**PRZ**	**GRZ**
Residential	65%	66%	64%	53%	56%
Small Business	63%	74%	64%	47%	61%
GS > 50 kW – 4,999	37/51	3/6	15/24	36/62	5/15
Large Use	5/5	3/5	4/7	1/1	n/a

Three proposed investments divide customers. Customers were split on whether to increase investments in general plant above the level currently included in rates. Support varied both by rate class and rate zone.

Percentage Supporting Recommended Approach to General Plant

Rate Zone Breakdown *% Recommended or higher* *n-size for sample sizes <60*	ERZ	BRZ	HRZ	PRZ	GRZ
Residential	58%	50%	60%	46%	61%
Small Business	50%	51%	57%	43%	55%
GS > 50 kW – 4,999	18/51	3/6	14/24	31/62	4/15
Large Use	2/5	2/5	3/7	0/1	n/a

The two other investments that divided customers were PowerStream-specific issues.

- As with the overall reaction to general plant spending, PowerStream customers are split on whether to accelerate the replacement of meters to eliminate security risks or not.
- On Distributed Energy Resources (DERs), while a plurality of PowerStream customers preferred the recommended pace of investment, majority support only emerges for the slower pace option.

Overall, customers are prepared to pay for the level of investment recommended by Alectra Utilities. Respondents were shown the rate impact of their choices and given the opportunity to change their responses until they were satisfied. There was very little significant change across rate classes and rate zones.

Respondents were then asked their view on the cost of implementing all the investments recommended by Alectra Utilities. A majority in all rate classes in all rate zones either supported the increase outright or said they didn't like it but felt that it is necessary.

Percentage Who Say Rate Increase is Reasonable or at least Necessary

Rate Zone Breakdown *% Favourable* *n-size for sample sizes <60*	ERZ	BRZ	HRZ	PRZ	GRZ
Residential	78%	69%	80%	75%	81%
Small Business	73%	91%	74%	70%	80%
GS > 50 kW – 4,999	34/43	1/2	17/20	44/59	10/15
Large Use	3/3	2/3	6/7	1/1	n/a

About this Consultation

Engagement Overview

Innovative Research Group Inc. (INNOVATIVE) was engaged by Alectra Utilities Corporation (Alectra Utilities) in the Spring of 2018 to assist in meeting Alectra Utilities' customer engagement commitments under the Renewed Regulatory Framework for Electricity Distributors. The work was completed in two phases.

The first phase took place over the spring and summer of 2018 and was focused on two goals:

1. To provide input on customers needs and preferences for outcomes at the start of Alectra Utilities' first consolidated Distribution System Plan (DSP) for the period covering 2020 to 2024.
2. To provide input into process for assessing the appropriateness of various projects for a 2018 ICM application including customer views on bill impacts.

Using that input, Alectra Utilities' managers reviewed each part of the utility's business. Business units submitted business cases for the proposed projects. Those cases were assessed using a common set of criteria to establish the relative benefit of each project, so it could be compared to all other projects.

In that planning process, Alectra Utilities identified more investment needs than the current approved rates can support. This reality required that any follow-up engagement be able to inform three distinct needs:

1. customer views on the relative priority of various spending priorities within existing rates,
2. customer views on individual projects, and
3. customer views on an overall capital rate rider which would be sufficient to fund a final version of the DSP that reflects customer priorities across the range of spending areas.

The second phase took place in the Spring of 2019 and asked customers to provide feedback on a final set of choices for Alectra Utilities' DSP.

The goal of the workbook was to allow customers to provide feedback on whether the planners have found the right balance or whether Alectra Utilities should be choosing different options that better reflect customer views.

Methodology

The general approach to the two phases were planned at the beginning of phase 1.

The basic challenge for electricity consultations is to get meaningful input from a wide variety of customers, many of whom begin with a very limited understanding of the electricity system, its governance, and the role of distributors such as Alectra Utilities.

To overcome this challenge, INNOVATIVE recommended a workbook-based consultation. The core idea behind this approach is to provide customers with choices based on basic values illustrated with trade-off among different outcomes. To provide meaningful feedback on those choices, workbooks create an opportunity for customers to learn the basics of the distribution system and provide the context needed to make informed choices.

In approaching the design of this round of engagement, INNOVATIVE and Alectra Utilities considered the comprehensive nature of the utility's previous 2017 customer engagement. That effort included a voluntary online workbook, completed by 17,595 customers, and randomly recruited focus groups, leading up to random digit dialing customer telephone surveys in both the former PowerStream and Enersource rate zones.

The previous engagement found support for investments varied by rate zone, rate class and project type. The diagnostic questions in the workbook and discussion groups found that the basic format for assessing individual investments worked.

A key concern was how often the utility can sustain the level of participation secured in the 2017 customer engagement. The view was that customer participation in these engagement activities would likely decline if repeated too frequently and that it would be counter-productive to attempt three large-scale voluntary engagements three years in a row.

Looking at the content of the two phases, it was felt that projects in the 2020-2024 Consolidated DSP would likely have more impact on the value delivered to more customers than the incremental projects discussed in the ICM Application. Given these considerations, the first round relied primarily on random-sample telephone surveys. The second phase of DSP consultation received priority for the large-scale voluntary engagement.

Phase 1 Methodology

In order to assess the customer needs and preferred outcomes, telephone surveys were used to collect the preferences of a random-sample of residential, small business and mid-market customers in the Horizon, Enersource, Brampton and PowerStream rate zones. An online survey was used for key accounts. This was possible because Alectra Utilities had email addresses for the full population being sampled. Using an online survey facilitated maximizing the completion rate of key accounts in all four rate zones. The survey questions were tested in focus groups among customers within the former Enersource and PowerStream rate zones.

While full reports of the results were provided to Alectra Utilities, the key findings were distilled into a one page "placemat" format to facilitate the distribution of key findings to all planners involved in the DSP process. The initial version of the placemat was provided in August 2018 with a final version provided in October 2018.

Phase 2 Methodology

Workbook Development

The initial task was to develop an online workbook for the voluntary engagement. As noted in previous engagement reports, a key challenge in collecting meaningful input from many customers is their initial low level of knowledge about the electricity system.

The customer engagement workbook gave customers a basic overview of Alectra Utilities and where it fits in the electricity system before they were asked their preferences on key business choices. Topics covered in this orientation included:

- The merger of Enersource, Horizon Utilities, Brampton Hydro, PowerStream and Guelph Hydro to form Alectra Utilities;
- the role of Alectra Utilities as a local electricity distributor;
- Alectra Utilities' portion of the total electricity bill;
- the estimated typical annual increase in monthly bills until 2024 under the Price Cap Formula without any incremental capital spending beyond approved rates; and
- the reliability experience of the typical Alectra Utilities customer.

The workbook then moved on to the key choices managers were making in the final stages of the DSP process. Alectra Utilities began by collecting all the potential capital projects that may be required in the 2020 to 2024 period and screening them to ensure they provide a meaningful benefit to customers. That process identified more projects that the rates expected under the Price Cap Formula can support.

As a result, Alectra Utilities identified a series of choices. For each choice, Alectra Utilities provided an option to stay within existing rates under the price cap formula. It also identified options to increase investments. In some areas, where practical, options to reduce investments to reduce rates or make room for increased investments in more pressing areas were provided. The workbook identifies what, in the view of the planners, provides the best balance between any potential rate increase with the intention to maintain reliability and to fix or avoid pockets of customers that are having significantly below average experiences.

Customers were given an option to review the cumulative cost impact of their choices and to change those choices until they reached a cost impact that they were comfortable with. Customers were also asked their view on an overall rate increase sufficient to fund planners recommended options across all projects.

The workbook was tested in three nights of randomly recruited residential and small business focus groups to ensure comprehension and to test for length. Diagnostic questions were included to assess customer experience and the voluntary workbook included a comment box for every substantive question to allow customers to flag concerns.

Why Online?

Once the workbook was completed, the team then needed to assess the best way to collect the views of a representative sample on the same content. The core challenge of the Phase 2 consultation was that it included some of the most complex content INNOVATIVE has covered in a consultation. In order to provide feedback on the priorities for managing capital needs within existing rates, it was important for customers to understand the overall scope of the DSP. While INNOVATIVE felt it was possible to collect the views of customers on the individual project options and general outcome trade-offs using a telephone methodology, it was also a goal of this phase to give customers an opportunity to reconsider their answers on individual business choices after reviewing the total rate impact of their initial choices. Given customers were reviewing between seven and 13 choices, it was only possible to allow customers to reconsider their views after seeing the total cost through an online methodology.

In most rate zones, Alectra Utilities has emails for half or more of each rate class. Only Brampton has significantly lower levels of coverage. The table below illustrates a typical level of email coverage using the Enersource rate zone customer base.

Email Coverage by Rate Class in Enersource

Rate Class	Full Population	Email Coverage	
Residential	181,020 records	68,271 records	**38%**
GS<50	18,090 records	13,783 records	**76%**
500>GS>50	3,663 records	3,127 records	**85%**
GS>500	386 records	367 records	**95%**

A comparison of customers with emails to the overall customer base was completed on known characteristics of region and electricity usage. Customers with emails are similar to the overall customer base which made an online survey a viable alternative to traditional telephone surveys. Even in the Brampton rate zone, with relatively low levels of email coverage, customers with emails are not dramatically different in electricity usage.

Comparing Usage Between Customers with and Without Emails in Brampton

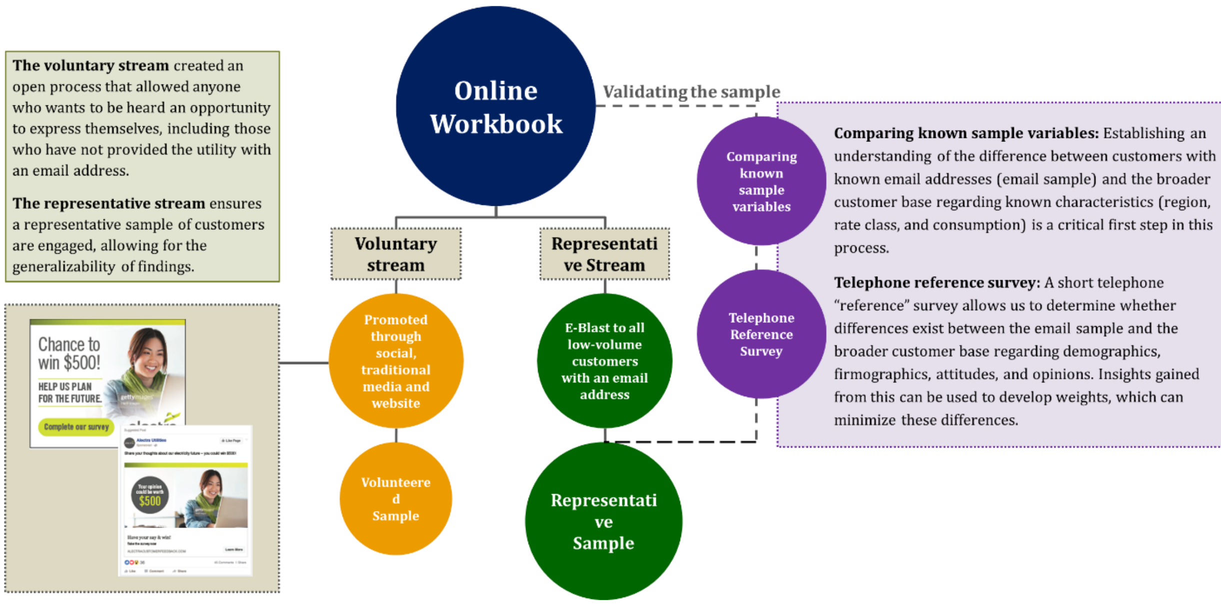
Rate Class	Full Population	Those with email addresses	Difference
Residential	756 kWh	719 kWh	**-5%**
GS<50	3,061 kWh	3,278 kWh	**+7%**
700>GS>50	61,278 kWh	75,230 kWh	**+23%**
GS>700	1,425 kW*	1,511 kW*	**+6%**

Given those considerations, INNOVATIVE recommended conducting a representative online survey.

Every customer for whom Alectra Utilities had an email in every rate class in all five rate zones was sent an invitation containing a unique URL linking to the survey. Monitoring after launch showed a lower response from small and mid-sized business customers compared to residential and large customers. This appeared to be due in part to email addresses provided for billing purposes that went to the accounting side of the business rather than the people responsible for electricity management. A phone to online recruit was added to overcome that challenge and the field window extended for those customer classes.

As an additional check against the possibility that customers who provided email may be different in their attitudes compared to customers who did not provide emails, Alectra Utilities also commissioned a much shorter reference study.

Phase 2 Customer Engagement Process



The representative online workbook was launched on April 8th, 2019. Residential surveys were completed on May 1st. The business field window was extended to May 15th for all classes except the Brampton GS over 50 which was further extended to May 22nd. A total of 32,491 customers participated in either the voluntary or representative sample.

Total Number of Customer Engagement Workbook Completes by Rate Zone and Rate Class

	Unweighted Completes	ERZ	BRZ	HRZ	PRZ	GRZ	Total
Voluntary	**Residential**	854	535	1,095	1,204	407	4,095
	Small Business	30	12	60	65	19	186
	Total Voluntary	884	547	1,155	1,269	426	4,281
Representative	**Residential**	5,838	3,193	6,699	9,636	2,015	27,381
	Small Business	191	68	92	246	49	646
	GS>50kW – 4,999kW	51	13	24	62	15	165
	Large Use	5	5	7	1	0	18
	Total Representative	6,085	3,279	6,822	9,945	2,079	28,210
	Total Customer Engagement	**6,969**	**3,826**	**7,977**	**11,214**	**2,505**	**32,491**

The sample of those who completed the workbook was then tested in two ways:

1. Customers who completed workbooks in the representative sample were compared to the broader customer base on known characteristics of region and electricity usage. Weights were applied to the final representative sample to ensure those who completed the workbook shared the same proportions on region and electricity usage as the overall customer base. Very little weighting was required.
2. A telephone reference study was conducted to establish benchmarks on general attitudes and economic circumstances. Overall the representation sample looks quite similar to the broader customer base. The key difference is the representative sample has more LEAP-qualified customers than expected. The sample was not weighted on this measure.

The workbook also included diagnostic questions to assess customer experience. Customers had a favourable impression of the workbook, felt it struck the right balance between having too much or too little information, and over 32,000 customers were willing to complete all the questions.

An initial overview of the voluntary results was provided on April 29th. Alectra Utilities was provided with a report of the representative and voluntary responses on May 9th. An updated version with 198 additional business responses was provided on May 15th. While the new numbers allowed for further depth of analysis, they did not result in any substantive changes in the results. A final addendum with the additional GS over 50 completes in Brampton was provided on May 23rd.

Summary

With more than 32,000 customers fully completing an online workbook, the Alectra Utilities 2020-2024 Distribution System Plan customer engagements is the largest consultation ever conducted in the Ontario electricity sector.

This engagement was fully integrated in Alectra Utilities business planning process. An initial phase to provide input on customers needs and preferences for outcomes at the start of Alectra Utilities' business planning was completed in 2018. In addition to the full reports, a one-page summary was developed and shared with all Alectra Utilities managers contributing to the plan to ensure full awareness of customer needs and preferred outcomes.

Planners did their best to find the right balance between keeping rate increases down and delivering on other outcomes valued by customers. The second phase asked customers to provide feedback on whether the planners had found the right balance or whether Alectra Utilities should be choosing different options that better reflect customer views.

The second phase identified key choices covering the full range of Alectra's capital spending and expressed those choices in terms of rate and customer outcome impacts. By moving to an online format, the engagement allowed customers to review those choices considering their combined rate impact and change them if they wished. And it asked customers to respond to the total cost of Alectra Utilities' recommended options.

Twenty-different versions of the workbook ensured each customer only responded to the choices relevant for their rate zone and class with rate impact reflecting the average impact for that rate zone and class.

Following on Alectra Utilities' approach to past ICM project, customers were given an opportunity, where applicable, to provide input into system design choices, including the utility's rear lot conversion program.

Specific attention has been paid to how LEAP-qualified customers' opinions vary from the broader customer base. Reflecting their financial capacity, LEAP-qualified customers are less supportive of investments than the average customer but still generally support those proposed investments.

New to this engagement, the responses of customers who do not benefit from specific investments are compared to those who do. All customers are willing to support investments in overhead and underground renewal and rear lot conversions, whether they directly benefit or not.

Participants generally support the investments proposed by Alectra Utilities' planners. There is a very strong consensus in favour of investing in elements of the grid that most directly support customers. There is majority support across Alectra Utilities' service territory for investments in system service, voltage conversion and most station investments. The key issue that splits customers is how much to invest in general plant, such as tools, trucks, buildings, computers and software.

Participants had a favourable impression of the engagement. They felt the workbook found the right balance between too much and too little information. With more than 32,000 responses, customers showed they are willing and able to invest their time and energy to contribute to planning of their electricity system.

2020-2024 DSP Customer Engagement

Representative Report

This report and all of the information and data contained within it may <u>not</u> be released, shared or otherwise disclosed to any other party, without the prior, written consent of Alectra Utilities Inc.

May 15, 2019

Update from May 9, 2019

STRICTLY PRIVILEGED AND CONFIDENTIAL

Introduction

Representative Online Workbook

Alectra Utilities’ 2020-2024 Customer Engagement (Phase II)

Innovative Research Group Inc. (INNOVATIVE) was engaged by Alectra Utilities Corporation (Alectra Utilities) to assist in meeting Alectra Utilities’ customer engagement commitments under the Renewed Regulatory Framework for Electricity Distributors. The information contained within this report are the result of a series of customer engagements workbooks.

- Each response from within this report was collected using a unique survey URL which was sent directly to customers via Alectra Utilities. Each workbook was customized to the individual customers’ rate zone and rate class. Each customer received a workbook customised to their rate zone and class for a total of 20 different versions.
- Customers provided their feedback on between 7 and 13 key business choices relevant to their needs.
- Where possible, the results of customers directly impacted from an investment are shown separately from those who are not affected. The views of vulnerable Ontarians are also provided.

Setting the Context

Alectra Utilities is developing its first consolidated Distribution System Plan. The first phase of customer engagement conducted in the Spring and Summer of 2018 provided feedback on customer needs and the outcomes valued by customers. This report covers the second phase of engagement which focused on customer preferences on program timing and balancing outcomes.

With more than **27,000** customers fully completing engagement workbooks as part of the representative sample and another more than **4,000** completing workbooks in the voluntary component, the second Phase of Alectra Utilities Distribution System Plan engagement is the largest public consultation ever conducted in Ontario’s electricity sector.

Interpreting the Results

This report covers the findings of an online workbook distributed to all customers who have provided email addresses to Alectra. A comparison of usage rates between customers with emails and customers without emails shows that customers with emails are very similar to customers without emails.

For Residential, GS<50kW and GS>50kW rate classes, responses were weighted by rate zone, region (where applicable) and by usage to ensure the responses were representative of the broader customer base. This report includes an additional 198 business responses collected since May 8th. The additional responses provide for further depth of analysis but resulted in no material change in the results.

A telephone reference survey was also conducted to explore any differences in key attitudes and circumstances between the customers with email addresses and the customers without email addresses. A comparison of survey responses between customers with emails and customers without emails shows the customers with emails are very similar to customers without emails. We are confident that the views of customers with emails are reflective of the broader customer base.

The following report is an updated version of the initial report dated May 9, 2019. This updated report includes 198 additional business responses. While the additional responses allowed for further depth of analysis, they did not result in any substantive changes in the results.

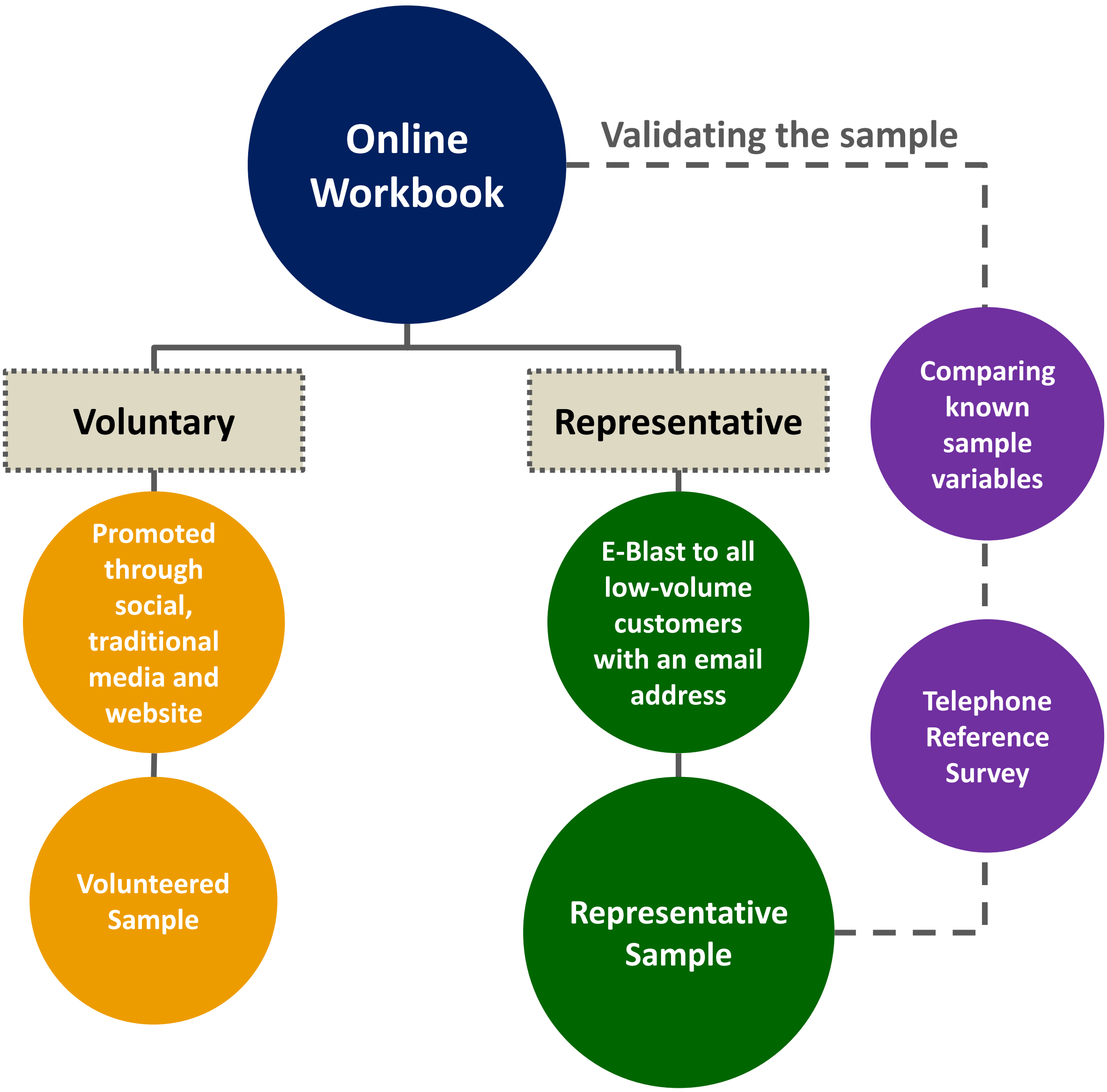
Sample Validation

Overall Approach

Alectra Utilities' low volume (residential and small business) customer engagement workbook featured two streams – *representative* and *voluntary*.

The voluntary stream created an open process that allowed anyone who wants to be heard an opportunity to express themselves, including those who have not provided the utility with an email address. *Those results are provided in a separate report.*

The representative stream ensures a representative sample of customers are engaged, allowing for the generalizability of findings. *This is a report of those responses.*



Sample Validation
Overall Approach

A key improvement in this engagement is allowing customers to review the total cost impact of their earlier choices and then revise those choices to end up at a rate impact they are comfortable with. That required moving from a telephone survey for the representative sample to an online workbook.

This is a significant change in methodology so it is important to validate that the data being collected is generalizable to the broader customer base.

Understanding the difference between customers with known email addresses (email sample) and the broader customer base is a critical step for utilities that wish to migrate to representative online survey methodologies. Where significant differences exist between the email sample and the broader customer base (e.g. demographics, firmographics, attitudes, and opinions), the insights gained from these parallel surveys can be used to develop weights, which can minimize these differences.

INNOVATIVE undertook a rigorous "sample validation" process to understand whether and where differences occurred between email sample and the broader customer base. This process took place in two steps:

1. **Comparing known sample variables:** Establishing an understanding of the difference between customers with known email addresses (email sample) and the broader customer base regarding known characteristics (rate class, and consumption) is a critical first step in this process. *Those results are shared on pages 5 to 9.*

2. **Telephone reference survey:** A short telephone "reference" survey allows us to determine whether differences exist between the email sample and the broader customer base regarding demographics, firmographics, attitudes, and opinions. Insights gained from this can be used to develop weights, which can minimize these differences. *Those results are shared on pages 10 to 20.*

The population with emails looks very similar to the broader customer base with regards to electricity consumption and demand. We have used weights within rate class and region (where applicable) to ensure the final sample reflects the usage of the broader customer base.

The telephone reference survey also shows similar results to the online results on comparable questions. The residential online sample is almost identical to the phone sample on age and gender while the online small business sample is almost identical on firm size. So no weights were developed for those variables.

While the telephone sample shows the same number of respondents who would qualify for financial assistance, such as the Low-Income Energy Program (LEAP), as the online sample, on more subjective measures of financial stress, both residential and business online samples are somewhat more stressed than the telephone respondents. The differences are not that large so the sample was NOT weighted on that measure.

Sample Validation

Enersource Rate Zone Coverage and Consumption Analysis

Comparing the overall population to the sample of that population with email addresses across known variables, we can see that the email sample is largely representative of the overall population of customers.

Customers in the Enersource rate zone account for **20%** of Alectra Utilities' total customer base.

Overall Coverage

More than a third of residential customers in the Enersource area have emails on file, with progressively higher coverage in all small business rate classes.

Rate Class	Full Population	Email Coverage	
Residential	181,020 records	68,271 records	**38%**
GS<50	18,090 records	13,783 records	**76%**
500>GS>50	3,663 records	3,127 records	**85%**
GS>500	386 records	367 records	**95%**

Average Consumption

The consumption of Enersource customers who have email addresses on file is similar to the consumption of the total population of residential customers, with an average consumption that is 4% lower. The difference is smaller for each small business rate class, with differences ranging from +1% to +3%.

Rate Class	Full Population	Those with email addresses	Difference
Residential	731 kWh	704 kWh	**-4%**
GS<50	2,974 kWh	3,070 kWh	**+3%**
500>GS>50	45,551 kWh	46,195 kWh	**+1%**
GS>500	887 kW*	904 kW*	**+2%**

* Note: GS>500 customers are billed by demand rather than consumption

Sample Validation

Brampton Rate Zone Coverage and Consumption Analysis

Comparing the overall population to the sample of that population with email addresses across known variables, we can see that the email sample is largely representative of the overall population of customers.

Customers in the Brampton Hydro rate zone account for **16%** of Alectra Utilities' total customer base.

Overall Coverage

Coverage is lowest for small and medium sized business customers, with 16% and 20% coverage respectively. It is higher for residential and large businesses with over a third in each group.

Rate Class	Full Population	Email Coverage	
Residential	151,569 records	58,391 records	**39%**
GS<50	9,261 records	1,438 records	**16%**
700>GS>50	1,543 records	309 records	**20%**
GS>700	101 records	35 records	**35%**

Average Consumption

Differences between the full population and those with email addresses are small for residential, small businesses, and large businesses. There is a larger gap between medium businesses overall and only those with email addresses. Those with email addresses on file on average consume more power than the overall population.

Rate Class	Full Population	Those with email addresses	Difference
Residential	756 kWh	719 kWh	**-5%**
GS<50	3,061 kWh	3,278 kWh	**+7%**
700>GS>50	61,278 kWh	75,230 kWh	**+23%**
GS>700	1,425 kW*	1,511 kW*	**+6%**

* Note: GS>500 customers are billed by demand rather than consumption

Sample Validation

Guelph Rate Zone Coverage and Consumption Analysis

Comparing the overall population to the sample of that population with email addresses across known variables, we can see that the email sample is largely representative of the overall population of customers.

Customers in the Guelph Hydro rate zone account for **5%** of Alectra Utilities' total customer base.

Overall Coverage

Coverage is consistently high across rate classes, with a low of 64% in the residential group and a high of 80% among GS>50 customers.

Rate Class	Full Population	Email Coverage	
Residential	48,706 records	31,231 records	**64%**
GS<50	4,476 records	2,927 records	**65%**
GS>50	626 records	498 records	**80%**

Average Consumption

Differences between the full population and those with email addresses are small for residential customers. There is a slightly larger gap in the GS<50 and GS>50 customer groups, with the email portion of the population having slightly higher consumption levels than the overall population.

Rate Class	Full Population	Those with email addresses	Difference
Residential	634 kWh	628 kWh	**-1%**
GS<50	3,067 kWh	3,328 kWh	**+9%**
GS>50	166,954 kWh	180,847 kWh	**+8%**

Sample Validation

Horizon Rate Zone Coverage and Consumption Analysis

Comparing the overall population to the sample of that population with email addresses across known variables, we can see that the email sample is largely representative of the overall population of customers.

Customers in the Horizon rate zone account for **24%** of Alectra Utilities' total customer base.

Overall Coverage

Coverage is consistently above 50% across rate classes; lower among residential and GS<50 customers and highest among GS>50 customers.

Rate Class	Full Population	Email Coverage	
Residential	221,152 records	124,629 records	**56%**
GS<50	18,345 records	10,173 records	**55%**
GS>50	1,383 records	1,088 records	**79%**

Average Consumption

Differences between the full population and those with email addresses are small for residential and GS>50 customers. There is a slightly larger gap in the GS<50 class, with the email portion of the population having slightly higher consumption levels than the overall population.

Rate Class	Full Population	Those with email addresses	Difference
Residential	608 kWh	625 kWh	**+3%**
GS<50	2,561 kWh	2,762 kWh	**+8%**
GS>50	26,334 kWh	26,988 kWh	**+2%**

Sample Validation

PowerStream Rate Zone Coverage and Consumption Analysis

Comparing the overall population to the sample of that population with email addresses across known variables, we can see that the email sample is largely representative of the overall population of customers.

Customers in the PowerStream rate zone account for **36%** of Alectra Utilities' total customer base.

Overall Coverage

Coverage is lowest for residential customers, with 44% having email addresses on file, while the majority of both GS<50 and GS>50 customers have an address on file.

Rate Class	Full Population	Email Coverage	
Residential	329,880 records	145,455 records	**44%**
GS<50	32,015 records	17,987 records	**56%**
GS>50	5,029 records	3,565 records	**71%**

Average Consumption

The gap between the average consumption of the full population and that of those with email addresses on record is small for residential and GS<50 customers. For GS>50 customers, the gap is slightly larger – customers who have an email address on file consume 13% more power than the average across all GS>50 customers.

Rate Class	Full Population	Those with email addresses	Difference
Residential	702 kWh	686 kWh	**-2%**
GS<50	2,610 kWh	2,767 kWh	**+6%**
GS>50	77,966 kWh	88,450 kWh	**+13%**

Telephone Reference Survey

Survey Design & Methodology

Residential

Both the residential telephone reference survey and representative online workbook were weighted based on known variables, including rate zone and rate class. Furthermore, both surveys were weighted to be proportionate based on the actual distribution of residential customers in each rate zone throughout Alectra Utilities' service territory. *Weighted and unweighted sample size are outlined below.*

Residential Telephone Reference Survey

Rate Zone	Unweighted N					Weighted N				
	Consumption Quartiles					Consumption Quartiles				
	Low	Medium-Low	Medium-High	High	Total	Low	Medium-Low	Medium-High	High	Total
Enersource	125	125	125	126	501	121	121	121	121	484
Brampton	125	125	126	125	501	101	101	101	101	404
Horizon	125	125	125	125	500	149	149	149	149	596
PowerStream	126	126	127	127	506	222	222	222	222	888
Guelph	125	125	125	125	500	34	34	34	34	136
Total	626	626	628	628	2,508	627	627	627	627	2,508

Residential Representative Online Workbook

Rate Zone	Unweighted N					Weighted N				
	Consumption Quartiles					Consumption Quartiles				
	Low	Medium-Low	Medium-High	High	Total	Low	Medium-Low	Medium-High	High	Total
Enersource	1,812	1,478	1,378	1,170	5,838	1,324	1,324	1,324	1,324	5,296
Brampton	1,122	852	677	542	3,193	1,105	1,105	1,105	1,105	4,420
Horizon	1,619	1,896	1,689	1,495	6,699	1,636	1,636	1,636	1,636	6,544
PowerStream	2,914	2,487	2,269	1,966	9,636	2,423	2,423	2,423	2,423	9,692
Guelph	549	536	482	448	2,015	367	367	367	367	1,468
Total	8,016	7,249	6,495	5,621	27,381	6,855	6,855	6,855	6,855	27,420

Note: *Graphs and tables may not always total 100% due to rounding values rather than any error in data. Sums are added before rounding numbers. Caution interpreting results with small n-sizes.*

Telephone Reference Survey

Demographics

Telephone reference survey: A short telephone "reference" survey allows us to determine whether differences exist between the email sample and the broader customer base regarding demographics, attitudes, and opinions. Insights gained from this can be used to develop weights, which can minimize these differences.

1. Email sample and broader customer base are similar based on demographics, including gender and age.

2. The broader population is generally more satisfied with the services they receive from Alectra Utilities compared to email sample.

3. Email sample more likely to have experienced an outage within the past 12 months. This could be a result of priming customers with additional information in the online workbook, including the average number of interruptions an Alectra Utilities customer experiences.

4. Household income and size are similar across both sample groups. Almost an equal proportion of customers would be LEAP qualified based on household income and size.

5. Email sample is slightly more vulnerable than broader sample, with more customers saying that their electricity bill has an impact on their household finances.

Gender	Telephone	Online	Difference
Male	56%	55%	-1%
Female	44%	44%	0%

Age	Telephone	Online	Difference
18-24	2%	1%	-1%
25-34	15%	15%	0%
35-44	23%	22%	-1%
45-54	20%	23%	+3%
55-64	19%	21%	+2%
65 or older	20%	18%	-2%

Note: sums added before rounding.

Telephone Reference Survey

Familiarity and Satisfaction

Residential

Familiarity with electricity system	Telephone	Online	Difference
Very familiar and could explain the details of Ontario's electricity system to others	20%	12%	-8%
Somewhat familiar, but could not explain all the details of Ontario's electricity system to others	38%	44%	+6%
Have heard of some of the terms and organizations mentioned in this workbook, but knew very little about Ontario's electricity system	18%	29%	+11%
I knew nothing about Ontario's electricity system	23%	15%	-8%

Satisfaction with Alectra Utilities	Telephone	Online	Difference
Very satisfied	46%	40%	-6%
Somewhat satisfied	39%	33%	-6%
Neither satisfied or dissatisfied	7%	21%	+14%
Somewhat dissatisfied	4%	4%	0%
Very dissatisfied	3%	1%	-2%

Familiarity w/ distribution % of Bill	Telephone	Online	Difference
Very familiar	13%	10%	-3%
Somewhat familiar	27%	44%	+17%
Not familiar at all	56%	46%	-10%
Don't know	5%	-	-

Note: sums added before rounding.

Telephone Reference Survey

Outage Experience and Service Type

Residential

Number of Outages in Past Year	Telephone	Online	Difference
No outages	44%	24%	-20%
1 outage	18%	28%	+10%
2 or 3 outages	24%	34%	+10%
4 or more outages	9%	10%	+1%
Don’t know	5%	4%	-1%

Overhead vs. Underground	Telephone	Online	Difference
Overhead wires	23%	25%	+2%
Underground cables	52%	58%	+6%
Don’t know	25%	17%	-8%

Note: sums added before rounding.

Telephone Reference Survey

Household Size and Income

Residential

Household Size	Telephone	Online	Difference
1 person	14%	11%	-3%
2 people	26%	31%	+5%
3 people	22%	20%	-2%
4 people	21%	23%	+2%
Five or more people	16%	16%	0%
Prefer not to say	2%	-	-

Household Income	Telephone	Online	Difference
Less than $28,000	9%	8%	-1%
Just over $28,000 to $39,000	8%	9%	+1%
Just over $39,000 to $48,000	6%	8%	+2%
Just over $48,000 to $52,000	8%	8%	0%
More than $52,000	53%	42%	-11%
Prefer not to say	16%	25%	+9%

LEAP Qualification	Telephone	Online	Difference
LEAP Qualified	14%	14%	0%
Not Qualified (<$52k)	17%	19%	+2%
Not Qualified (>$52k)	53%	42%	-11%
Prefer not to say	16%	25%	+9%

Note: sums added before rounding.

Telephone Reference Survey

Attitudes Towards Electricity

Residential

The cost of my electricity bill has a major impact on my finances and requires I do without some other important priorities.	Telephone	Online	Difference
Strongly agree	27%	22%	-5%
Somewhat agree	30%	40%	+10%
Somewhat disagree	21%	21%	0%
Strongly disagree	17%	15%	-2%
Don't know/No opinion	5%	2%	-3%
Agree (Strongly + Somewhat)	**57%**	**62%**	+5%
Disagree (Strongly + Somewhat)	**38%**	**36%**	-2%

Customers are well served by the electricity system in Ontario.	Telephone	Online	Difference
Strongly agree	37%	32%	-5%
Somewhat agree	44%	53%	+9%
Somewhat disagree	5%	9%	+4%
Strongly disagree	4%	3%	-1%
Don't know/No opinion	10%	3%	-7%
Agree (Strongly + Somewhat)	**81%**	**84%**	+3%
Disagree (Strongly + Somewhat)	**9%**	**12%**	+3%

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Telephone Reference Survey

Survey Design & Methodology

Both the residential telephone reference survey and representative online workbook were weighted based on known variables, including rate zone and rate class. Furthermore, both surveys were weighted to be proportionate based on the actual distribution of residential customers in each rate zone throughout Alectra Utilities' service territory. *Weighted and unweighted samples size are outlined below.*

Small Business Telephone Reference Survey

Rate Zone	Unweighted N					Weighted N				
	Consumption Quartiles					Consumption Quartiles				
	Low	Medium-Low	Medium-High	High	Total	Low	Medium-Low	Medium-High	High	Total
Enersource	50	50	51	50	201	55	55	55	55	220
Brampton	50	50	50	47	197	28	28	28	28	112
Horizon	51	50	51	51	203	57	57	57	57	228
PowerStream	50	50	51	61	212	99	99	99	99	396
Guelph	39	50	51	48	188	12	12	12	12	48
Total	240	250	254	257	1,001	251	251	251	251	1,004

Small Business Representative Online Workbook

Rate Zone	Unweighted N					Weighted N				
	Consumption Quartiles					Consumption Quartiles				
	Low	Medium-Low	Medium-High	High	Total	Low	Medium-Low	Medium-High	High	Total
Enersource	56	49	51	35	191	33	33	33	33	133
Brampton	14	13	12	9	48	17	17	17	17	68
Horizon	21	31	22	18	92	34	34	34	34	136
PowerStream	67	71	55	53	246	58	58	58	58	234
Guelph	9	13	15	12	49	7	7	7	7	30
Total	167	177	155	127	626	150	150	150	150	600

Note: *Graphs and tables may not always total 100% due to rounding values rather than any error in data. Sums are added before rounding numbers. Caution interpreting results with small n-sizes.*

Telephone Reference Survey

Company Size and Type

Small Business

1. Email sample and broader customer base are similar based on company size, with almost equal proportions with fewer than five employees vs. those with six or more.

2. The broader population includes more small businesses in the commercial sector. Otherwise, the two samples are very similar in terms of sector breakdown.

3. The broader population is generally more satisfied with the services they receive from Alectra Utilities compared to email sample.

4. Email sample more likely to have experienced an outage within the past 12 months. This could be a result of priming customers with additional information in the online workbook, including the average number of interruptions an Alectra Utilities customer experiences.

5. Email sample is more vulnerable than broader sample, with more customers saying that their electricity bill has an impact on their organization and results in some important spending priorities and investments being put off.

Company Size	Telephone	Online	Difference
5 or fewer	49%	52%	+3%
6 or more	48%	46%	-2%
Prefer not to say	3%	1%	-2%

Company Type	Telephone	Online	Difference
Commercial	31%	22%	-9%
Retail	14%	15%	+1%
Manufacturing or industrial	13%	13%	0%
Hospitality or restaurant	7%	9%	+2%
Multi-unit residential	6%	6%	0%
Warehouse	4%	8%	+4%
Other	24%	27%	+3%
Prefer not to say	1%	-	-

Note: sums added before rounding.

Telephone Reference Survey

Familiarity and Satisfaction

Small Business

Familiarity with electricity system	Telephone	Online	Difference
Very familiar and could explain the details of Ontario's electricity system to others	19%	13%	-6%
Somewhat familiar, but could not explain all the details of Ontario's electricity system to others	35%	42%	+7%
Have heard of some of the terms and organizations mentioned in this workbook, but knew very little about Ontario's electricity system	21%	28%	+7%
I knew nothing about Ontario's electricity system	25%	18%	-7%

Satisfaction with Alectra Utilities	Telephone	Online	Difference
Very satisfied	40%	33%	-7%
Somewhat satisfied	44%	33%	-11%
Neither satisfied or dissatisfied	8%	24%	+16%
Somewhat dissatisfied	5%	5%	0%
Very dissatisfied	3%	1%	-2%

Familiarity w/ distribution % of Bill	Telephone	Online	Difference
Very familiar	10%	10%	0%
Somewhat familiar	26%	45%	+19%
Not familiar at all	57%	45%	-12%
Don't know	6%	-	-

Note: sums added before rounding.

Telephone Reference Survey

Outage Experience and Service Type

Small Business

Number of Outages in Past Year	Telephone	Online	Difference
No outages	44%	22%	-22%
1 outage	16%	28%	+12%
2 or 3 outages	25%	30%	+5%
4 or more outages	7%	13%	+6%
Don’t know	8%	7%	-1%

Overhead vs. Underground	Telephone	Online	Difference
Overhead wires	28%	34%	+16%
Underground cables	29%	33%	+4%
Don’t know	43%	33%	-10%

Note: sums added before rounding.

Telephone Reference Survey

Attitudes Towards Electricity

Small Business

The cost of my electricity bill has a major impact on the bottom line of my organization and results in some important spending priorities and investments being put off.	Telephone	Online	Difference
Strongly agree	31%	28%	-3%
Somewhat agree	30%	41%	+11%
Somewhat disagree	18%	18%	0%
Strongly disagree	9%	9%	0%
Don’t know/No opinion	11%	5%	-6%
Agree (Strongly + Somewhat)	**61%**	**69%**	**+8%**
Disagree (Strongly + Somewhat)	**27%**	**27%**	**0%**

Customers are well served by the electricity system in Ontario.	Telephone	Online	Difference
Strongly agree	33%	29%	-4%
Somewhat agree	41%	50%	+9%
Somewhat disagree	5%	11%	+6%
Strongly disagree	4%	4%	0%
Don’t know/No opinion	17%	6%	-11%
Agree (Strongly + Somewhat)	**74%**	**79%**	**+5%**
Disagree (Strongly + Somewhat)	**9%**	**15%**	**+6%**

INNOVATIVE
RESEARCH GROUP

Residential Customers

Online Workbook Results

Methodology

Residential Online Workbook

INNOVATIVE was engaged by Alectra Utilities Corporation (Alectra Utilities) in this study to gather input on preferences on program timing and balancing outcomes. **Pages 23 to 84** show the actual pages of the workbook that was sent and completed by customers. The only additions are the actual results.

Field Dates & Workbook Delivery

The **Residential Online Workbook** was sent to all Alectra Utilities residential customers who have provided the utility with an email address. Customers had an opportunity to complete the workbook between April 8th and May 1st, 2019.

Each customer received a workbook customised to their rate zone and class using a unique URL that could be linked back to their annual consumption, region and rate class.

In total, the residential workbook was sent to **379,917** customers via e-blast from Alectra Utilities.

Residential Online Workbook Completes

A total of **27,381** (unweighted) Alectra Utilities residential customers completed the online workbook via a unique URL.

Sample Weighting

The residential online workbook sample has been weighted proportionately by rate zone and consumption quartiles in order to be representative of the broader Alectra Utilities service territory.

The table below summarizes the weighted sample breakdown by rate zone and quartile. For unweighted n-sizes, please consult Page 10 of this report.

Weighted Sample	Consumption Quartiles				Total	Distribution
	Low	Medium-Low	Medium-High	High		
Enersource	1,324	1,324	1,324	1,324	**5,296**	**19%**
Brampton	1,105	1,105	1,105	1,105	**4,420**	**16%**
Horizon	1,636	1,636	1,636	1,636	**6,544**	**24%**
PowerStream	2,423	2,423	2,423	2,423	**9,692**	**35%**
Guelph	3,67	367	367	367	**1,468**	**5%**
Total	**6,855**	**6,855**	**6,855**	**6,855**	**27,420**	**100%**

Note: *Graphs and tables may not always total 100% due to rounding values rather than any error in data. Sums are added before rounding numbers. Caution interpreting results with small n-sizes.*

Online Workbook

Welcome to Alectra Utilities' planning consultation!

Residential

We need your input on choices that will affect the service you receive and the price you pay.

1. Alectra Utilities is developing its investment plan for 2020 to 2024. This plan will determine the investments Alectra Utilities makes in equipment and infrastructure, the services it provides, and the rates you pay.
2. **Alectra will be accountable to the public regulator, both in terms of sharing what customers say and demonstrating how they considered those views.**
3. You don't need to be an electricity expert to participate in this consultation. This workbook is focused on basic choices and provides the background information you need to answer the questions.
4. All you need to do is provide your feedback on between **7 and 13 choices.** If you can give half an hour now, Alectra Utilities can finalize its plan to serve customers like you for the next five years.

Those who complete the questions that follow will be invited to enter a draw to win one of ten (10) $500 prepaid credit cards.

All of your individual responses will be kept confidential. Innovative Research Group (INNOVATIVE), an independent research company, has been hired to gather your feedback.

If you are reading this on a smaller mobile device, you may want to consider accessing the survey from a tablet, desktop or laptop instead so that it is easier for you to read.

Online Workbook

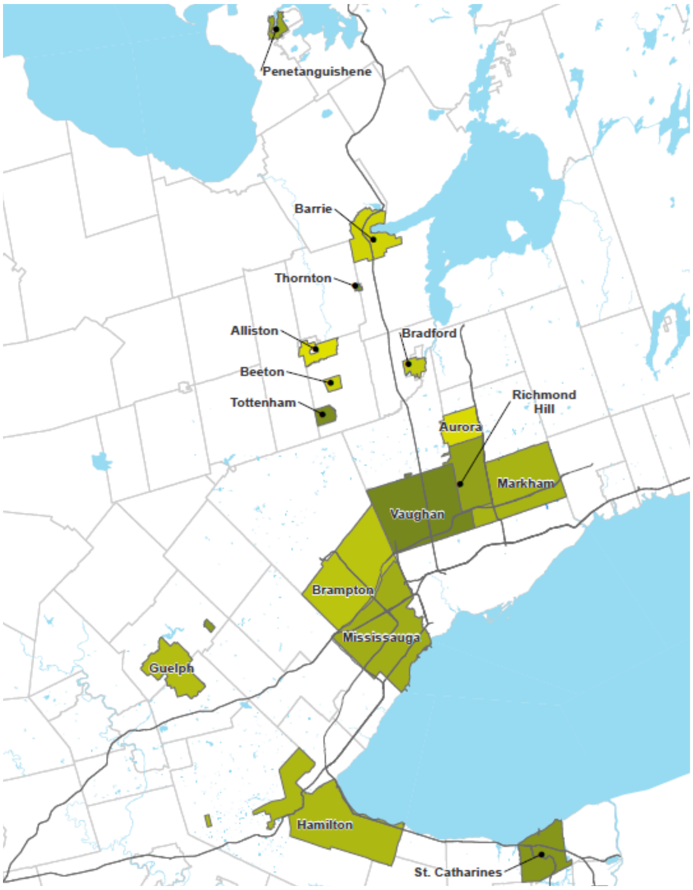
Who is Alectra Utilities?

Residential

Who is Alectra Utilities?

Alectra Utilities is preparing its first consolidated Distribution System Plan. Alectra Utilities is the union of five leading Ontario utilities – Enersource, Horizon Utilities, Brampton Hydro, PowerStream and Guelph Hydro. Alectra Utilities now serves over one million customers.

Guelph Hydro Electric Systems Inc. · hydro one Brampton · enersource · PowerStream · horizon UTILITIES Looking beyond... = alectra utilities



Alectra Utilities provides services to customers in all of these areas. However, customer rates are based on the cost of serving only the area that you live in.

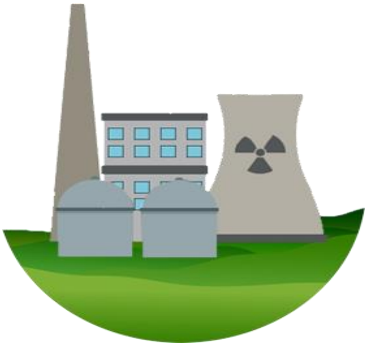
Understanding Alectra Utilities' role in Ontario's electricity system

Ontario's electricity system is owned and operated by public, private and municipal corporations across the province. It is made up of three components: generation, transmission and distribution.

1 Generation

Where electricity comes from.

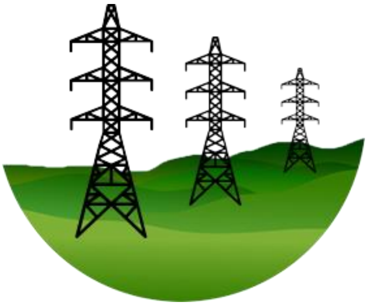
Ontario's electricity is generated by nuclear, natural gas, hydroelectric and renewable technologies, such as wind and solar. In Ontario, about 50% of electricity is generated by Ontario Power Generation, which has generation stations across the province.



2 Transmission

Electricity travels across Ontario.

Once electricity is generated, it must be transported to urban and rural areas across the province. This happens by way of high voltage transmission lines that serve as highways for electricity. The province has more than 30,000 kilometres of transmission lines.

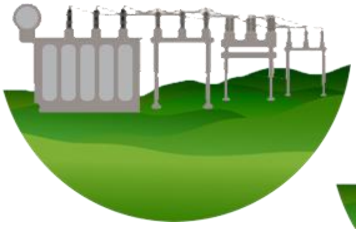


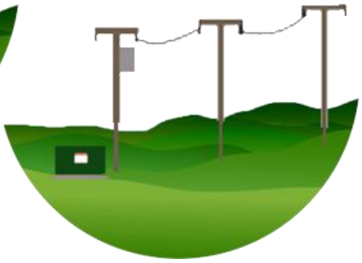
3 Local Distribution

Delivering power to homes and businesses in your community.

Alectra Utilities is responsible for the last step of the journey: distributing electricity to customers through its distribution network. This local grid includes transformer stations of various sizes and designs that decrease the voltage of the electricity so it can be used in your home or business.

Across Alectra Utilities' service territory, there are 16,400 km of overhead powerlines and 22,140 km of underground cable.

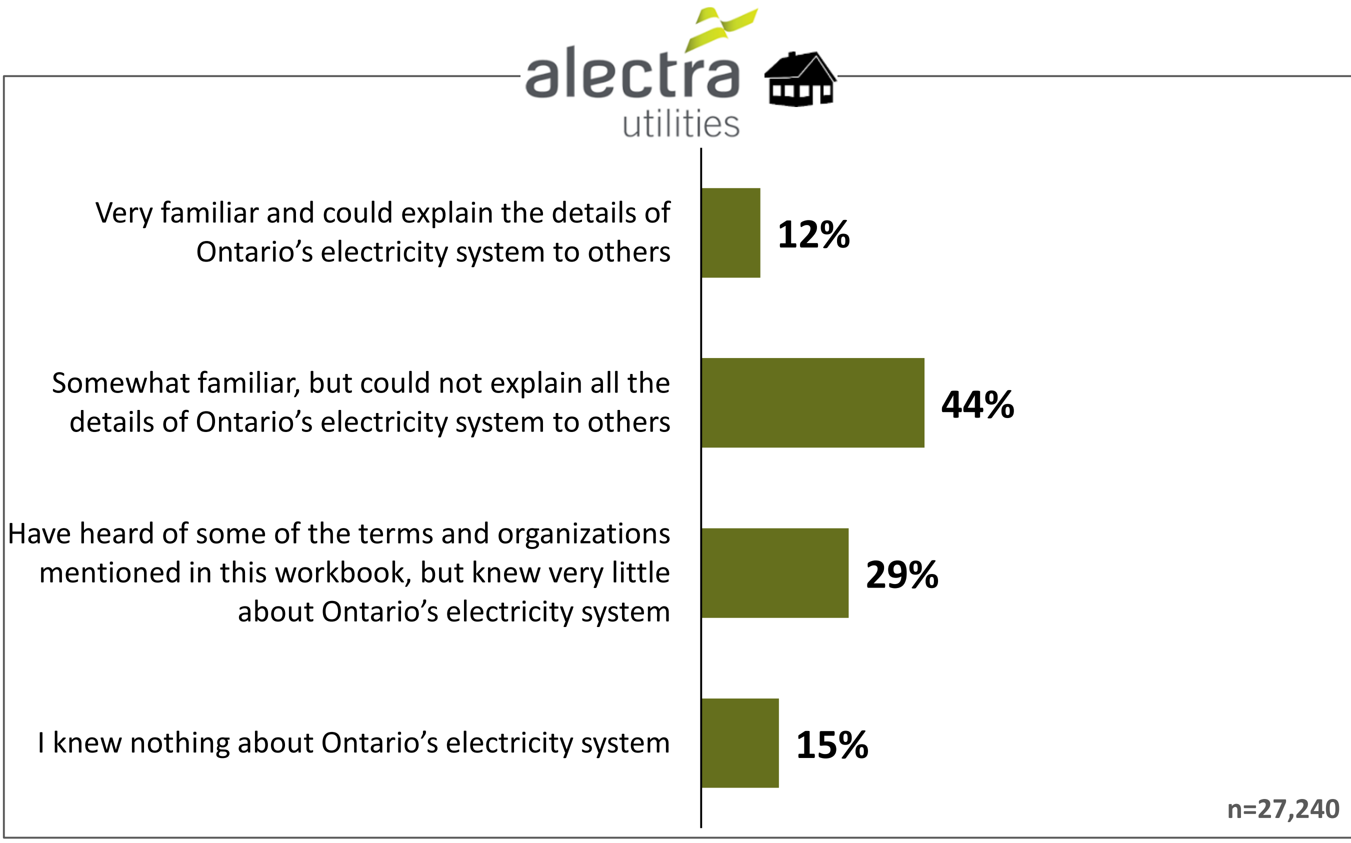




Online Workbook

Understanding Alectra Utilities' role in Ontario's electricity system

Q Before this consultation, how familiar were you with the various parts of the electricity system and how they work together?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very familiar	12%	11%	11%	12%	13%
Somewhat familiar	44%	39%	47%	44%	47%
Heard of some of the terms and organizations	27%	30%	29%	29%	29%
Knew nothing about the electricity system	16%	19%	13%	15%	12%

How much of you bill goes to Alectra Utilities?

- Every item and charge on your bill is mandated by the provincial government or regulated by the **Ontario Energy Board (OEB)**, the provincial energy regulator.
- While Alectra Utilities is responsible for collecting payment for the entire electricity bill, it retains only the distribution portion of the delivery charge.
- **Distribution makes up about [PIPE-PER] of the typical residential customer's bill.**
- The rest of your bill is passed onto provincial transmission companies, power generation companies, the government and regulatory agencies.

Residential Bill (Horizon Utilities)

Sample Alectra Utilities Monthly Bill
(Based on consumption of 750 kWh)

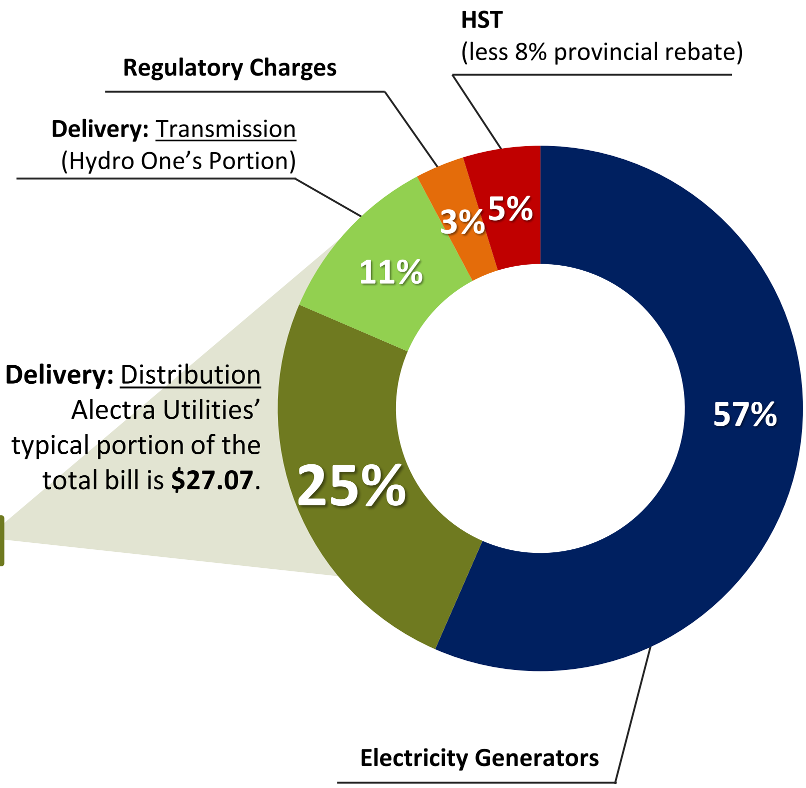
Account Number:
000 000 000 000 0000

Meter Number:
00000000

Alectra Utilities' portion: **$27.07**

Your Electricity Charges	
Electricity	
Off-Peak @ 6.5 ¢/kWh	31.69
Mid-Peak @ 9.4 ¢/kWh	11.99
On-Peak @ 13.2 ¢/kWh	17.82
Delivery	38.76
Regulatory Charges	3.29
Total Electricity Charges	**$103.54**
HST	13.46
8% Provincial Rebate*	**(-$8.28)**
Total Amount	**$108.72**

*The Ontario government is providing a rebate on your electricity costs equal to the provincial portion of the HST



Note: Graphs may not always total 100% due to rounding.

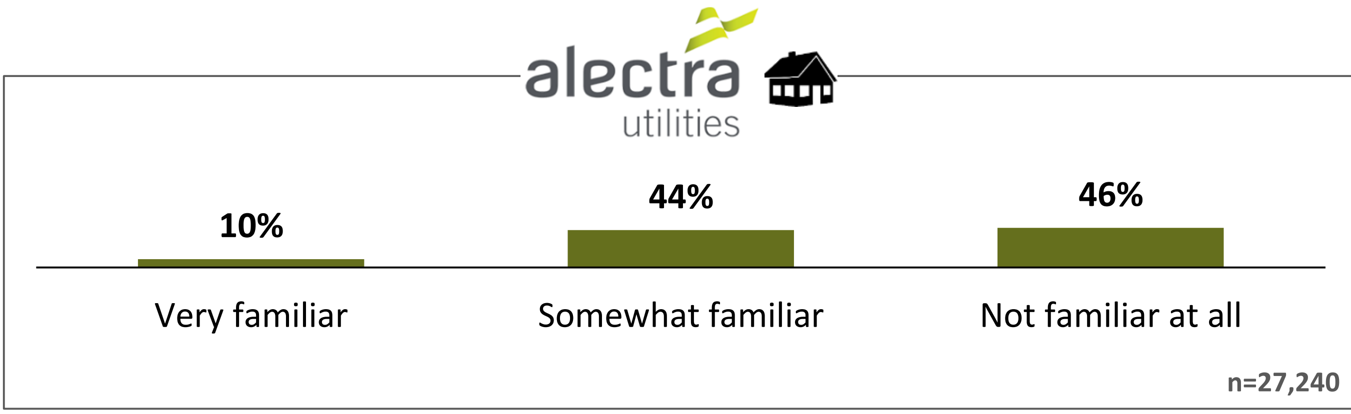
Note: Sample bills were customized for each rate zone and rate class. The above represents a sample residential bill in the Horizon rate zone.

Online Workbook

Percentage of bill that goes to Alectra Utilities

Residential

Q Before this consultation, how familiar were you with the percentage of your electricity bill that goes to Alectra Utilities?



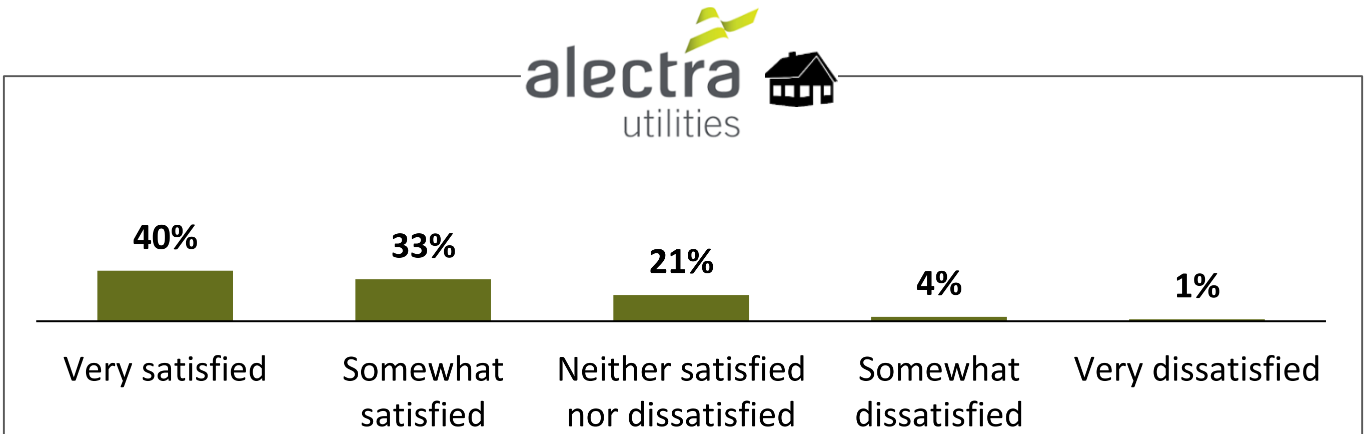
Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very familiar	10%	11%	9%	10%	9%
Somewhat familiar	45%	45%	43%	44%	38%
Not familiar at all	46%	44%	47%	46%	53%

Online Workbook

Overall satisfaction with Alectra Utilities

Residential

Q Generally, how satisfied or dissatisfied are you with the services you receive from Alectra Utilities?



Note: "Don't know" (2%) not shown.

n=27,240

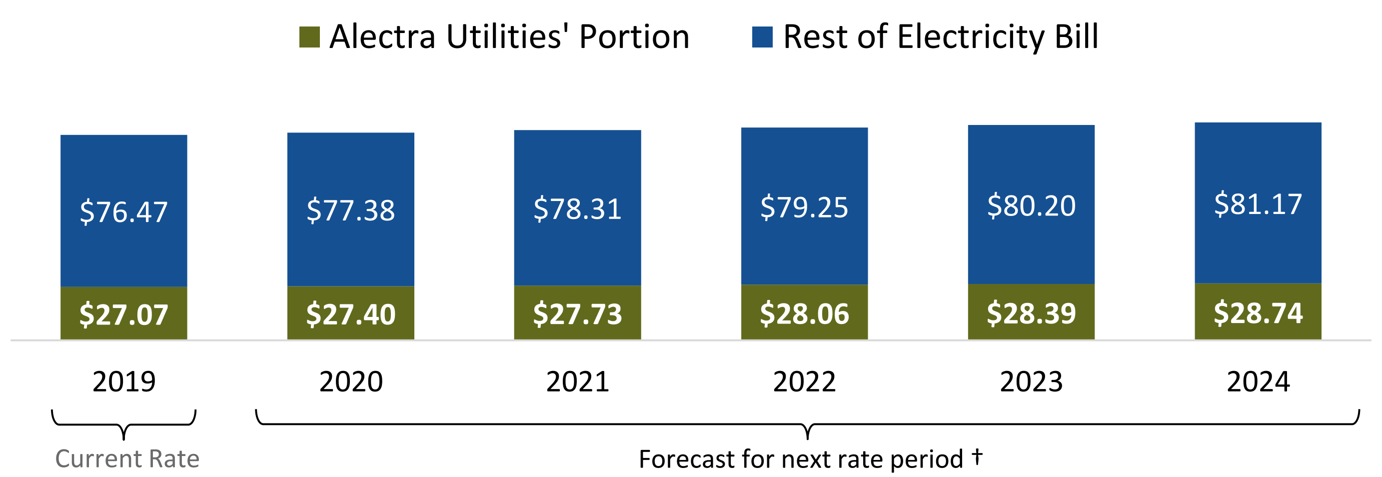
Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very satisfied	41%	40%	41%	39%	30%
Somewhat satisfied	33%	34%	31%	35%	27%
Neutral	20%	19%	21%	20%	29%
Somewhat dissatisfied	3%	4%	4%	3%	4%
Very dissatisfied	1%	2%	2%	1%	1%
Don't know	2%	2%	1%	1%	9%
Overall satisfied	**74%**	**74%**	**72%**	**74%**	**58%**
Overall dissatisfied	4%	6%	6%	5%	5%

How much can you expect to pay over the next few years?

Prior to the Alectra Utilities' merger, each predecessor utility had their rates set by the OEB. Until rates are rebased in 2027, your future rate increases will be limited by an OEB-set Price Cap Formula. Each year Alectra Utilities is permitted to increase rates to reflect inflation minus savings targets established by the OEB. **This requires Alectra Utilities to keep cost increases below inflation.**

For customers in your area and rate class, the distribution charge for **the typical bill is estimated to increase by 1.2%** on average for the next five years.

Estimated Typical Residential Annual Increase in Monthly Bill (Before Tax) ††



Note: Sample bills were customized for each rate zone and rate class. The above represents a sample residential bill in the Horizon rate zone.

Where does your money go?

Alectra Utilities has two budgets; **operating and capital.** The operating budget covers recurring expenses, such as salaries, taxes, fuel costs and rent. Under the Price Cap Formula, Alectra Utilities cannot ask for any additional money for operating expenses.

This consultation is about the capital budget. This budget covers things like poles, wires, cables, transformers, computers and programs, vehicles, and buildings.

†† On November 23, 2018, the OEB calculated the value of the inflation factor for incentive rate setting under the Price Cap IR plan of 1.5% for rate changes effective 2019. With a stretch factor of 0.3%, the Price Cap Adjustment for Alectra Utilities was 1.2%. This rate has been used to forecast the rates for 2020-2024. The 2020-2024 rates assumes no changes to electricity rates or the Group 1 riders over the 2020 to 2024 period. The OEB approved bill impact for 2019 was used as the basis for the calculation of forecasted rates for 2020-2024.

Online Workbook

What is this consultation about? | Preamble

Residential

What is this consultation about?

This consultation is about finding the right balance between reliability and the price you pay.

The point of this workbook is to allow customers, like yourself, to provide feedback on whether the planners have found the right balance or whether they should consider different options that better reflect your views.

Alectra Utilities is now creating its first overall investment plan as a merged utility. The process started with Alectra Utilities asking customers whether they had any unmet needs and which outcomes Alectra Utilities' plan should focus on. Click here to see more.

Using that input, Alectra Utilities' managers reviewed each part of the utility's business. All the projects identified in this workbook have been found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Now Alectra Utilities is coming back to customers with a final set of choices.

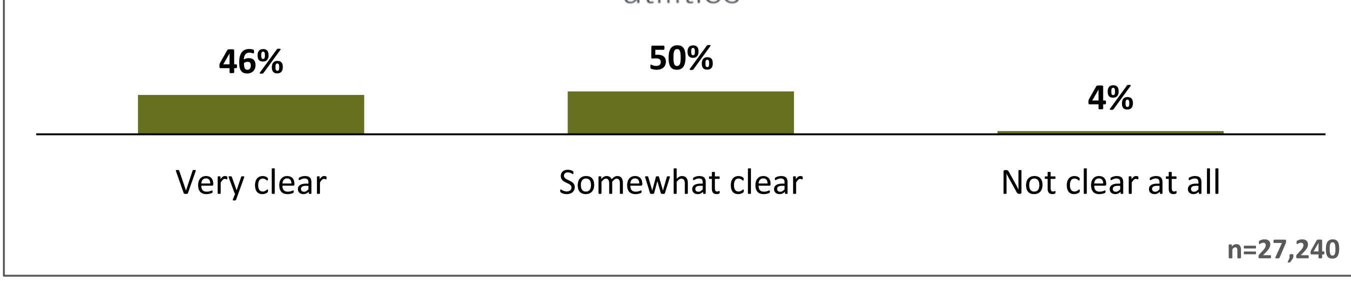
- For each choice, Alectra Utilities has identified an option to stay within existing rates under the price cap formula. It has also identified options to increase investments and, in some areas, where practical, options to reduce investments to make room for increased investments in more pressing areas.
- Planners have indicated the option that in their view provides the best balance between any potential rate increase with the intention to maintain reliability and to fix or avoid pockets of customers that are having significantly below average experiences.
- At the end of the these questions, you will have an opportunity to review your responses and total rate impact of those choices. You will be able to change your responses until you feel you have found the right mix of investments and rate impact, in your view.
- If your preferences result in higher levels of investment than current rates support, Alectra Utilities may apply for a rate increase under the rules established by the OEB. While the exact amount of any rate increase would consider the views collected in this consultation, the workbook will ask you for your views on a rate increase that will be sufficient to pay for the planners' recommended options.

Online Workbook

What is this consultation about?

Residential

Q Do you feel that the purpose of Alectra Utilities' customer consultation is clear?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very clear	45%	43%	47%	46%	52%
Somewhat clear	51%	53%	50%	50%	46%
Not clear at all	4%	4%	3%	4%	3%

INNOVATIVE RESEARCH GROUP

Online Workbook

Reliability Experience | Preamble

Reliability Experience

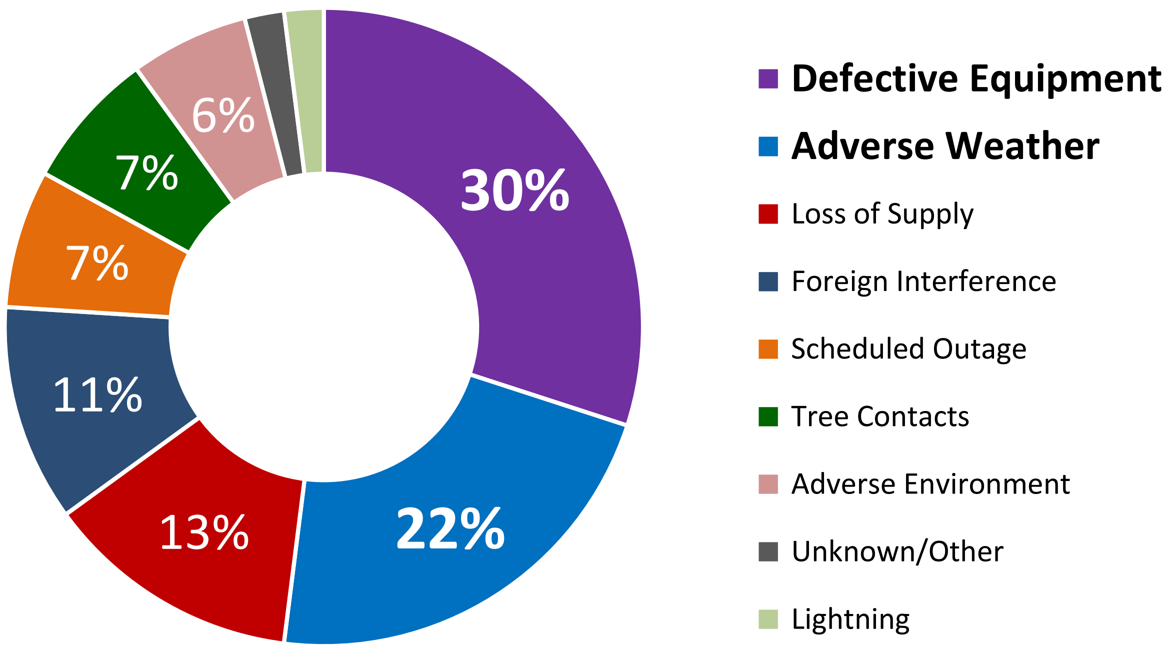
Reliability is a key priority for Alectra Utilities. Since 2014, both the average **number** and **duration** of outages has increased for the typical Alectra Utilities customer.

- The average number of outages (excluding major event days) has increased by an average of 6% per year from 2014-2018, rising from **1.27 to 1.53** over this period.
- The average duration of outages (excluding major event days) has increased by an average of 8% per year from 2014-2018, rising from **0.88 hours to 1.14** hours over this period.

The two primary contributors to outages account for more than 50% of all outages.

1. **Defective equipment** accounted for 30% of customer hours of interruption between 2014-2018, the single largest outage cause.
2. **Adverse weather** is the second leading cause of outages. It accounted for 22% of customer hours of interruption over the same period.

Customer Outage Duration (Hours) by Cause 2014-2018



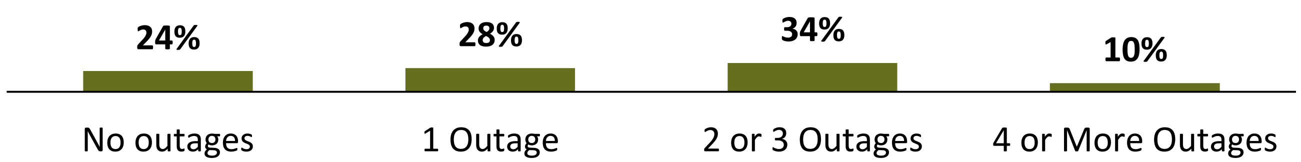
Depending on what rate zone you are in, the subsequent pages will ask you to review between 7 and 13 choices, many of which address the issues identified in the chart above.

Online Workbook

Reliability Experience

Residential

Q In the past 12 months, how many power outages do you recall experiencing at home/your organization?



Note: "Don't know" (4%) not shown.

n=27,240

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
No outages	30%	37%	20%	17%	29%
1 outage	28%	27%	30%	26%	30%
2 or 3 outages	28%	26%	37%	39%	29%
4 or more outages	8%	5%	10%	14%	8%
Don't know	6%	5%	3%	4%	4%

Online Workbook

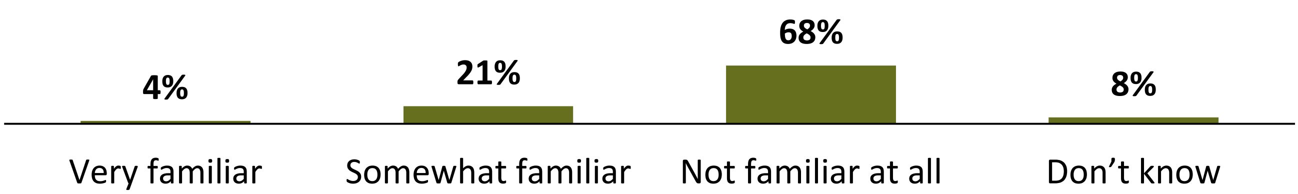
Mandatory Investments

Federal, provincial and municipal governments as well as regulators set requirements and standards that Alectra Utilities must satisfy. Mandatory investments can be broken down into three categories:

1. **Connecting customers:** This includes connecting customers to the grid when a new home or building is constructed or modified.
2. **Moving equipment:** This includes moving equipment like poles and cables for road widening.
3. **Mandated obligations:** This includes installing and maintaining customer meters and transferring electricity from the provincial transmission system.

These investments mean that about one-in-five dollars (20%) of your current rates are already committed and not available for other investments

Q Before this consultation, were you familiar that one-in-five dollars (20%) of your current rates are already committed to mandatory investments and not available for other projects?



n=27,240

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very familiar	3%	5%	3%	4%	2%
Somewhat familiar	22%	25%	18%	20%	18%
Not familiar at all	67%	61%	74%	67%	75%
Don't know	8%	9%	5%	9%	5%

Online Workbook

Unplanned Repairs and Replacements

On average, each year, Alectra Utilities spends approximately 19 million dollars or 6% of it's core budget to repair or replace equipment that has either failed, will fail imminently, or poses an imminent safety risk. This may include sudden equipment failure, or severe weather taking down a pole in front of your home or business.

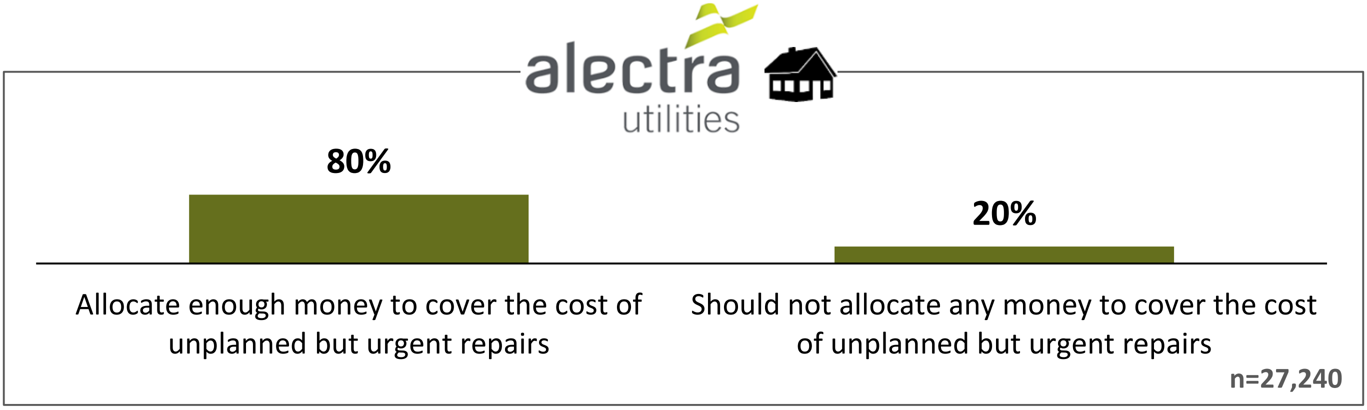
There are two possible approaches for how to fund these types of repairs:

1. By delaying other projects that had been planned but not started
2. By establishing an annual allocation for these unplanned repairs and replacements

If Alectra Utilities delays other projects, this can result in needs not being met and can create inefficiencies in project procurement and management.

If Alectra Utilities establishes an allocation for these unplanned repairs and replacements, that money is not available to fund other projects.

Q Which option do you prefer?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Alectra Utilities should allocate enough money (approximately 19 million or 6%) in its core budget to reactive capital to cover the cost of unplanned but urgent repairs	80%	81%	81%	80%	81%
Alectra Utilities should not allocate any money in its core budget to reactive capital and simply delay planned projects to cover the cost of unplanned but urgent repairs	20%	19%	19%	20%	19%

Online Workbook

Eliminating Meter Data Security Risks

Residential

Within the former PowerStream area, Alectra Utilities has identified an older type of meter that could be hacked. These meters collect and transmit information to Alectra Utilities about how much electricity you use, and when you use it, but do not have access to any other personal information.

While these meters are at increased risk of hacking, there has not been a known data breach, and it's possible that they won't be hacked in the future.

Between 2015 and 2019, Alectra Utilities will have replaced 41,000 of these at-risk meters, however, an additional 91,000 will still be in service at the end of 2019.

Alectra Utilities has a decision to make about how quickly or slowly they replace these meters. It's your data and it's your money, so Alectra Utilities would like to know what your preference is.

Q Which of the following options would you prefer?

Option	Expected Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities will be able to address all the metering needs identified for the distribution system during 2020-2024 including the replacement of first generation smart meters that do not support modern levels of data encryption
Base Pace *Within current rates*	Alectra Utilities will be able to address some of the metering needs identified for the distribution system during 2020-2024. Replacement of first generation smart meters that do not support modern levels of data encryption would be deferred beyond 2024

Investment only in PowerStream RZ

n=9,693

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Keeping the Business Running

Alectra Utilities is more than just poles and wires – it's a business that needs to invest in equipment such as tools, trucks, buildings, computers and software.

When deciding whether to continue to maintain existing equipment or replace them, Alectra Utilities considers whether the risks and costs of continuing to use them outweigh the benefits of waiting longer to replace them. Alectra Utilities business planning process has identified more needs for equipment investments than current rates will allow.

To stay within existing rates, Alectra Utilities has identified the most urgent priorities, things like: keeping large "bucket" trucks on the road; replacing computer equipment that is no longer functional; and repairing leaking roofs. This would mean that less urgent investments, like vans and other equipment would be delayed.

Alectra Utilities recognizes that delaying the less pressing investments will make it harder for staff to do their jobs safely and maintain reliability and security standards.

Bucket trucks (left) have been identified as the most urgent priority, while investments in vans (right) would be delayed in the *base approach.*

Online Workbook

Keeping the Business Running

Residential

Q Which of the following options would you prefer?

Option	Outcome
Recommended Approach ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities staff will have access to equipment of the same standard as similar sized businesses
Base Approach *Within current rates*	Stay within its existing rates and only replace the equipment with the most urgent needs

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Recommended Approach	58%	50%	60%	46%	61%
Base Approach	42%	50%	40%	54%	39%

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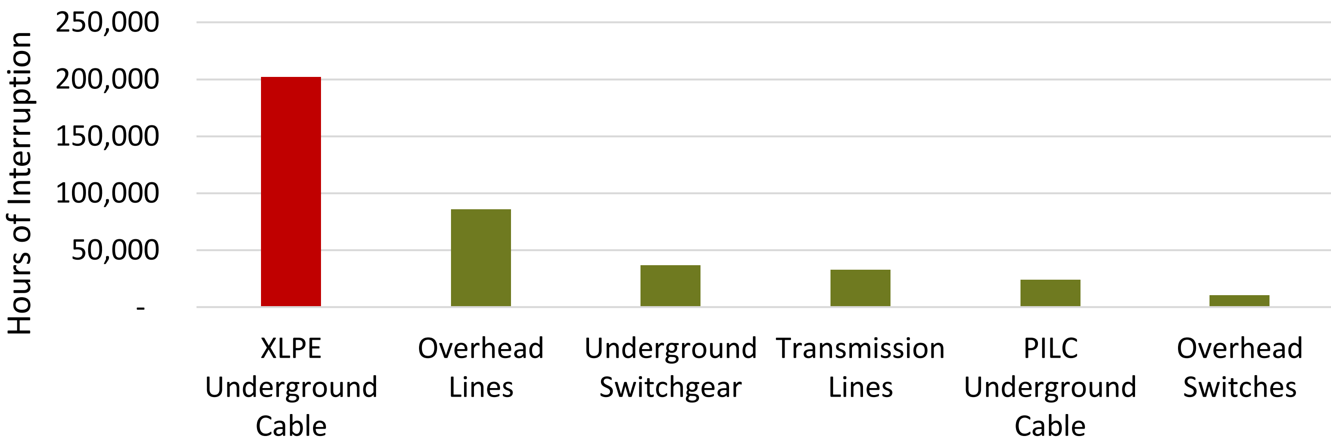
Underground Asset Renewal

Equipment failure is the single largest cause of outages in Alectra Utilities' system. As the chart below illustrates, a particular type of equipment known as cross-linked polyethylene (XLPE) cable is the leading cause of outages across Alectra Utilities' system.

What type of equipment is causing the most outages? (5-year average)



Case Study

The deterioration of these cables is directly impacting customers. For example, the York/Hilda neighbourhood in Vaughan was originally scheduled to have its cables replaced in 2019. But in 2018, customers began to experience a cascading series of prolonged outages, due to cable failures. Cables repaired one week would fail again the next. In the summer, 250 customers experienced eight cable faults (one outage a week). As a result, the cable had to be replaced on an emergency basis at both a higher cost to Alectra Utilities and major inconvenience to the affected customers.

As Alectra Utilities reviewed all of its equipment across all of its operating areas, it became clear that replacing XLPE underground cable requires an accelerated investment plan. To provide the best value to customers, Alectra Utilities will be using two approaches:

- **Cable Rejuvenation**: Cable rejuvenation is a lower-cost solution that can extend the life of these cables without the need to excavate and replace the entire cable. While it is the better value for customers for cables in fair condition, it is not effective for cables that are already declining.

- **Cable Replacement**: In some cases, Alectra Utilities has no prudent choice but to replace the cable. Replacing this equipment now rather than trying to extend its life will cost more now, but will deliver superior reliability over time, relative to older standards of cable.

Alectra Utilities has a decision to make regarding the pace in which they invest in replacing or extending the life of at-risk underground equipment.

Online Workbook

Pacing Investments in the Underground System

Within current rates, the reliability of underground cable is expected to further worsen by approximately 4% from current 2018 levels. As such, Alectra Utilities is recommending a pace of cable replacement and rehabilitation that will maintain current levels of reliability.

Q Which of the following cable replacement strategies would you prefer?

Option	Cable replaced or rehabilitated	Expected Reliability Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**2,184 km** by 2024	Improve the reliability of cables by 8% from the current (2018) level
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**1,978 km** by 2024	Maintain the reliability of cables at the current (2018) level
Base Pace *Within current rates*	**1,861 km** by 2024	Reliability of cables to further worsen by 4% from the current (2018) level
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**1,624 km** by 2024	Reliability of cables expected to further worsen by 10% from the current (2018) level

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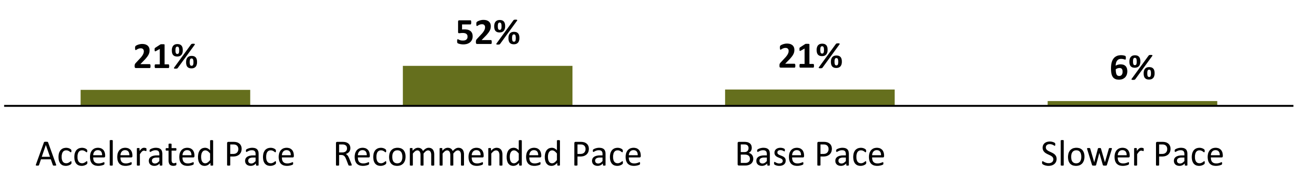


n=21,530

Rate Zone Breakdown	ERZ	HRZ	PRZ
Accelerated Pace	21%	26%	17%
Recommended Pace	53%	52%	51%
Base Pace	21%	17%	24%
Slower Pace	6%	6%	7%

Keeping Pace with Overhead System Renewal

Compared to previous years, Alectra Utilities is considering slowing down its overall spending on poles and wires, known as the overhead system. There are two primary reasons for this proposed reduction in spending:

1. **Additional focus on the underground system:** As noted earlier, customers served by the underground system are having more reliability issues than customers served by overhead lines.

2. **New technology increasing the lifespan of poles:** Advancements in testing and inspections are enabling Alectra Utilities to keep overhead poles and wires in service for longer and have enabled the utility to be smarter about replacing aging equipment.

Based on a recent condition study, most poles in Alectra Utilities' overhead system are in good or excellent condition. However, the study identified that 8,110 or 7.5% of the poles in Alectra Utilities' system are currently in poor or very poor condition. Alectra Utilities also projects that a portion of the 15% of poles currently in fair condition will deteriorate into poor or very poor condition over the next five years and will need to be replaced.

Generally, Alectra Utilities tries to replace groups of poles in similar condition which allows for a lower average cost of replacement than replacing poles one at a time. While the slower option reduces the total amount of spending, the cost per pole is higher because it would involve doing more single-pole replacements and more replacements that require overtime labour.

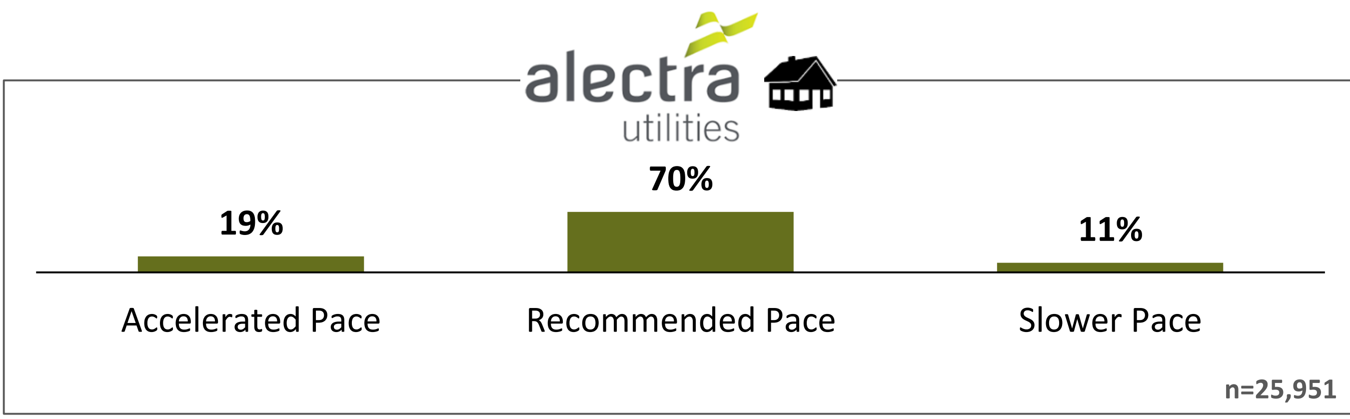
Online Workbook

Keeping Pace with Overhead System Renewal

Residential

Q Which of the following options would you prefer?

Option	Poles replaced	Expected Outcome
Accelerated Pace ***Additional*** *\$X.XX per month annually (\$Y.YY more per bill by 2024)*	**8,110** by 2024	Address **all of the poor and very poor poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Recommended Pace *Within current rates*	**4,830** by 2024	Address **most of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Slower Pace ***Decrease*** *of \$X.XX per month annually (\$Y.YY less per bill by 2024)*	**3,190** by 2024	Address **half of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ
Accelerated Pace	19%	23%	21%	14%
Recommended Pace	71%	63%	70%	73%
Slower Pace	10%	14%	9%	13%

Online Workbook

Overhead and Underground Renewal by Service Type

Residential

The questions below are broken down by the type of electricity service customers believe they receive.

- "Wires" refers to homes that are serviced by the overhead system
- "Cables" refers to homes that are serviced by the underground system

Q Underground System Renewal **by** Service Type

Rate Zone Breakdown	ERZ		HRZ		PRZ	
Service Type	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**
Accelerated Pace	23%	21%	27%	25%	17%	19%
Recommended Pace	49%	54%	51%	53%	50%	51%
Base Pace	22%	20%	17%	17%	25%	24%
Slower Pace	6%	5%	5%	5%	8%	7%

Q Overheard System Renewal **by** Service Type

Rate Zone Breakdown	ERZ		BRZ		HRZ		PRZ	
Service Type	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**
Accelerated Pace	23%	19%	26%	24%	23%	19%	16%	15%
Recommended Pace	68%	72%	63%	63%	69%	72%	72%	73%
Slower Pace	9%	9%	11%	13%	9%	8%	12%	12%

Alectra Utilities' Transformer Replacement Program

Transformers are a critical piece of distribution equipment that reduce voltage from the higher levels that are more efficient to move electricity long distances to lower levels that are safer to connect to homes and offices. They can either be located on the ground, in underground vaults or attached to distribution poles

- Through the annual Asset Condition Assessment, Alectra Utilities has identified that 2,998 transformers are now in a *poor* or *very poor* condition. Alectra Utilities already has funded plans to replace 1,148 of these transformers. However, there will still be a need to replace 1,850 transformers based on present day condition assessments.
- Over the next five years, Alectra Utilities projects that another 2,000 transformers will deteriorate and will need to be replaced as well.
- In addition to the *poor* and *very poor* condition transformers, Alectra Utilities has identified another 900 transformers that need to be replaced due to unsafe legacy configurations or that are consistently overloaded in current conditions.

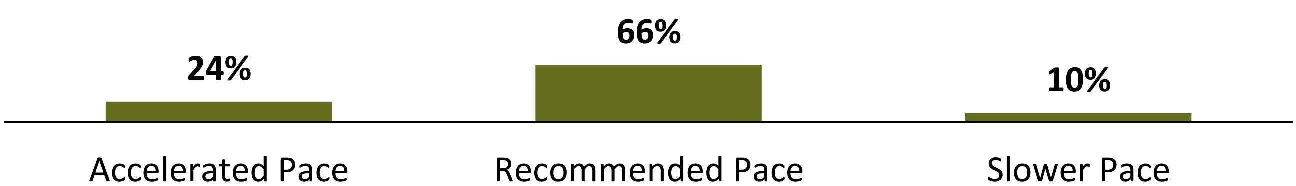
Online Workbook

Alectra Utilities' Transformer Replacement Program

Residential

Q Which of the following options would you prefer?

Option	Transformers replaced	Expected Outcome
Accelerated Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**4,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations or are consistently overloaded. • Replace all transformers that will decline to poor and very poor condition over the next five years
Recommended Pace *Within current rates*	**2,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations that are consistently overloaded
Slower Pace ***<u>Decrease</u>*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**1,850** by 2024	• Replace only transformers currently assessed to be in poor or very poor condition



n=27,240

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	23%	24%	28%	20%	28%
Recommended Pace	69%	62%	64%	69%	63%
Slower Pace	9%	14%	8%	11%	9%

Monitoring and Control Equipment

Using proven technology like pole top monitors and automated switches allows Alectra Utilities to automatically reroute power during outages and planned maintenance, reducing the length of time customers are without power and reducing reliance on crews who need to travel to the site to physically reroute power.

When Alectra Utilities is rebuilding existing lines, it typically replaces equipment that is like-for-like. That means, rebuilt older lines would not have monitoring and control equipment installed.

Alectra Utilities is proposing a different approach for its main feeder lines. Feeder lines are high capacity lines that bring electricity from substations to the lines that connect to homes or businesses. An outage on a feeder line can impact a 1,000 or more customers. Alectra Utilities is planning to phase in monitoring and control equipment to each feeder in the system, so that when power does go out, it can be quickly restored for large numbers of customers.

Each of the three options will continue to phase in this equipment during typical renewal. The difference is in how quickly they modify the remaining feeder lines.

Online Workbook

Monitoring and Control Equipment

Residential

Q Which of the following options would you prefer?

Option	Devices installed over next 5 years	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**284** 95 additional targeted reliability improvements	Projected to improve reliability by 17% for approximately 142,000 customers. All feeders would be automated in 10 years
Recommended Pace *Within current rates*	**189** 47 additional worst performing feeders	Projected to improve reliability by 17% for approximately 95,000 customers. All feeders would be automated in 15 years
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**142**	Projected to improve reliability by 17% for approximately 71,000 customer. All feeders would be automated in 20 years

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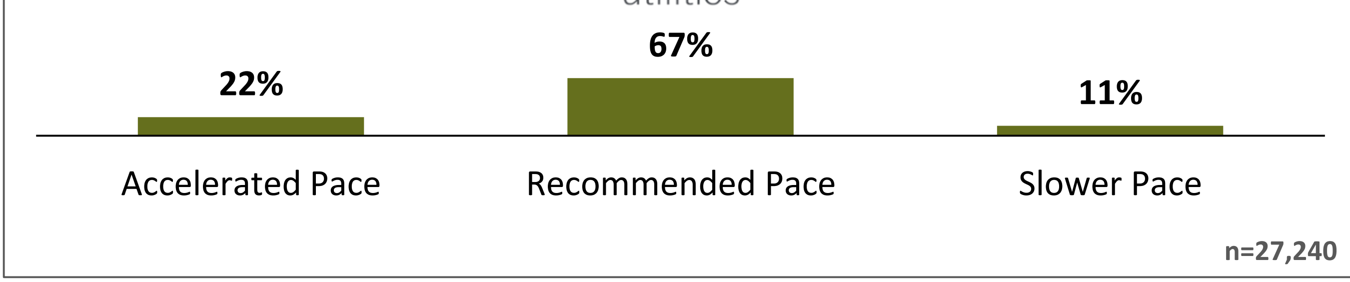


Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	24%	25%	24%	17%	21%
Recommended Pace	66%	61%	67%	71%	67%
Slower Pace	10%	14%	9%	12%	12%

Converting Rear Lot Service

Alectra Utilities' service area contains multiple older suburban and urban neighbourhoods with rear lot or "backyard" infrastructure. In general, rear lot electricity lines are 40 years of age or older. This type of equipment presents three primary problems:

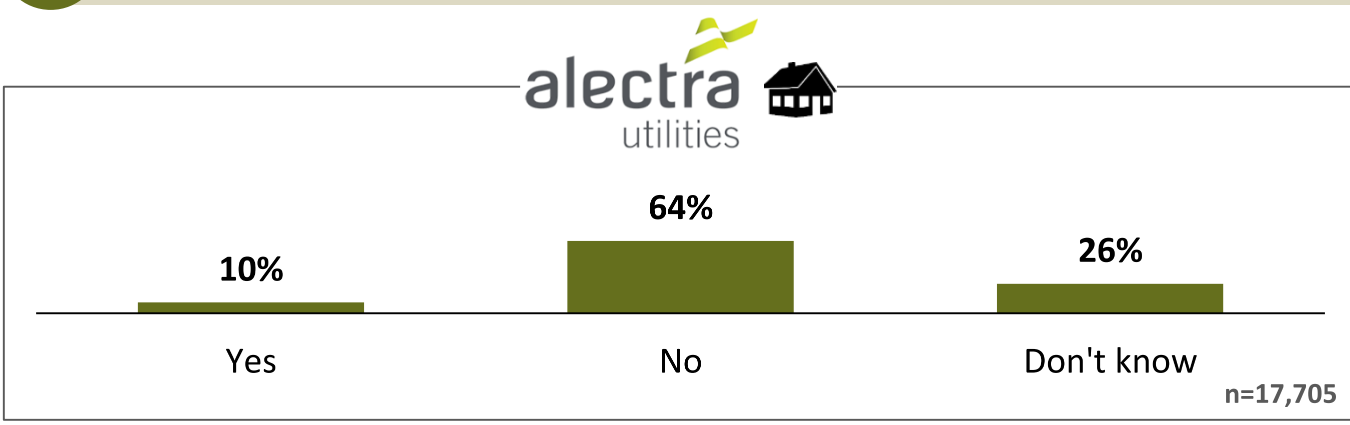
1. Repairs and maintenance are complicated because these lines are in the backyard of homes, rather than the front. Often regular equipment cannot access the backyards and repair crews need to work around trees, pools, sheds and other obstacles.

2. Rear lot equipment is subject to greater tree contact, especially during severe weather

3. The equipment presents elevated safety risks to the general public should the assets fail.

An Alectra Utilities study showed that rear lot restoration times are approximately 4.55 hours. This is three times higher than a comparable front lot restoration time of 1 to 1.4 hours.

Q To the best of your knowledge, does your power come from a line in a backyard behind your home?



Rate Zone Breakdown	HRZ	PRZ	GRZ
Yes	13%	8%	6%
No	63%	63%	75%
Don't know	24%	29%	19%

Online Workbook

Converting Rear Lot Service

Residential

Alectra Utilities has two choices to make in dealing with rear lot service, a design choice and a timing choice. The first question relates to what design approach the utility chooses. The options below assume that all rear lot equipment is converted within the next 70 years.

Q Which of the following design approaches would you prefer?

Option	Rear lot or "backyard" equipment design choices
Reactive Approach ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Reactively** replace rear lot assets when they have reached their physical end-of-life criteria, knowing that there could be prolonged reliability impacts. This option leaves customers vulnerable to longer than average storm outages and resulting safety risks.
New poles in backyard ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** replace old poles and equipment, with new poles and equipment in backyards. This would improve day-to-day reliability but leaves customers vulnerable to longer than average storm outages, and resulting safety risks.
Partial Underground ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** re-locate some rear lot infrastructure to front lot underground. This would address some of the vulnerability to longer than average storm outages and resulting safety risks.
Full Underground ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** re-locate all rear lot infrastructure to front lot underground. This would completely resolve the vulnerability to longer than average storm outages and resulting safety risks.

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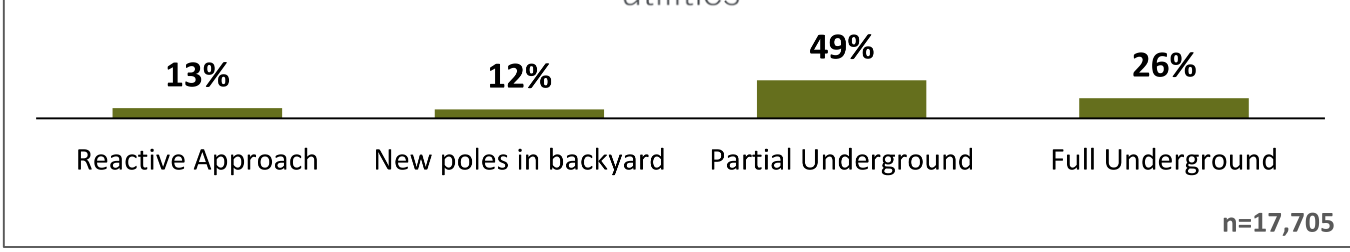


Rate Zone Breakdown	HRZ	PRZ	GRZ
Reactive Approach	11%	15%	14%
New poles in backyard	11%	13%	9%
Partial Underground	54%	46%	45%
Full Underground	24%	26%	33%

Timing of a Rear Lot Conversion Program

Approximately 11,000 customers throughout the former Horizon, PowerStream and Guelph Hydro rate zones are supplied by rear lot lines.

Because rear lot lines have reasonable reliability in normal weather, Alectra Utilities has given other projects priority within its current approved rates. However because rear lot conversions will reduce customer exposure to prolonged outages, and safety risks, Alectra Utilities has identified three timing options to replace rear lot lines proactively.

The exact cost will depend on the design, but for your feedback the options assume the full replacement with front lot underground service.

Examples of rear lot equipment

Online Workbook

Timing of a Rear Lot Conversion Program

Residential

Q Which of the following timing options would you prefer?

Option	Pacing of renewal and conversion	Service renewed and converted over 5-year period
Accelerated Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **30 year period**	Approximately **1,810 customers** (16% of customer with rear lot)
Moderate Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **40 year period**	Approximately **1,360 customers** (12% of customer with rear lot)
Recommended Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **70 year period**	Approximately **851 customers** (8% of customer with rear lot)
Base Pace *Within current rates*	Renew and convert existing rear lot overhead locations on a reactive emergency basis	Expose customers serviced by these lines to prolonged outage and safety risks

Rate Zone Breakdown	HRZ	PRZ	GRZ
Accelerated Pace	10%	8%	12%
Moderate Pace	11%	7%	14%
Recommended Pace	52%	48%	48%
Base Pace	27%	36%	25%

Online Workbook

Rear Lot Questions by Service Type

Q Converting Rear Lot Service (Design) **by** Service Type

Rate Zone Breakdown	HRZ		PRZ		GRZ	
Service Type	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot
Reactive Approach	11%	11%	13%	15%	19%	14%
New poles in backyard	13%	11%	15%	12%	10%	8%
Partial Underground	49%	55%	44%	47%	38%	45%
Full Underground	27%	23%	28%	26%	34%	34%

Q Timing of a Rear Lot Conversion Program (Timing) **by** Service Type

Rate Zone Breakdown	HRZ		PRZ		GRZ	
Service Type	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot
Accelerated Pace	**15%**	9%	**14%**	8%	13%	13%
Moderate Pace	**16%**	11%	**10%**	7%	13%	15%
Recommended Pace	49%	51%	50%	47%	50%	47%
Base Pace	20%	29%	26%	38%	24%	25%

Planning for Expansion, Intensification and Back-up

Expansion, increased intensification and increased back-up projects all involved adding high capacity feeder lines to the grid.

- **Expansion:** Where there is no line or a line might have been initially built to service a farm, it is now serving a subdivision and can no longer meet the needs of those customers.

- **Intensification and redevelopment:** Multiple downtown areas are becoming more densely populated, which has resulted in insufficient supply to meet the increased demand.

- **Back-up capacity:** Because of the way the grid has grown, there are certain areas within Alectra Utilities' service territory that no longer have access to adequate back-up capacity in the case of an outage.

While most expansion related projects cannot be deferred due to the obligation to connect new customers, some intensification and back-up capacity projects could be delayed.

Intensification:

- Since these projects are often completed with other infrastructure projects such as road widening and sewer work, deferral could lead to increased costs and service disruptions.

- Building expansion projects now allows the projects to be built at lower cost with less disruptions than waiting until development is underway and the need is pressing.

Back-up capacity:

- Deferral of back-up projects could lead to increased outage times during contingency condition and may cause reliability issues on some heavily loaded lines.

- Adding back-up capacity now allows for quicker restoration of power when caused by transmission system failures or severe weather events.

Online Workbook

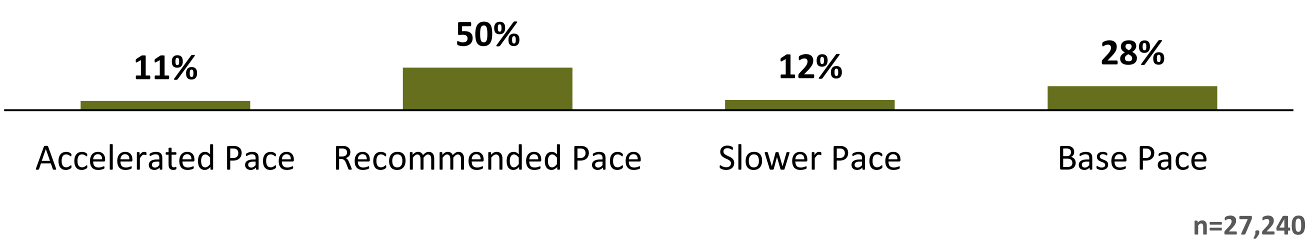
Planning for Expansion, Intensification and Back-up

Residential

Q Which of the following timing options would you prefer?

Option	2020 – 2024 Expansion & Intensification Projects
Accelerated Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	Address all the expansion, intensification and contingency needs identified for the distribution system during 2020-2024.
Recommended Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	Address all the expansion needs and many of the intensification and required back-up projects. Some projects related to intensification or back-up capability will be deferred.
Slower Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	Address all expansion projects but defer majority of intensification and all required back-up capability projects. Reliability and power quality may be affected on heavily loaded feeders.
Base Pace *Within current rates*	Complete key expansion projects but defer significant amount of intensification and back up capability projects during 2020 -2024.

alectra utilities



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	13%	16%	10%	7%	8%
Recommended Pace	52%	50%	54%	46%	48%
Slower Pace	12%	10%	11%	12%	16%
Base Pace	22%	25%	25%	34%	28%

Voltage Conversion

About 8.5% of Alectra Utilities' customers are serviced by low voltage distribution systems. These lines were built in the 1950's and represent some of Alectra Utilities' oldest distribution assets. These lines have much less capacity than modern lines. During an outage, the modern lines cannot be used to restore power to the low voltage lines, because they don't operate at the same voltage levels.

This equipment has become functionally obsolete, and the risk of equipment failure is increasing. Since there is no urgent threat to reliability, there are no low voltage conversion investments included within existing rates.

However, investing in voltage conversion projects would:

- improve reliability through the new lines and transformers;
- provide access to increased supply from higher voltage substations; and
- improve outage restoration from the enhanced back-up and availability of tie points at this higher voltage level.

Online Workbook

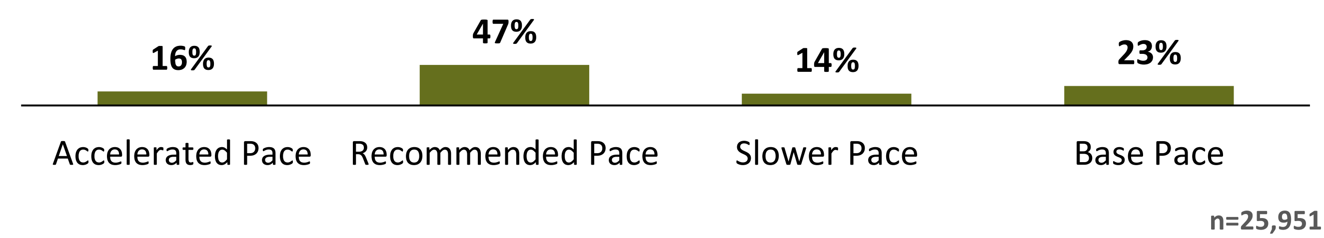
Voltage Conversion

Residential

Q Which of the following timing options would you prefer?

Option	Voltage Conversion	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **11** low voltage substations	Enable Alectra Utilities to convert 10,533 customers to present day supply voltage
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **9** low voltage substations	Enable Alectra Utilities to convert 9,984 customers to present day supply voltage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **5** low voltage substations	Enable Alectra Utilities to convert 6,566 customers to present day supply voltage
Base Pace *Within current rates*	Alectra Utilities will not decommission any stations	Current rates support the investment to enable Alectra Utilities to convert 3,600 customer to present day supply voltage

alectra utilities



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ
Accelerated Pace	19%	16%	11%	18%
Recommended Pace	47%	41%	45%	51%
Slower Pace	14%	16%	19%	10%
Base Pace	20%	26%	25%	21%

Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity in order to provide electricity for existing and new developments; provide more resilience to deal with extreme weather event and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline in Alectra Utilities' quality of service to current customers.

Here in Mississauga, Alectra Utilities has two stations that need investment.

- The proposed new Duke station is located immediately north of Square One and will help serve the growing demands of that area.
- A station in the East Credit area of Mississauga is currently located on leased land that Alectra Utilities would like to purchase for long term security.

The lead time to build a station is 2 to 3 years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures.

Online Workbook

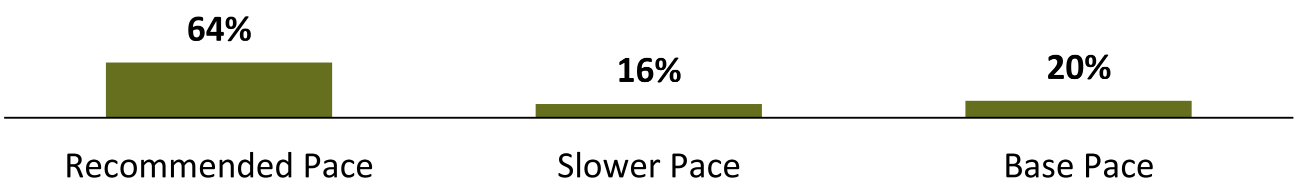
Distribution Stations Capacity (ERZ)

Residential

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station and increase capacity at one station	Enable Alectra Utilities to build Duke station as well as buy leased land at the East Credit area station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station	Enable Alectra Utilities to build Duke station, while assuming the risk that it will cost more to purchase leased land at a station in East Credit in the future.
Base Pace *Within current rates*	Delay any station capacity investments	Risk that it will cost more to purchase leased land in future. Existing stations likely to experience overloading and increased risk of reliability issues.

enersource | alectra utilities



Investment only in Enersource RZ

n=5,294

Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity to provide electricity for existing and new developments; provide more resilience to deal with extreme weather events and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities’ is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities’ substations are approaching capacity limits. Delaying planned investments could result in a decline Alectra Utilities‘ quality of service to current customers.

Here in the former PowerStream area, Alectra Utilities has four stations that need investment:

- The existing Melbourne station in Bradford is located on leased land that Alectra Utilities would like to purchase for long-term stability. Furthermore, this station requires an upgrade.
- Barrie and Alliston both have growing demand that will need Alectra Utilities to buy the land for and to build new stations.
- Growth in Markham and Richmond Hill requires building a new transformer station after 2024. However, prior to building this new station, an environmental assessment is needed.

The lead time to build a station is two to three years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures. Alectra Utilities has presented the following options that balance system needs and rate impacts.

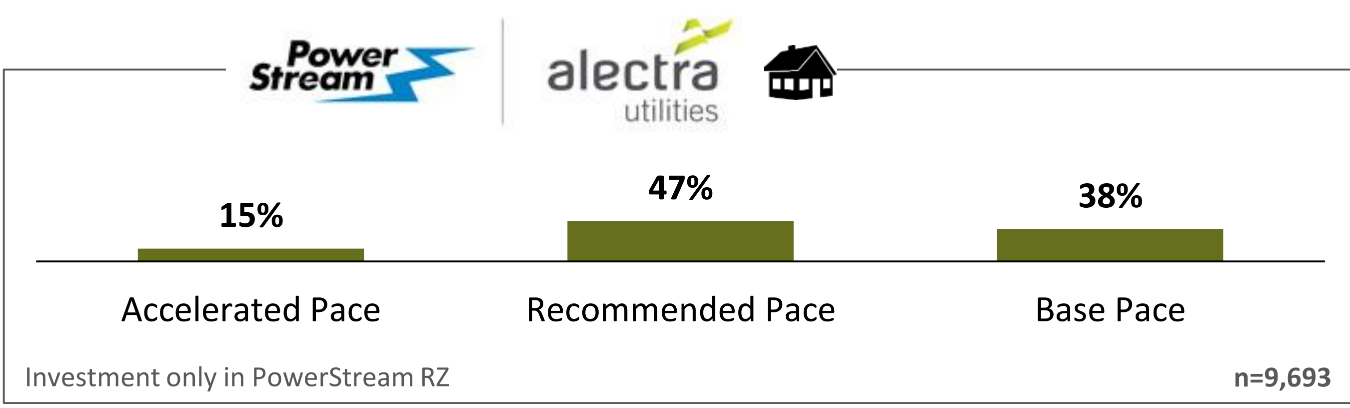
Online Workbook

Distribution Stations Capacity (PRZ)

Residential

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Accelerated Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build two new stations and increase capacity at one station	• Upgrade Bradford station • Build new stations in both Alliston and Barrie • Complete environmental assessment for Markham station.
Recommended Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new stations and increase capacity at one Station	• Upgrade Bradford station • Build station in Alliston • Complete environmental assessment for Markham station. Risk that existing Barrie stations will experience overloading and increased risk of reliability issues.
Base Pace *Within current rates*	Upgrade one station and secure land for future station build.	• Upgrade Bradford station • Complete environmental assessment for Markham station. Risk that existing Alliston and Barrie stations will experience overloading and increased risk of reliability issues.



Additional Station Investments

Beyond the transformers and other equipment that directly operate the grid, other investments are required for security, communications and control systems. Distribution stations play an important role in Alectra Utilities' electricity grid, transforming high voltage electricity to a lower voltage that is suitable for distribution. A failure in a distribution station can result in an outage for thousands of customers.

- **Communications and control systems** allow Alectra Utilities staff in central control rooms to remotely monitor and control the equipment in distribution stations in order to avoid equipment failures and manage failures when they do occur. Monitoring equipment is also used for security purposes.

While new investments to keep these systems up to date would help to maintain reliability and security, delaying these investment is less likely to cause problems compared to delaying other projects discussed earlier.

To manage within existing rates, Alectra Utilities is proposing to postpone any investments in distribution station, communications and control systems. Managers know that as these systems age, there will likely be more outages, but it is not possible to estimate the exact risks involved.

Online Workbook

Additional Station Investments

Residential

Q Which of the following timing options would you prefer?

Option	Level of Investment	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew communication, replace end-of-life station equipment, obsolete protection equipment and upgrade station facilities.	• Maintain reliability • Ensure reliable communication performance of the system • Increases security at the station.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication, replace end of life station equipment and obsolete protection equipment.	• Maintain reliability • Ensure reliable communication performance of the system • Does not increase security at the station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication and replace end of life station equipment.	• Maintain reliability • Ensure reliable communication infrastructure. • Does not increase security at the station.
Base Pace *Within current rates*	Monitor station equipment and reactively replace when necessary. Defer other investments beyond 2024	This option would require allocating funds from the reactive budget as necessary.

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	19%	19%	20%	12%	17%
Recommended Pace	52%	52%	58%	49%	63%
Slower Pace	10%	9%	8%	16%	-
Base Pace	19%	20%	13%	24%	20%

Combined Alectra Utilities results not shown because “slower pace” option was not presented in the Guelph rate zone. **n=27,240**

Preparing for More Consumer Choice

New technologies are changing the way that consumers are able to interact with the electricity system. Emerging technologies like solar power, battery storage and electric vehicles are constantly evolving; they are becoming more affordable, more widely available, and better performing.

Properly planned and managed, the integration of these technologies with Alectra Utilities' traditional "poles and wires" equipment is expected to provide benefits to customers by way of:

- reducing the amount of infrastructure costs related to meeting the increased demand for electricity; and
- generating electricity more locally, reducing the amount of generation that is needed elsewhere in the province.

Regardless of whether you are considering new energy choices like an electric vehicle for yourself today, the market is changing quickly, and Alectra Utilities must be prepared as adoption becomes more widespread over the next five years. For instance, charging each electric vehicle draws as much energy as two average homes. If a dozen or so people come home and start changing their vehicles at a period of peak demand, it could overload the grid in that neighbourhood. Not being prepared could result in increased equipment failure due to overloaded lines, as well as costly infrastructure upgrades to meet the demand posed by this technology.

Alectra Utilities has identified three pilot projects to ensure the system is ready when more consumers adopt this technology. These pilots are intended to answer questions like;

- *How will the grid respond if a neighbourhood rapidly adopts new technology, such as electric vehicles?*
- *How can Alectra Utilities reduce the strain on the system by using smart technology to dispatch electricity?*

These pilots are not required to meet immediate reliability issues, however, they will help to ensure that Alectra Utilities is able to meet the challenged as more consumers embrace this technology in the next few years.

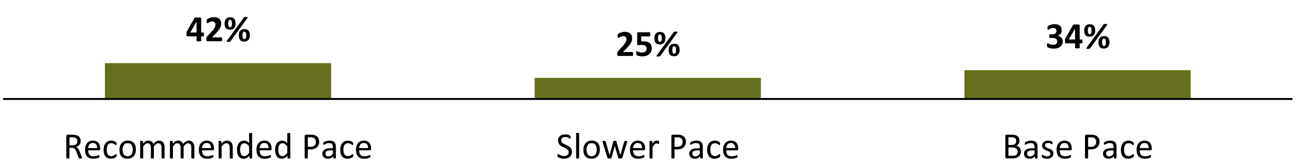
Online Workbook

Preparing for More Consumer Choice

Residential

Q Which of the following timing options would you prefer?

Option	Approach
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Conduct three pilot projects to prepare to integrate new technology like electric vehicles, solar power and battery storage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Wait until new technology like electric vehicles, solar power and battery storage becomes more widely adopted
Base Pace *Within current rates*	Reactively respond to technology uptake by investing in traditional 'poles and wires' infrastructure as reliability and capacity issues become apparent



Investment only in PowerStream RZ

n=9,693

Investment Alternative Summary

Throughout this workbook, you have been asked about some key choices that could impact your rates. Below is a summary of your answers to the questions that could impact your rates.

At the bottom of this page you will find the total bill impact of all the answers you gave that would result in a bill increase.

Having seen the total bill impact, please review your answers and change your responses if you desire; your potential rate impact will be re-calculated. You will have the opportunity to adjust your answers again until you feel you've reached the best balance for you.

Q Residential Customer Bill Impact Change and Magnitude of Bill Impact

Bill Impact Analysis	ERZ	BRZ	HRZ	PRZ	GRZ
Average $ Initial	$0.18	$0.13	$0.18	$0.23	$0.10
Average $ Final	$0.17	$0.12	$0.17	$0.22	$0.10
Difference: Initial VS. Final	$0.00*	($0.01)*	$0.00*	($0.01)*	$0.00

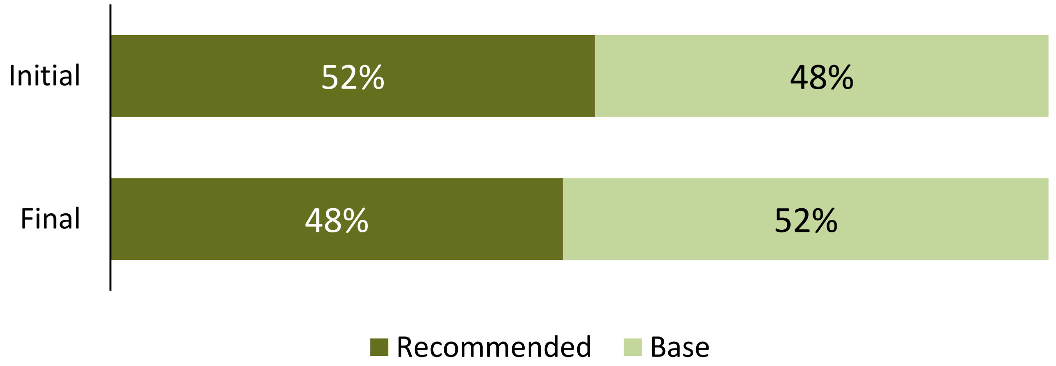
Differences that are statistically significant at 95% are noted by an asterisk (*).

Online Workbook

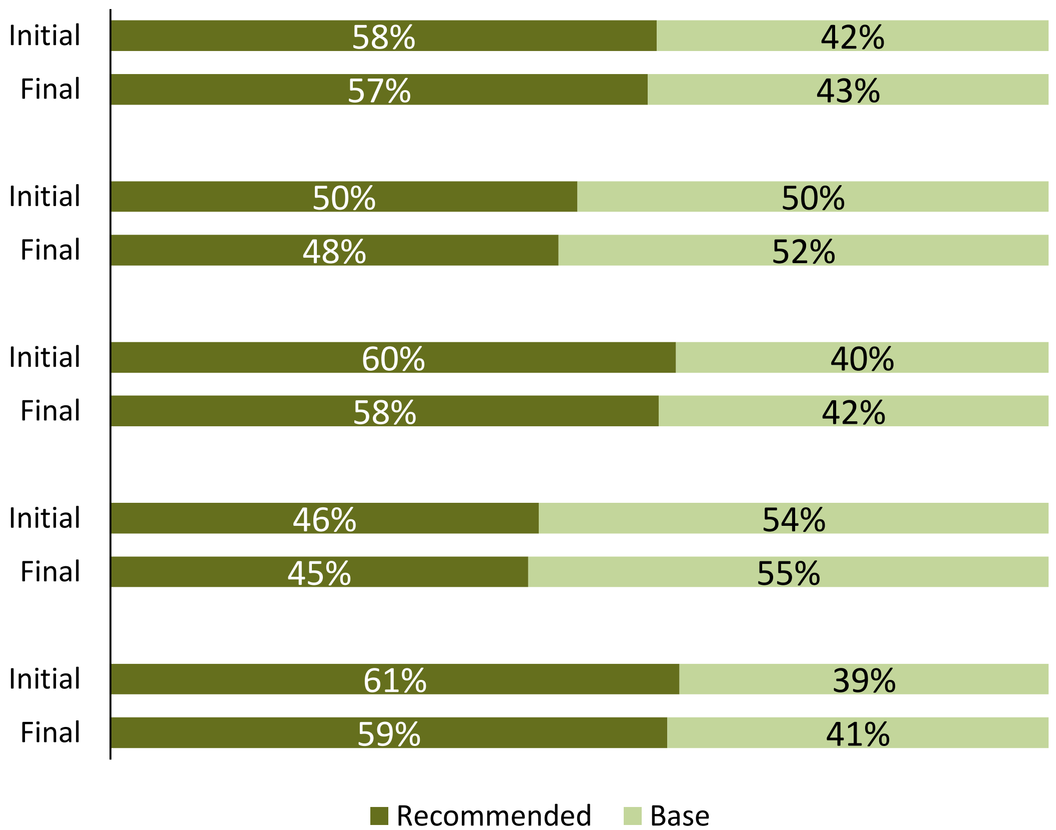
Change in Initial vs. Final Response by Project

Residential

Q Eliminating Meter Data Security Risks



Q Keeping the Business Running

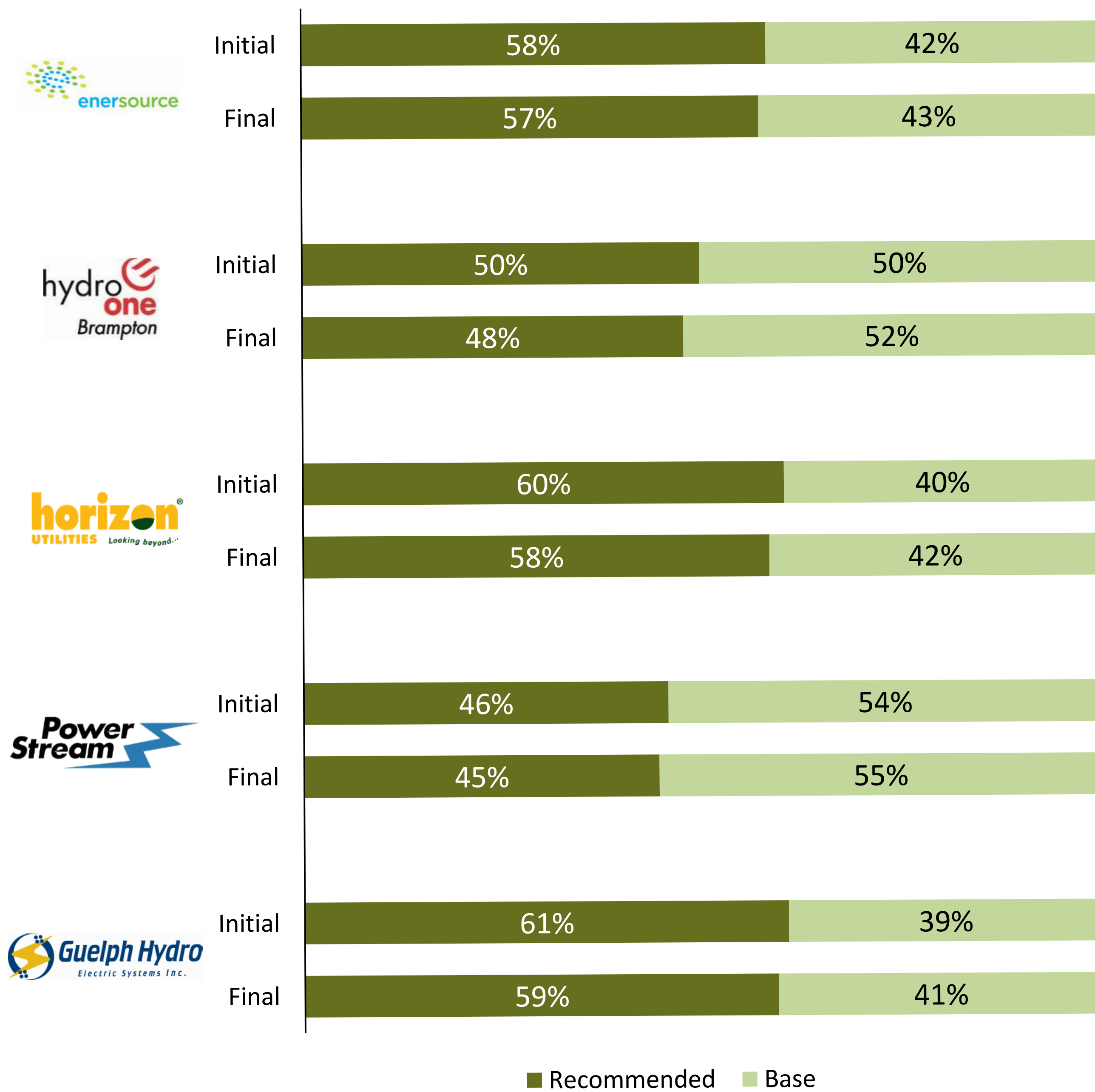


Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Keeping the Business Running



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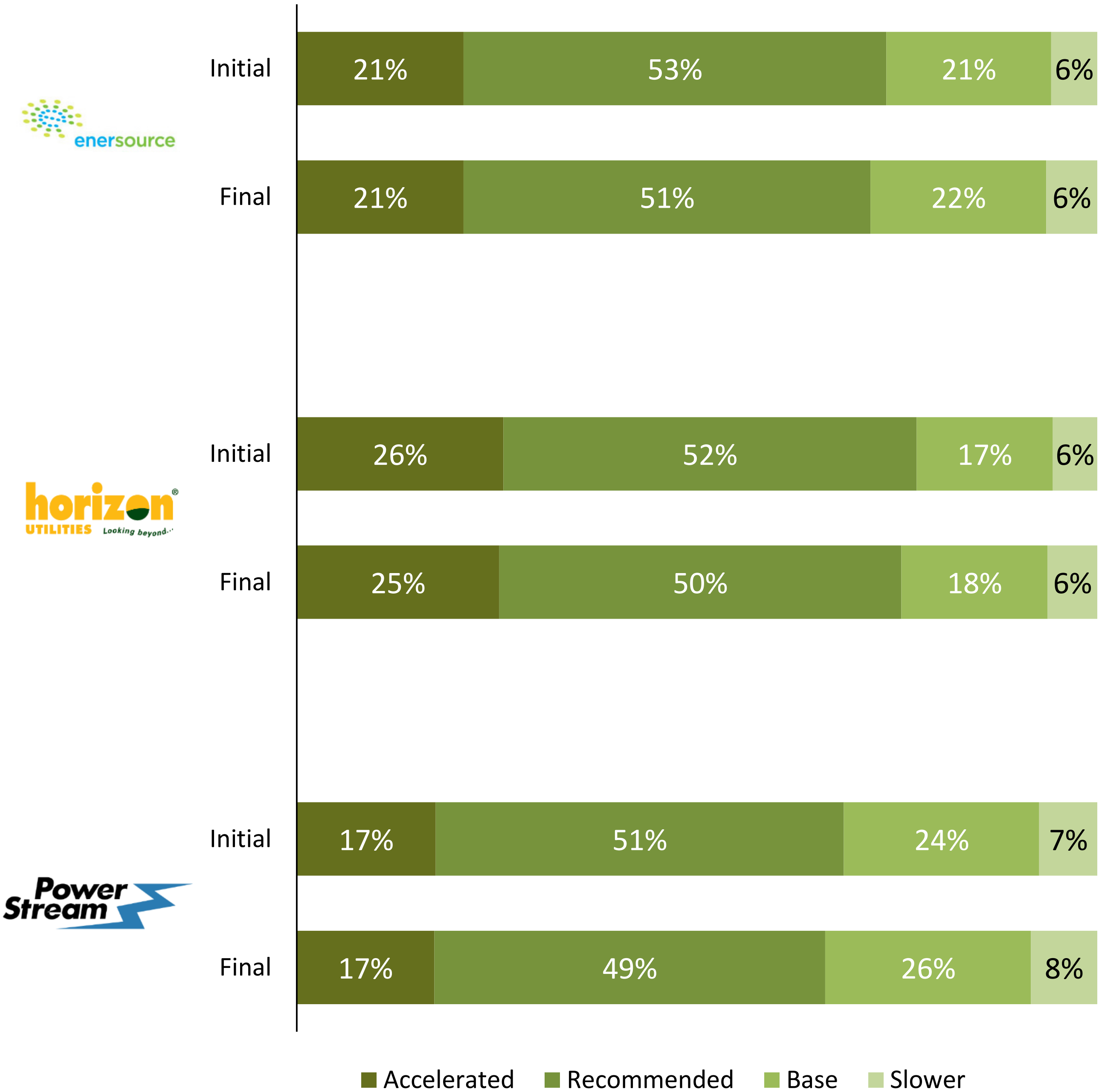
Change in Initial vs. Final Response by Project

Residential

Q Pacing Investments in the Underground System



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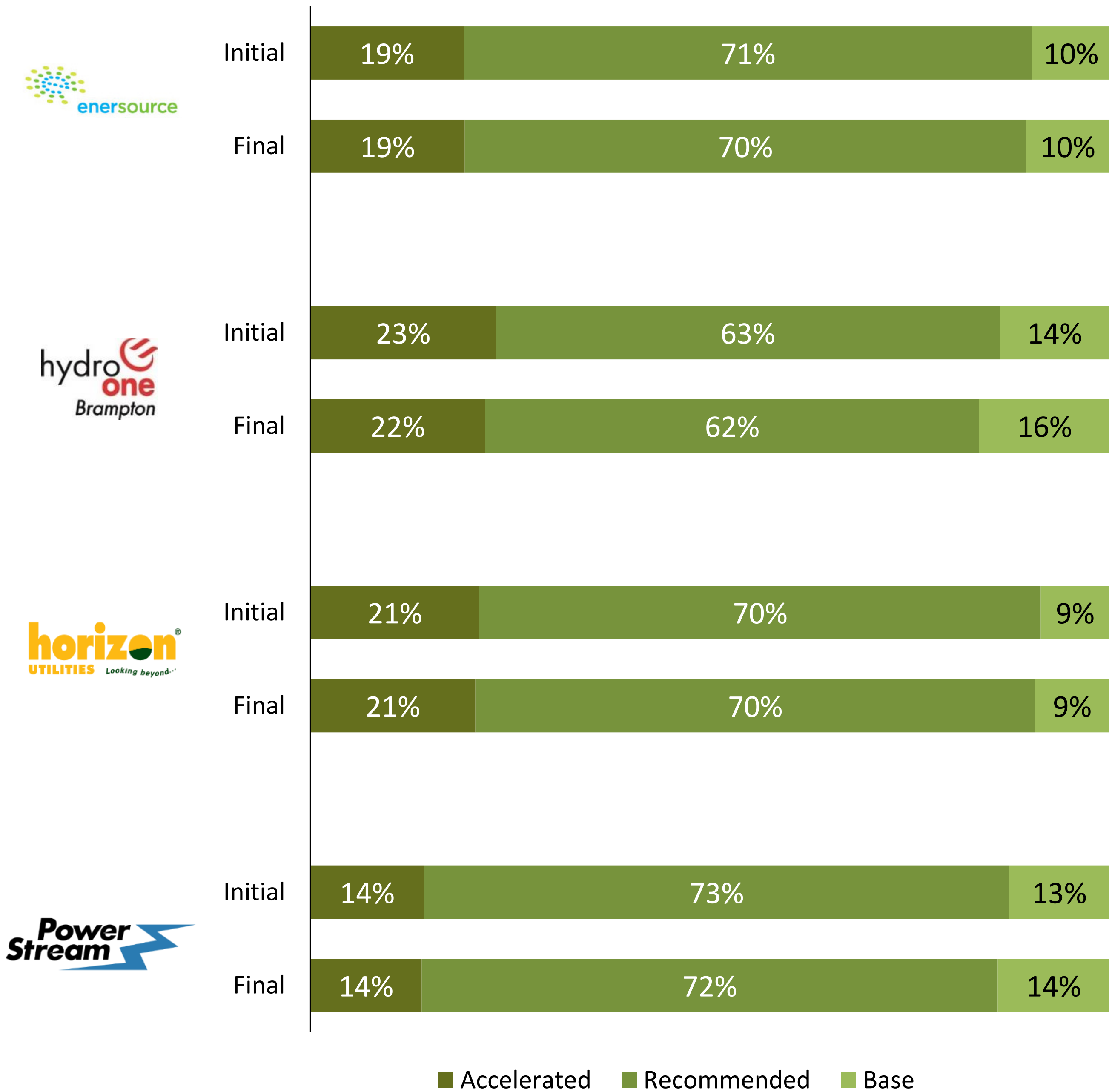
Change in Initial vs. Final Response by Project

Residential

Q Keeping Pace with Overhead System Renewal



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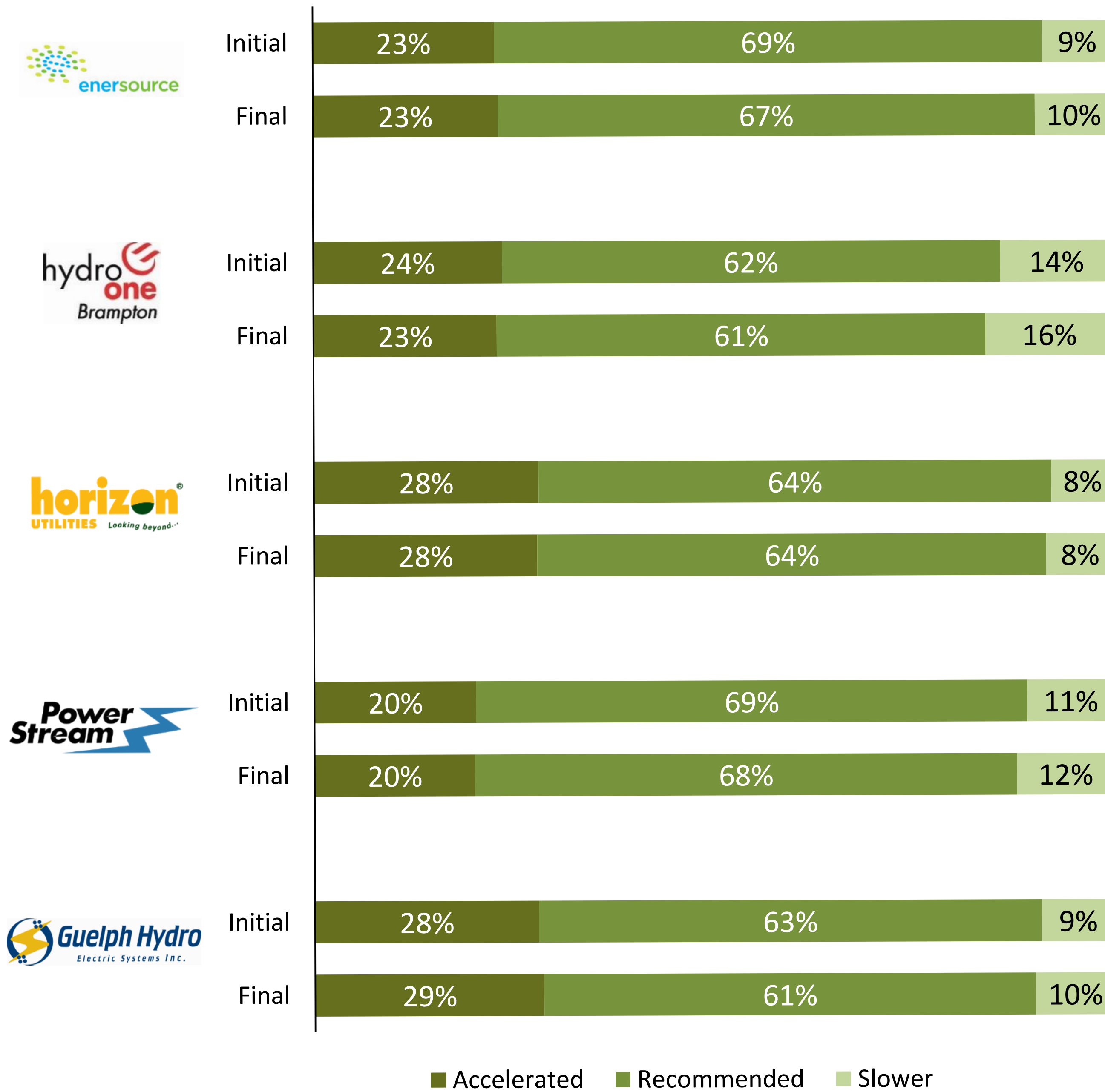
Change in Initial vs. Final Response by Project

Residential

Q Alectra Utilities' Transformer Replacement Program

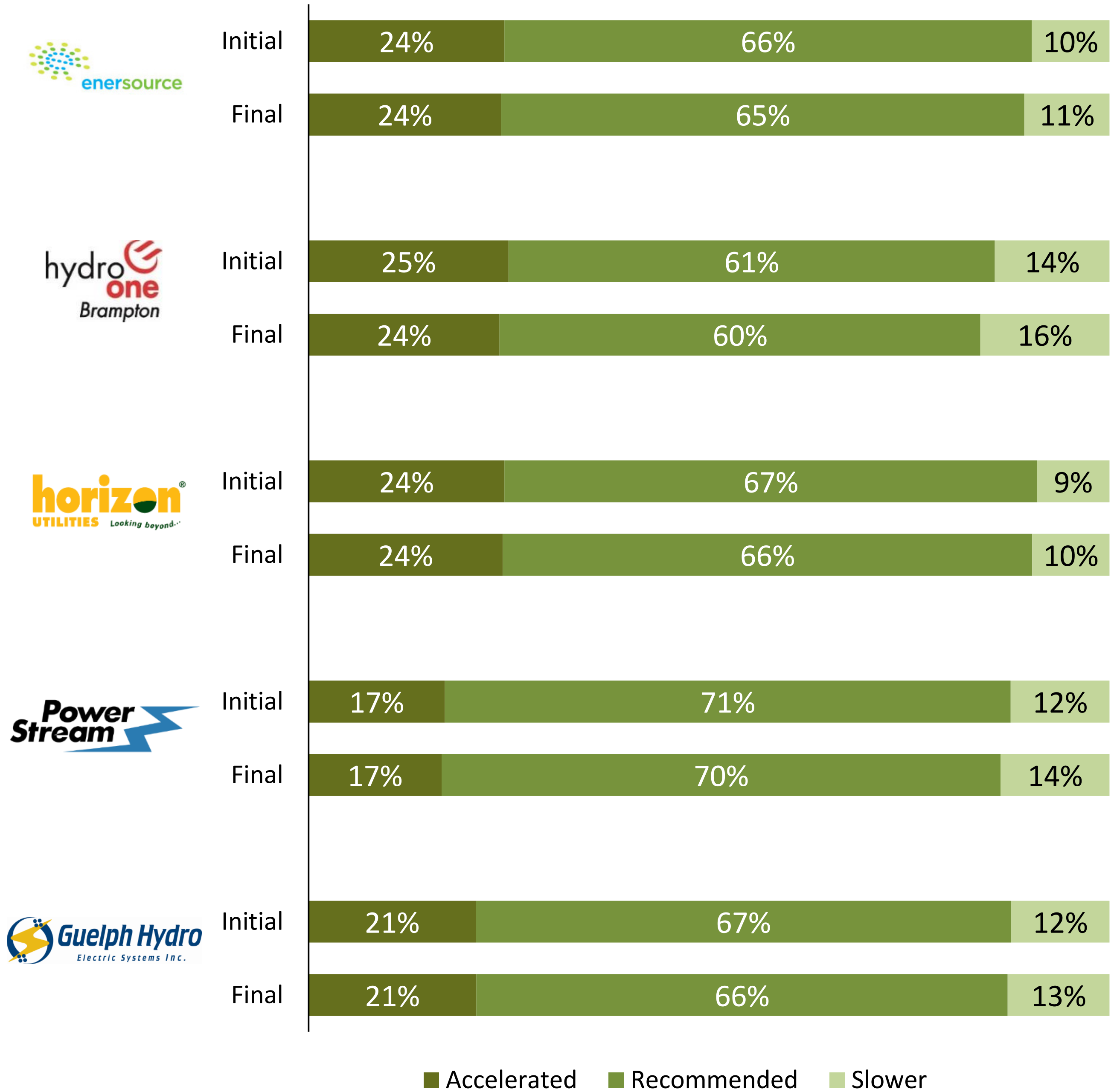


Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Monitoring and Control Equipment



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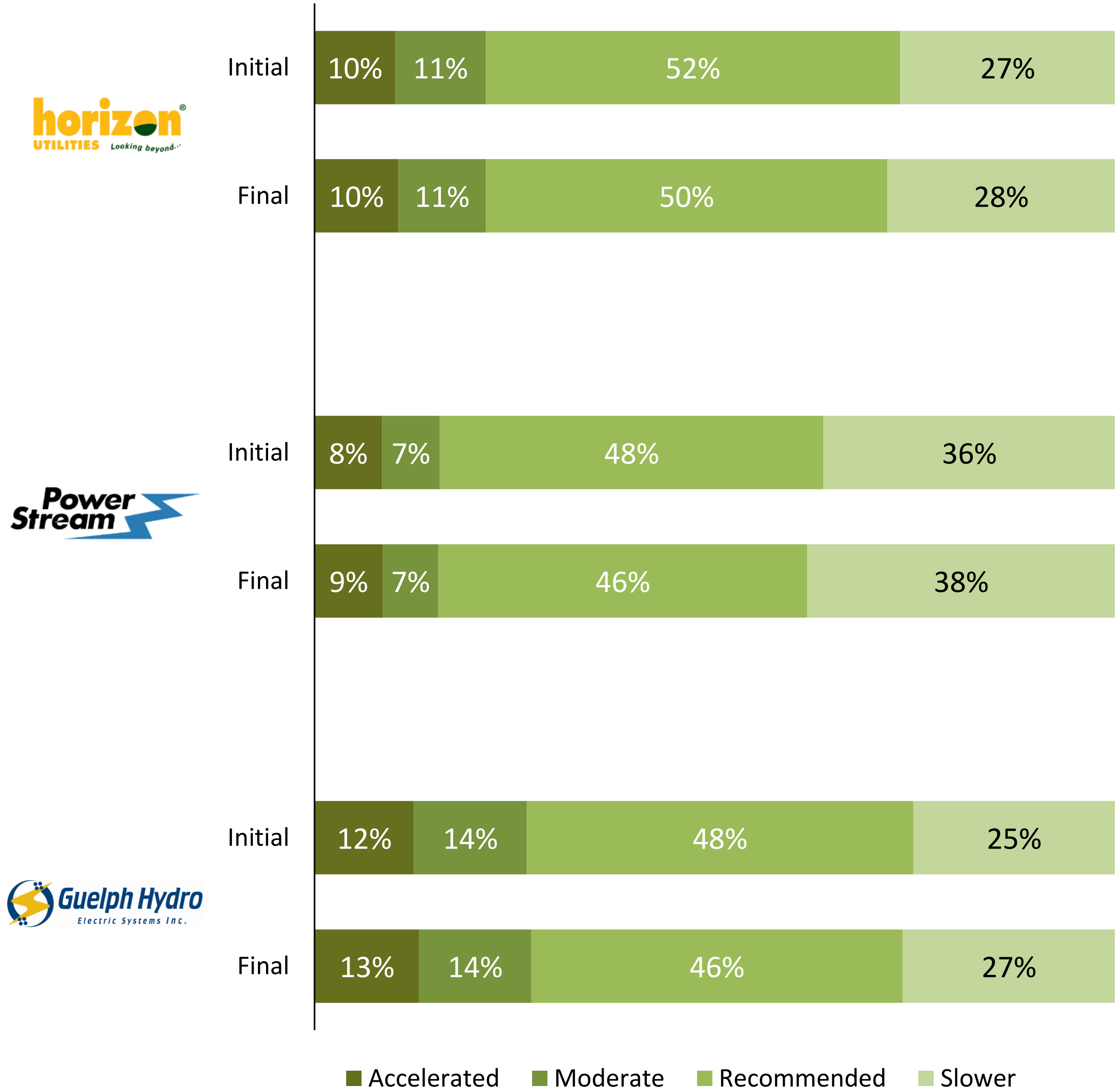
Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Timing of a Rear Lot Conversion Program



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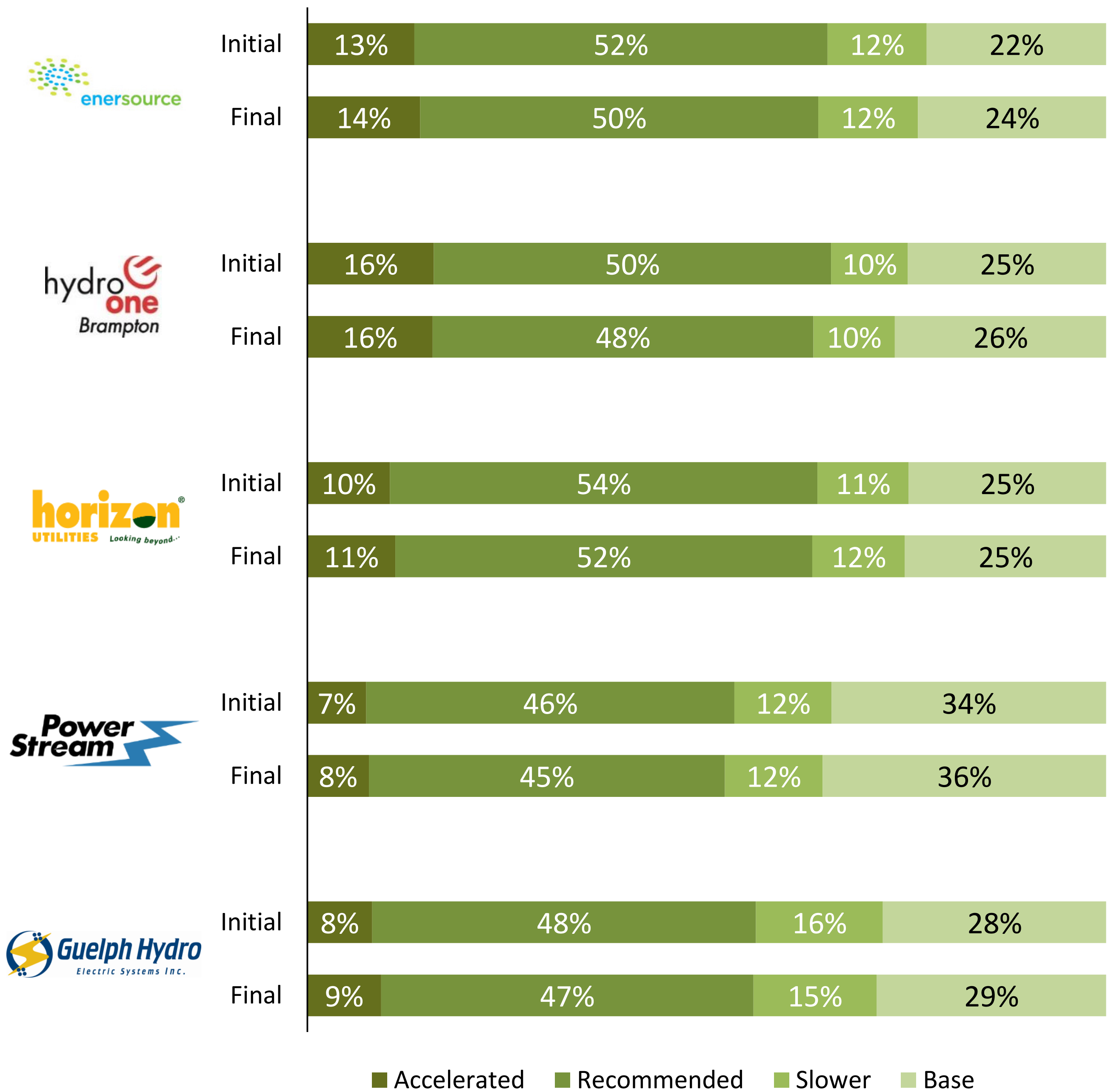
Change in Initial vs. Final Response by Project

Residential

Q Planning for Expansion, Intensification and Back-up

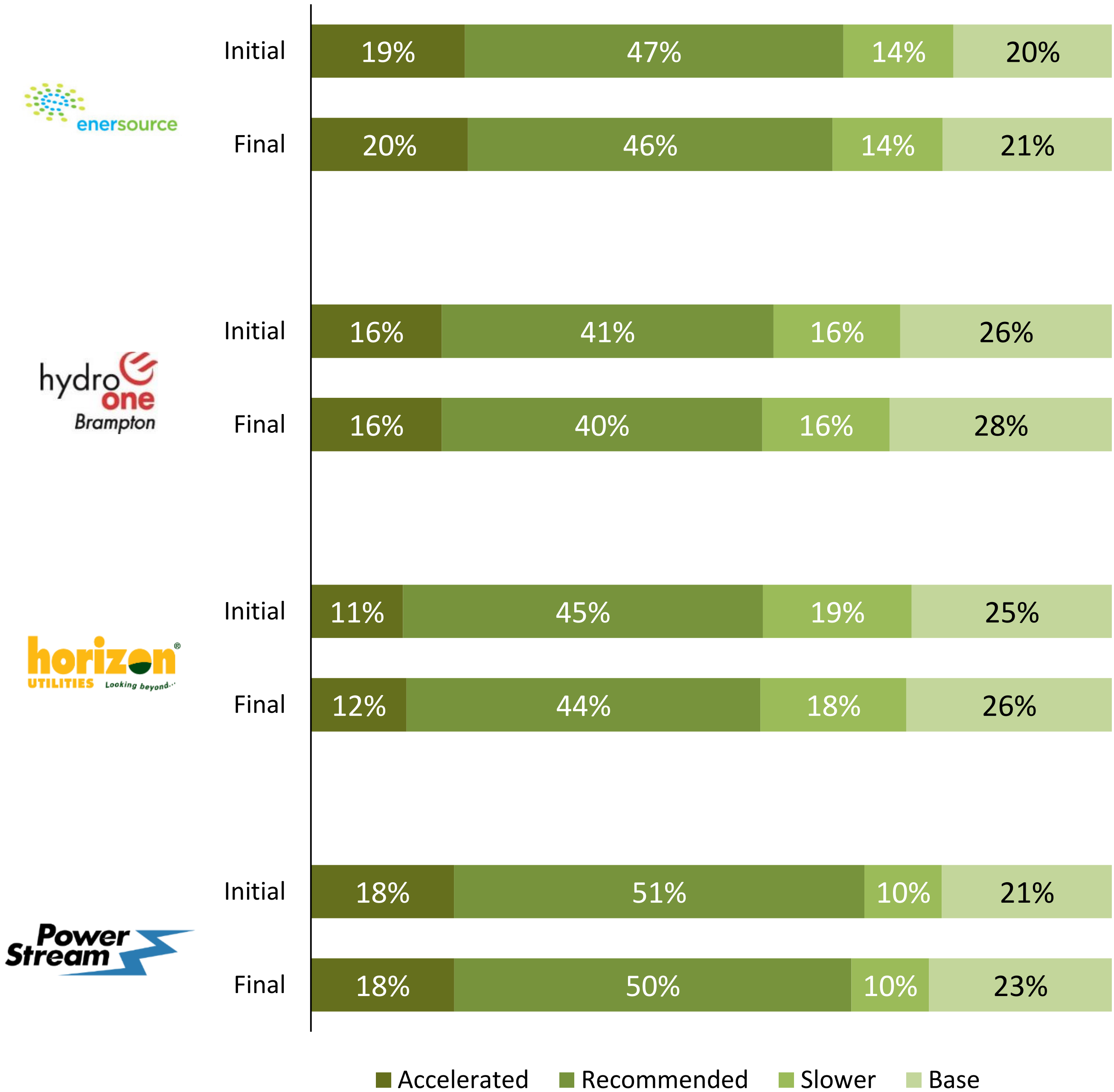


Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Voltage Conversion

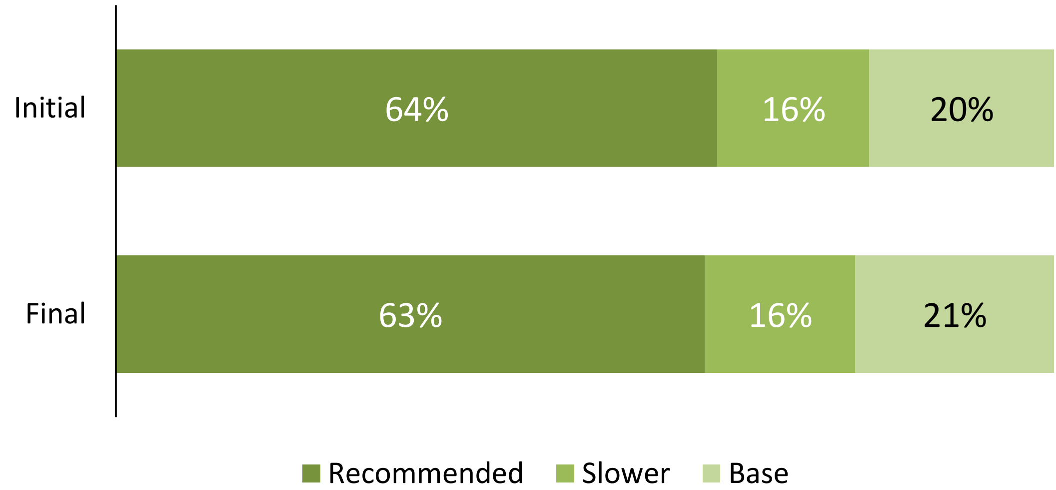


Online Workbook

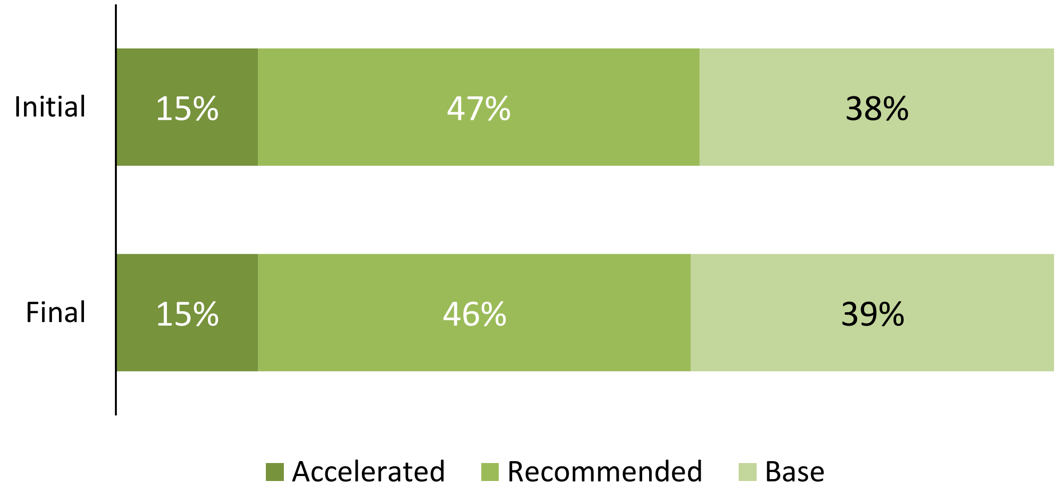
Change in Initial vs. Final Response by Project

Residential

Q Distribution Stations Capacity (ERZ)



Q Distribution Stations Capacity (PRZ)

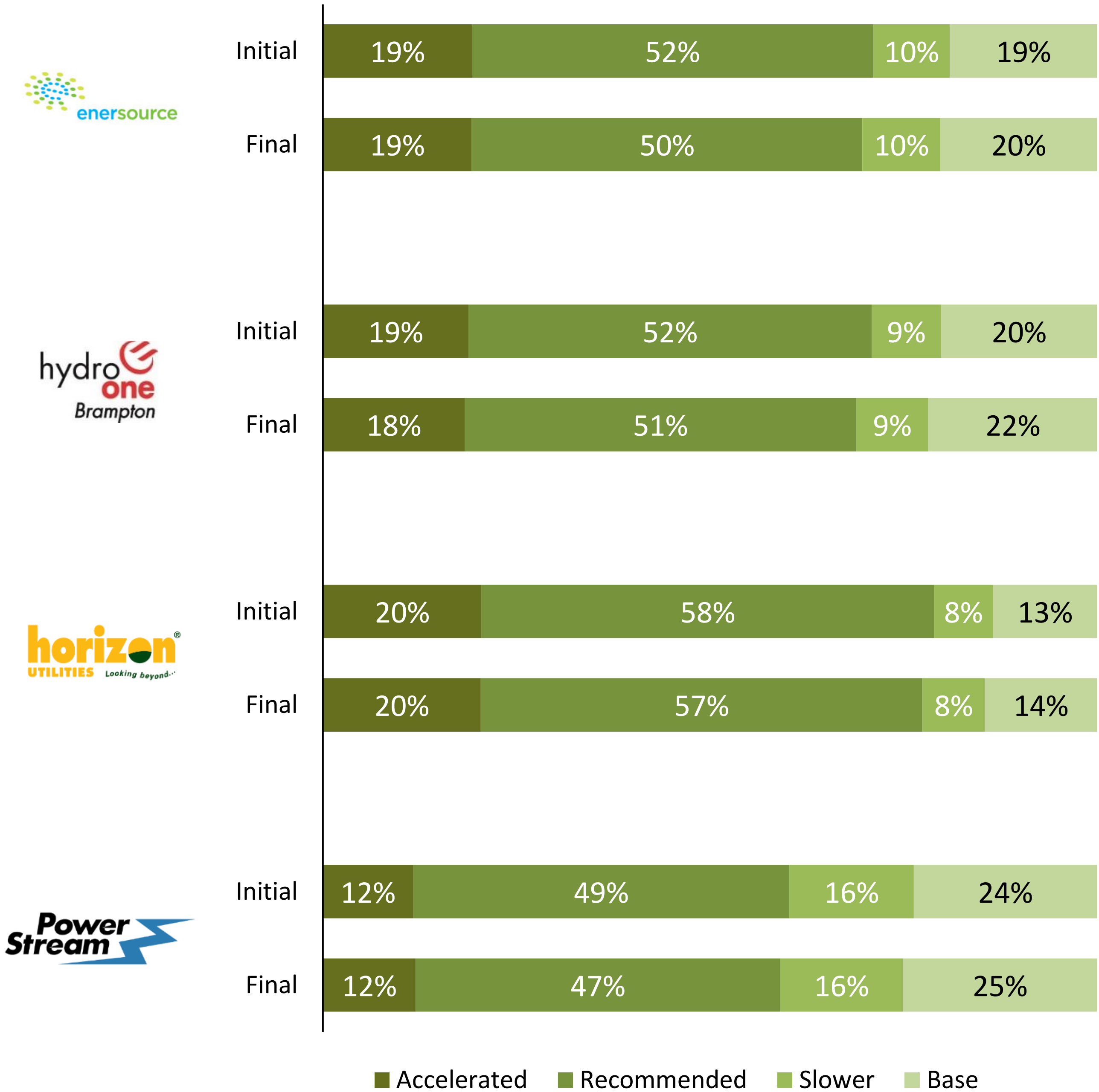


Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Additional Station Investments

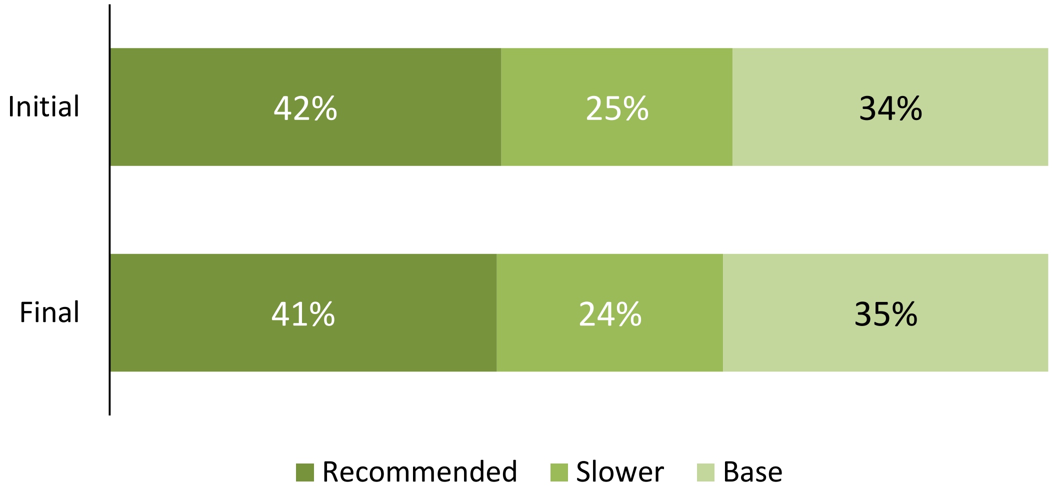


Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Preparing for More Consumer Choice



Online Workbook
Impact of Choices on Rates | Preamble

Impact of Choices on Rates

As noted earlier, all the projects identified in this workbook have been evaluated and found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Under the OEB rules, Alectra Utilities can apply for additional rates, beyond the scheduled 1.2% increase, to pay for these improvements.

Alectra Utilities has calculated the rate impact of implementing the options recommended by their planners.

These priorities may change based on your input but give you a sense of the cost for an investment program that aims to:

- maintain reliability for the average customer;
- fix or avoid equipment issues that cause below average reliability for some customers; and
- help the system do a better job of responding to major outages caused by severe weather or transmission grid failures.

Following Alectra Utilities planners' recommended approach would result in an average additional [PIPE-RID1] cents per month annually for the typical customer in your rate class.

At the end of the 5-year plan, the typical customer in your rate class would see the distribution portion of their electricity bill increase by [PIPE-RID2] above the current projected rate of [PIPE-TOT] in 2024.

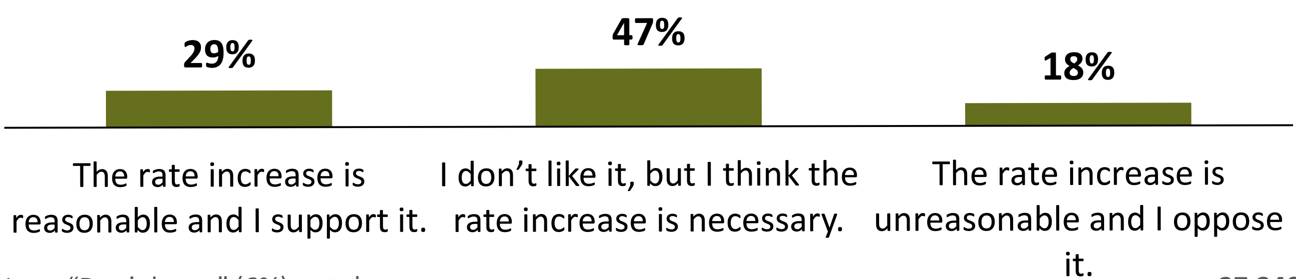
Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
[PIPE-RID1]	$0.23	$0.23	$0.25	$0.39	$0.14
[PIPE-RID2]	$1.16	$1.13	$1.27	$1.95	$0.72
[PIPE-TOT]	$26.71	$26.33	$28.74	$30.67	$31.14

Online Workbook

Impact of Choices on Rates

Residential

Q Which of the following statements best represents your view?



Note: "Don't know" (6%) not shown.

n=27,240

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
The rate increase is reasonable and I support it	32%	24%	31%	28%	33%
I don't like it, but I think the rate increase is necessary	46%	45%	48%	47%	48%
The rate increase is unreasonable and I oppose it	17%	24%	15%	19%	15%
Don't know	5%	7%	5%	6%	4%
Reasonable and support it + don't like it, but think it's necessary	**78%**	**69%**	**80%**	**75%**	**81%**

Online Workbook

Overall Rate Impact by LEAP Qualification and Rate Zone

Residential

Q Which of the following statements best represents your view?

Enersource Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	Total ERZ
The rate increase is reasonable and I support it	26%	29%	41%	32%
I don't like it, but I think the rate increase is necessary	42%	47%	46%	46%
The rate increase is unreasonable and I oppose it	24%	18%	11%	17%
Don't know	8%	5%	2%	5%
Top 2 Boxes	**68%**	**76%**	**86%**	**78%**

Brampton Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	Total ERZ
The rate increase is reasonable and I support it	22%	21%	32%	24%
I don't like it, but I think the rate increase is necessary	39%	49%	47%	45%
The rate increase is unreasonable and I oppose it	30%	25%	18%	24%
Don't know	10%	6%	4%	7%
Top 2 Boxes	**60%**	**70%**	**79%**	**69%**

Note: Those who said "prefer not to say" to income question not shown.

Online Workbook

Residential

Overall Rate Impact by LEAP Qualification and Rate Zone

Q Which of the following statements best represents your view?

Horizon Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	**Total HRZ**
The rate increase is reasonable and I support it	25%	31%	40%	31%
I don't like it, but I think the rate increase is necessary	51%	51%	46%	48%
The rate increase is unreasonable and I oppose it	16%	14%	11%	15%
Don't know	8%	5%	3%	5%
Top 2 Boxes	**76%**	**82%**	**86%**	**80%**

PowerStream Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	**Total PRZ**
The rate increase is reasonable and I support it	21%	26%	36%	28%
I don't like it, but I think the rate increase is necessary	42%	50%	46%	47%
The rate increase is unreasonable and I oppose it	26%	18%	15%	19%
Don't know	12%	6%	3%	6%
Top 2 Boxes	**62%**	**76%**	**82%**	**75%**

Note: Those who said "prefer not to say" to income question not shown.

INNOVATIVE RESEARCH GROUP

Online Workbook

Residential

Overall Rate Impact by LEAP Qualification and Rate Zone

Q Which of the following statements best represents your view?

Guelph Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	**Total GRZ**
The rate increase is reasonable and I support it	24%	31%	41%	33%
I don't like it, but I think the rate increase is necessary	52%	50%	45%	48%
The rate increase is unreasonable and I oppose it	16%	15%	11%	15%
Don't know	9%	4%	3%	4%
Top 2 Boxes	**75%**	**81%**	**86%**	**81%**

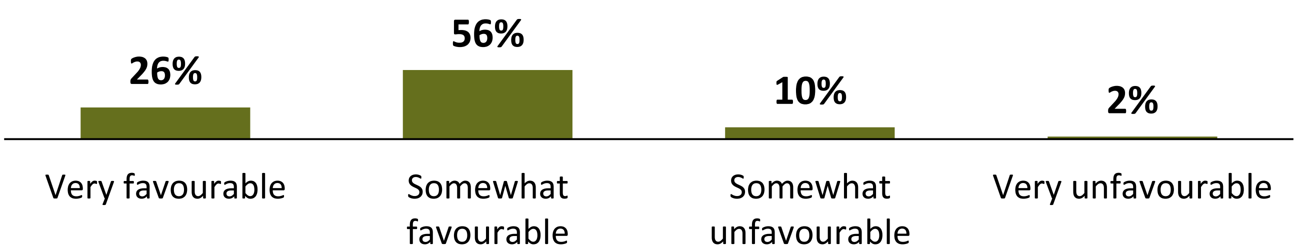
Note: Those who said "prefer not to say" to income question not shown.

Online Workbook

Workbook Diagnostics | Overall Impression

Residential

Q Did you have a favourable or unfavourable impression of the workbook you just completed?



Note: "Don't know" (7%) not shown.

n=27,240

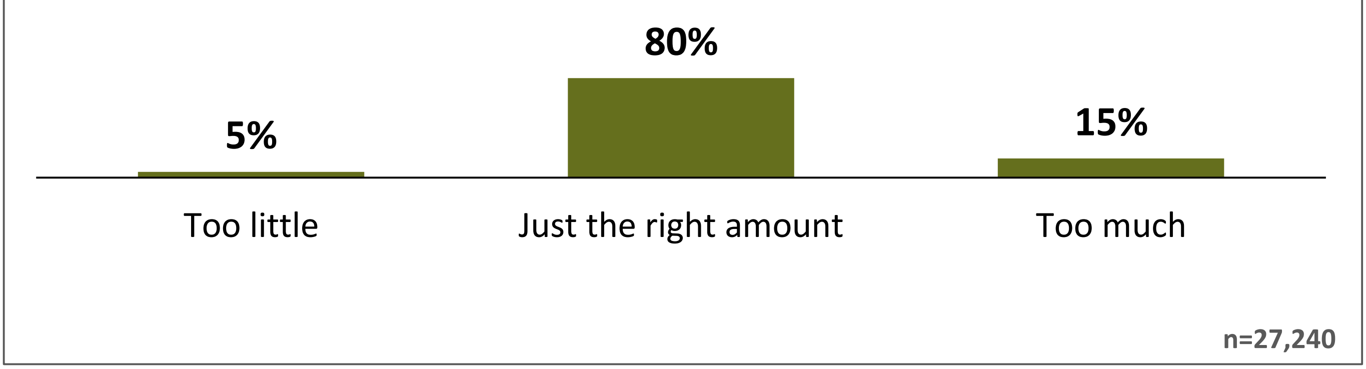
Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very favourable	28%	27%	26%	24%	25%
Somewhat favourable	56%	56%	56%	56%	55%
Somewhat unfavourable	9%	9%	10%	10%	10%
Very unfavourable	2%	2%	2%	2%	2%
Don't know	6%	7%	7%	8%	8%
Favourable	83%	82%	81%	80%	80%
Unfavourable	10%	11%	12%	13%	12%

Online Workbook

Workbook Diagnostics | Volume of Information

Residential

Q Did Alectra Utilities provide too much information, not enough, or just the right amount?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Too little	4%	6%	4%	4%	5%
Just the right amount	81%	81%	81%	78%	83%
Too much	15%	13%	15%	18%	12%

Small Business Customers

Online Workbook Results

Methodology

Small Business Online Workbook

INNOVATIVE was engaged by Alectra Utilities Corporation (Alectra Utilities) in this study to gather input on preferences on program timing and balancing outcomes. **Pages 87 to 135** show the actual pages of the workbook that was sent and completed by customers. The only additions are the actual results.

Field Dates & Workbook Delivery

The **Small Business Online Workbook** was sent to all Alectra Utilities small business customers who have provided the utility with an email address. Customers had an opportunity to complete the workbook between April 8th and May 15th, 2019.

Each customer received a workbook customised to their rate zone and class using a unique URL that could be linked back to their annual consumption, region and rate class. Follow-up telephone calls were placed by INNOVATIVE in order to encourage small business participation in the survey.

In total, the small business workbook was sent to **22,758** customers via e-blast from Alectra Utilities.

Small Business Online Workbook Completes

A total of **626** (unweighted) Alectra Utilities small business customers completed the online workbook via a unique URL.

Sample Weighting

The Small Business online workbook sample has been weighted proportionately by rate zone and consumption quartiles in order to be representative of the broader Alectra Utilities service territory.

The table below summarizes the weighted sample breakdown by rate zone and quartile. For unweighted n-sizes, please consult Page 16 of this report.

Weighted Sample	Consumption Quartiles				Total	Distribution
	Low	Medium-Low	Medium-High	High		
Enersource	33	33	33	33	133	22%
Brampton	17	17	17	17	68	11%
Horizon	34	34	34	34	136	23%
PowerStream	58	58	58	58	234	39%
Guelph	7	7	7	7	30	5%
Total	**150**	**150**	**150**	**150**	**600**	**100%**

Online Workbook

Small Business

Welcome to Alectra Utilities' planning consultation!

We need your input on choices that will affect the service you receive and the price you pay.

1. Alectra Utilities is developing its investment plan for 2020 to 2024. This plan will determine the investments Alectra Utilities makes in equipment and infrastructure, the services it provides, and the rates you pay.

2. **Alectra will be accountable to the public regulator, both in terms of sharing what customers say and demonstrating how they considered those views.**

3. You don't need to be an electricity expert to participate in this consultation. This workbook is focused on basic choices and provides the background information you need to answer the questions.

4. All you need to do is provide your feedback on between **7 and 13 choices.** If you can give half an hour now, Alectra Utilities can finalize its plan to serve customers like you for the next five years.

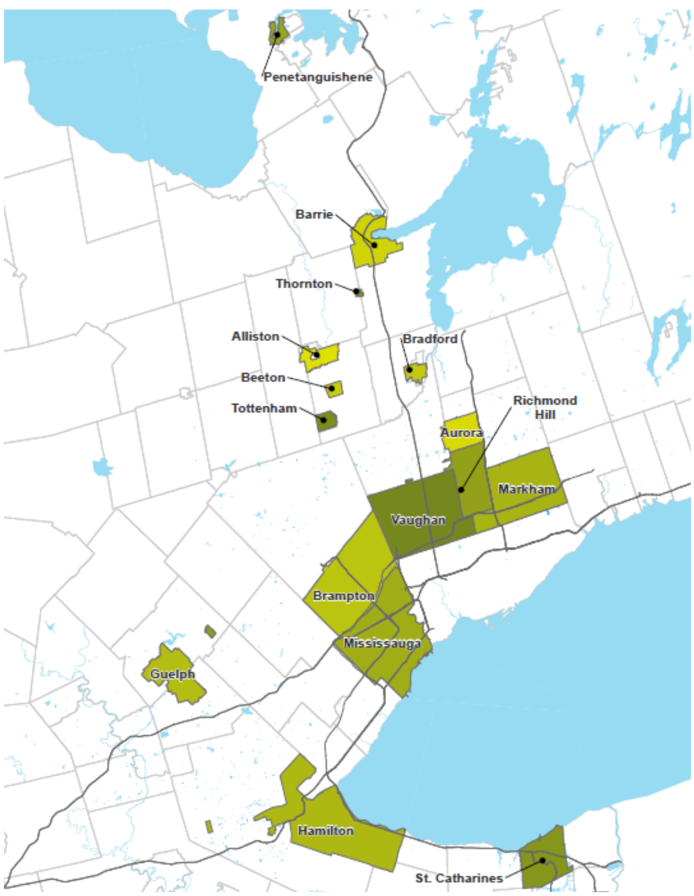
Those who complete the questions that follow will be invited to enter a draw to win one of ten (10) $500 prepaid credit cards.

All of your individual responses will be kept confidential. Innovative Research Group (INNOVATIVE), an independent research company, has been hired to gather your feedback.

If you are reading this on a smaller mobile device, you may want to consider accessing the survey from a tablet, desktop or laptop instead so that it is easier for you to read.

Who is Alectra Utilities?

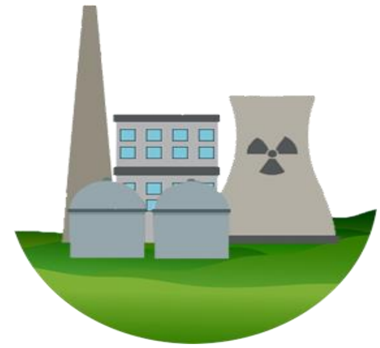
Alectra Utilities is preparing its first consolidated Distribution System Plan. Alectra Utilities is the union of five leading Ontario utilities – Enersource, Horizon Utilities, Brampton Hydro, PowerStream and Guelph Hydro. Alectra Utilities now serves over one million customers.



Alectra Utilities provides services to customers in all of these areas. However, customer rates are based on the cost of serving only the area that you live in.

Understanding Alectra Utilities' role in Ontario's electricity system

Ontario's electricity system is owned and operated by public, private and municipal corporations across the province. It is made up of three components: generation, transmission and distribution.



1 Generation

Where electricity comes from.

Ontario's electricity is generated by nuclear, natural gas, hydroelectric and renewable technologies, such as wind and solar. In Ontario, about 50% of electricity is generated by Ontario Power Generation, which has generation stations across the province.

2 Transmission

Electricity travels across Ontario.

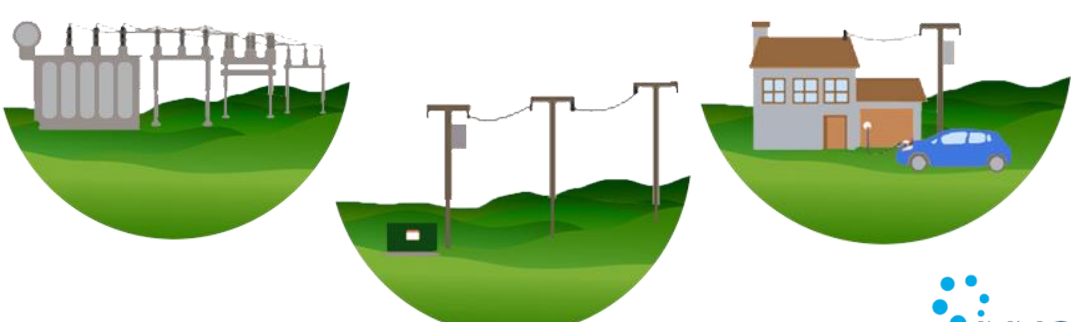
Once electricity is generated, it must be transported to urban and rural areas across the province. This happens by way of high voltage transmission lines that serve as highways for electricity. The province has more than 30,000 kilometres of transmission lines.

3 Local Distribution

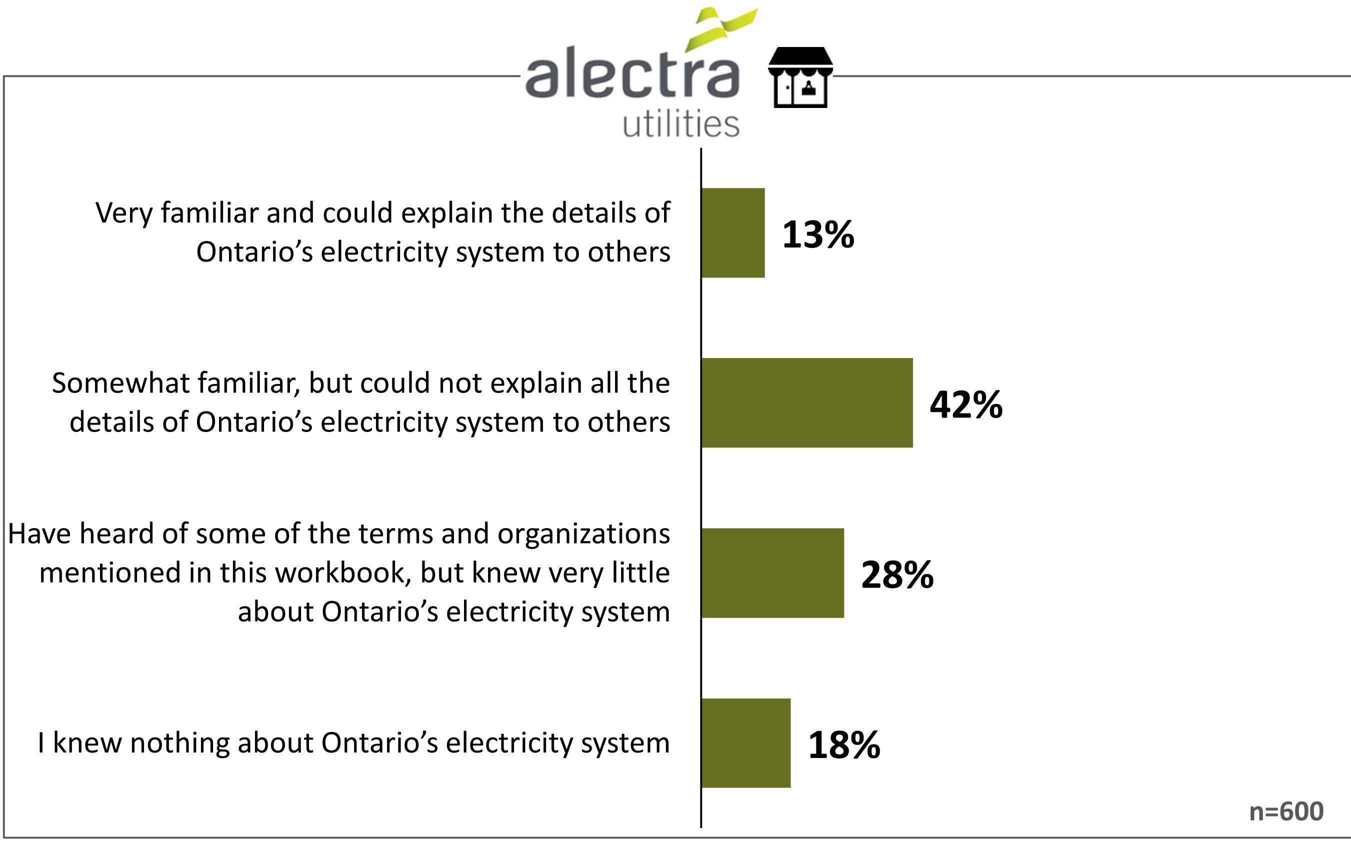
Delivering power to homes and businesses in your community.

Alectra Utilities is responsible for the last step of the journey: distributing electricity to customers through its distribution network. This local grid includes transformer stations of various sizes and designs that decrease the voltage of the electricity so it can be used in your home or business.

Across Alectra Utilities' service territory, there are 16,400 km of overhead powerlines and 22,140 km of underground cable.



Q Before this consultation, how familiar were you with the various parts of the electricity system and how they work together?



Rate Zone Breakdown	ERZ	BRZ*	HRZ	PRZ	GRZ*
Very familiar	13%	8%	14%	13%	12%
Somewhat familiar	42%	43%	49%	36%	49%
Heard of some of the terms and organizations	30%	26%	21%	32%	30%
Knew nothing about the electricity system	15%	23%	17%	19%	10%

* Small sample size, interpret with caution.

Online Workbook

Small Business

How much of you bill goes to Alectra Utilities?

How much of you bill goes to Alectra Utilities?

- Every item and charge on your bill is mandated by the provincial government or regulated by the **Ontario Energy Board (OEB)**, the provincial energy regulator.
- While Alectra Utilities is responsible for collecting payment for the entire electricity bill, it retains only the distribution portion of the delivery charge.
- **Distribution makes up about [PIPE-PER] of the typical small business customer's bill.**
- The rest of your bill is passed onto provincial transmission companies, power generation companies, the government and regulatory agencies.

Typical Small Business Bill

Sample Alectra Utilities Monthly Bill
(Based on consumption of 2,000 kWh)

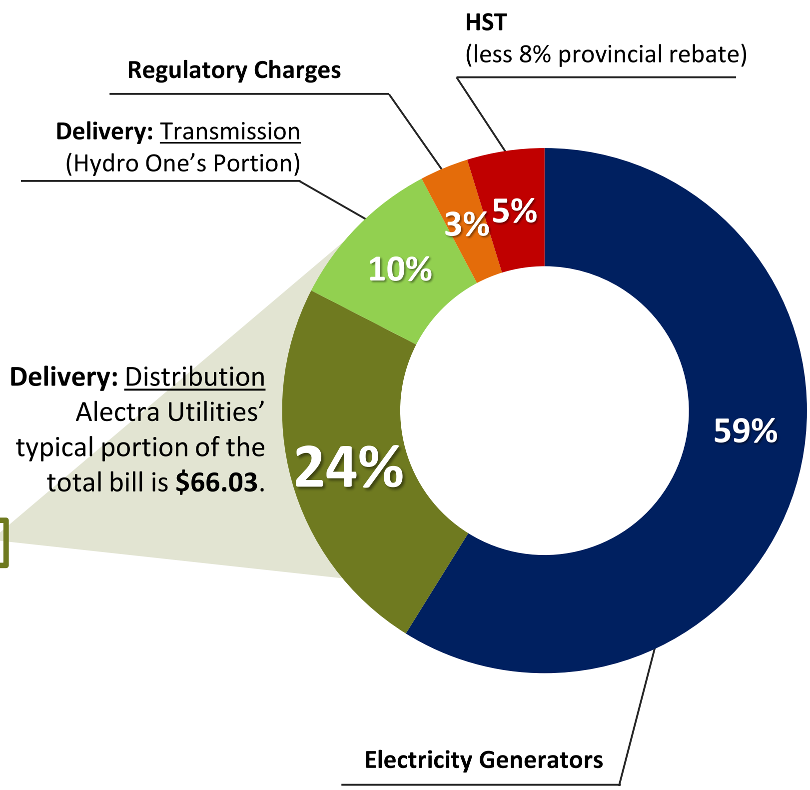
Account Number:
000 000 000 000 0000

Meter Number:
00000000

Alectra Utilities' portion: **$66.03**

Your Electricity Charges	
Electricity	
Off-Peak @ 6.5 ¢/kWh	84.50
Mid-Peak @ 9.4 ¢/kWh	31.96
On-Peak @ 13.2 ¢/kWh	47.52
Delivery	92.98
Regulatory Charges	8.35
Total Electricity Charges	**$265.31**
HST	34.49
8% Provincial Rebate*	**(-$21.22)**
Total Amount	**$278.57**

*The Ontario government is providing a rebate on your electricity costs equal to the provincial portion of the HST



Note: Graphs may not always total 100% due to rounding.

Note: Sample bills were customized for each rate zone and rate class. The above represents a sample small business bill in the Horizon rate zone.

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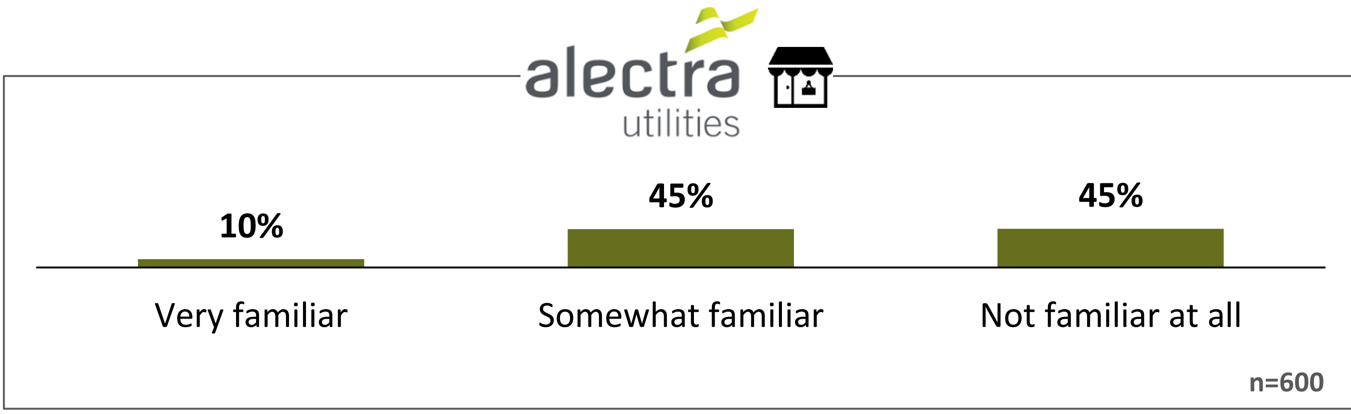
Online Workbook

Percentage of bill that goes to Alectra Utilities

Small Business

Q Before this consultation, how familiar were you with the percentage of your electricity bill that goes to Alectra Utilities?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Very familiar	10%	12%	11%	9%	8%
Somewhat familiar	50%	41%	43%	45%	43%
Not familiar at all	40%	47%	46%	47%	49%

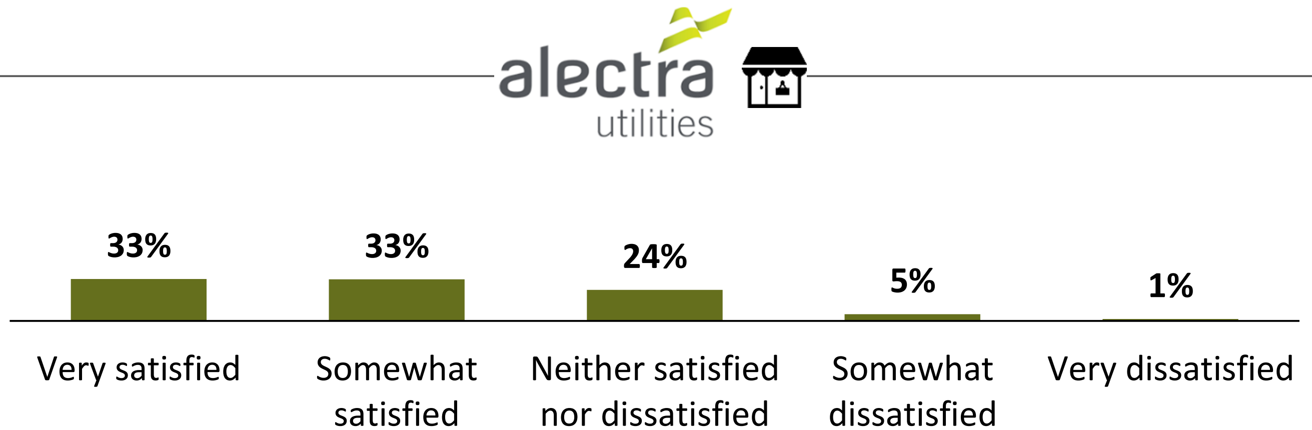
* Small sample size, interpret with caution.

Online Workbook

Overall satisfaction with Alectra Utilities

Small Business

Q Generally, how satisfied or dissatisfied are you with the services you receive from Alectra Utilities?



Note: "Don't know" (3%) not shown.

n=600

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Very satisfied	34%	38%	31%	33%	31%
Somewhat satisfied	35%	37%	31%	32%	23%
Neutral	23%	21%	28%	23%	34%
Somewhat dissatisfied	5%	-	5%	7%	6%
Very dissatisfied	1%	-	3%	1%	-
Don't know	2%	4%	2%	4%	6%
Overall satisfied	**68%**	**75%**	**62%**	**65%**	**54%**
Overall dissatisfied	**7%**	**-**	**8%**	**8%**	**6%**

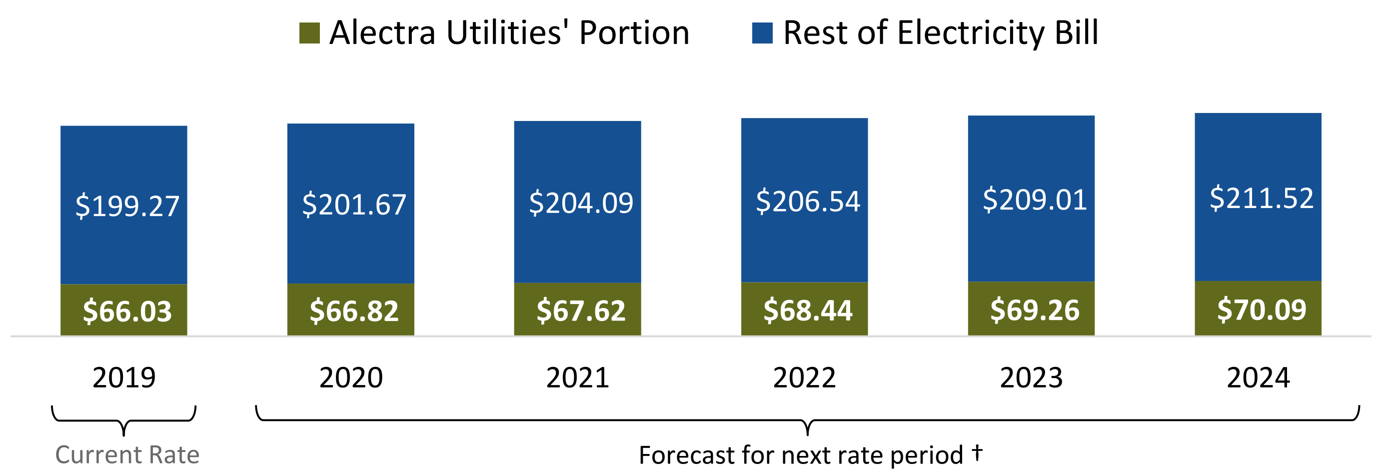
* Small sample size, interpret with caution.

How much can you expect to pay over the next few years?

Prior to the Alectra Utilities' merger, each predecessor utility had their rates set by the OEB. Until rates are rebased in 2027, your future rate increases will be limited by an OEB-set Price Cap Formula. Each year Alectra Utilities is permitted to increase rates to reflect inflation minus savings targets established by the OEB. **This requires Alectra Utilities to keep cost increases below inflation.**

For customers in your area and rate class, the distribution charge for **the typical bill is estimated to increase by 1.2%** on average for the next five years.

Estimated Typical Small Business Annual Increase in Monthly Bill (Before Tax) ††



Note: Sample bills were customized for each rate zone and rate class. The above represents a sample small business bill in the Horizon rate zone.

Where does your money go?

Alectra Utilities has two budgets; **operating and capital.** The operating budget covers recurring expenses, such as salaries, taxes, fuel costs and rent. Under the Price Cap Formula, Alectra Utilities cannot ask for any additional money for operating expenses.

This consultation is about the capital budget. This budget covers things like poles, wires, cables, transformers, computers and programs, vehicles, and buildings.

†† On November 23, 2018, the OEB calculated the value of the inflation factor for incentive rate setting under the Price Cap IR plan of 1.5% for rate changes effective 2019. With a stretch factor of 0.3%, the Price Cap Adjustment for Alectra Utilities was 1.2%. This rate has been used to forecast the rates for 2020-2024. The 2020-2024 rates assumes no changes to electricity rates or the Group 1 riders over the 2020 to 2024 period. The OEB approved bill impact for 2019 was used as the basis for the calculation of forecasted rates for 2020-2024.

What is this consultation about?

This consultation is about finding the right balance between reliability and the price you pay.

The point of this workbook is to allow customers, like yourself, to provide feedback on whether the planners have found the right balance or whether they should consider different options that better reflect your views.

Alectra Utilities is now creating its first overall investment plan as a merged utility. The process started with Alectra Utilities asking customers whether they had any unmet needs and which outcomes Alectra Utilities' plan should focus on. Click here to see more.

Using that input, Alectra Utilities' managers reviewed each part of the utility's business. All the projects identified in this workbook have been found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

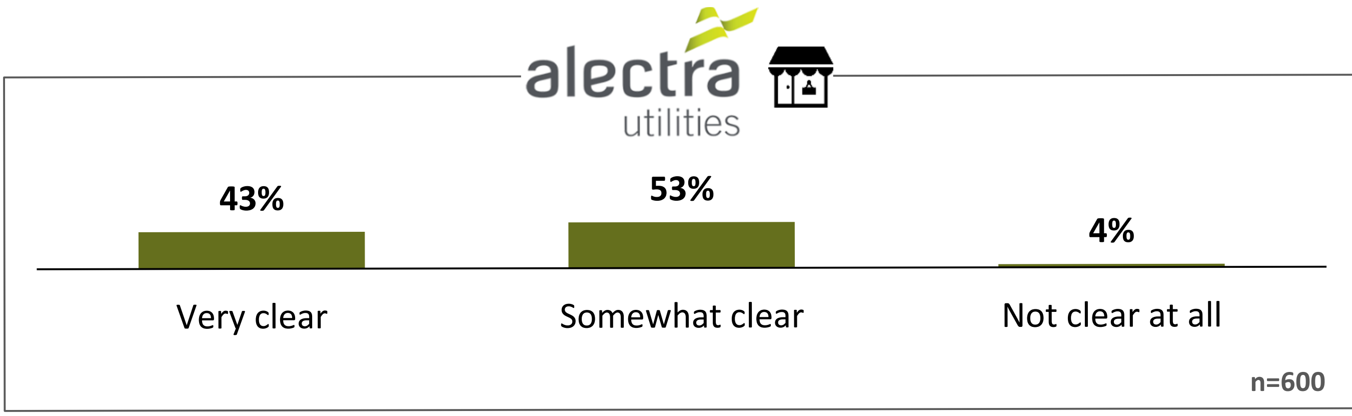
Now Alectra Utilities is coming back to customers with a final set of choices.

- For each choice, Alectra Utilities has identified an option to stay within existing rates under the price cap formula. It has also identified options to increase investments and, in some areas, where practical, options to reduce investments to make room for increased investments in more pressing areas.
- Planners have indicated the option that in their view provides the best balance between any potential rate increase with the intention to maintain reliability and to fix or avoid pockets of customers that are having significantly below average experiences.
- At the end of the these questions, you will have an opportunity to review your responses and total rate impact of those choices. You will be able to change your responses until you feel you have found the right mix of investments and rate impact, in your view.
- If your preferences result in higher levels of investment than current rates support, Alectra Utilities may apply for a rate increase under the rules established by the OEB. While the exact amount of any rate increase would consider the views collected in this consultation, the workbook will ask you for your views on a rate increase that will be sufficient to pay for the planners' recommended options.

Online Workbook

What is this consultation about?

Q Do you feel that the purpose of Alectra Utilities' customer consultation is clear?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Very clear	44%	48%	47%	39%	39%
Somewhat clear	54%	52%	47%	57%	59%
Not clear at all	2%	-	6%	5%	2%

* Small sample size, interpret with caution.

INNOVATIVE RESEARCH GROUP

Online Workbook
Reliability Experience | Preamble

Small Business

Reliability Experience

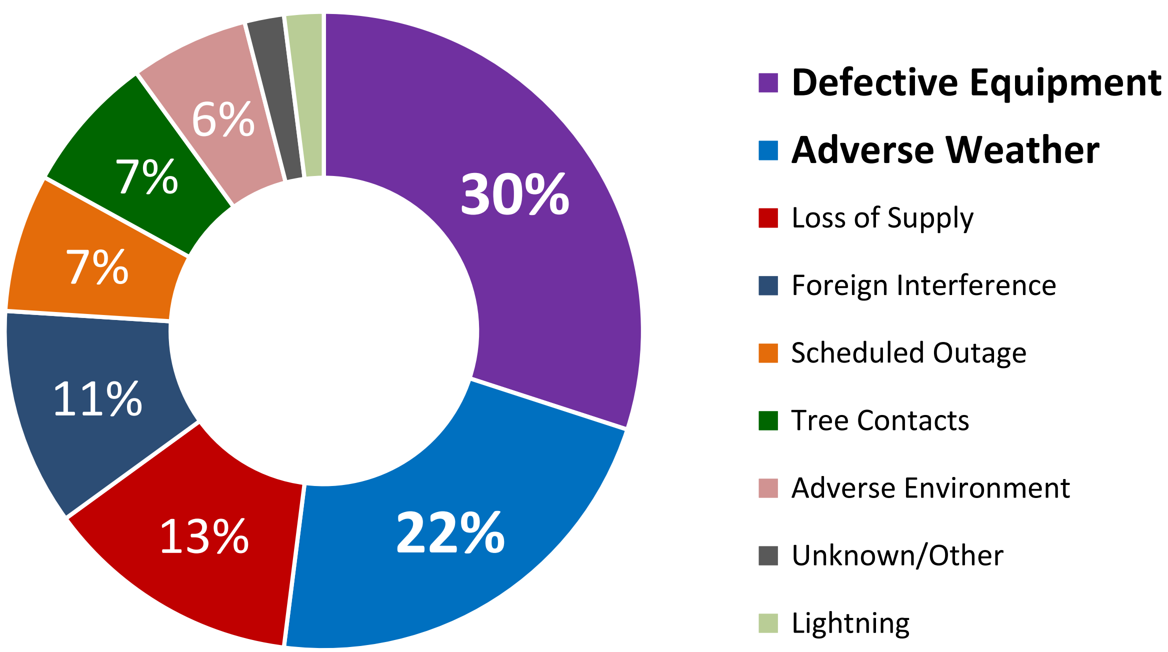
Reliability is a key priority for Alectra Utilities. Since 2014, both the average **number** and **duration** of outages has increased for the typical Alectra Utilities customer.

- The average number of outages (excluding major event days) has increased by an average of 6% per year from 2014-2018, rising from **1.27 to 1.53** over this period.
- The average duration of outages (excluding major event days) has increased by an average of 8% per year from 2014-2018, rising from **0.88 hours to 1.14** hours over this period.

The two primary contributors to outages account for more than 50% of all outages.

1. **Defective equipment** accounted for 30% of customer hours of interruption between 2014-2018, the single largest outage cause.
2. **Adverse weather** is the second leading cause of outages. It accounted for 22% of customer hours of interruption over the same period.

Customer Outage Duration (Hours) by Cause 2014-2018



Depending on what rate zone you are in, the subsequent pages will ask you to review between 7 and 13 choices, many of which address the issues identified in the chart above.

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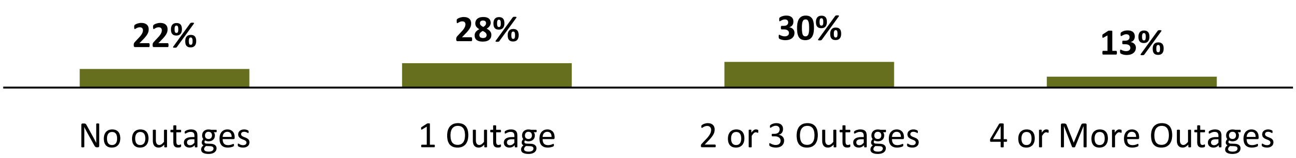
Online Workbook

Reliability Experience

Small Business

Q In the past 12 months, how many power outages do you recall experiencing at home/your organization?



Note: “Don’t know” (7%) not shown.

n=600

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
No outages	29%	20%	20%	17%	37%
1 outage	28%	38%	33%	24%	23%
2 or 3 outages	23%	27%	30%	36%	21%
4 or more outages	14%	7%	10%	16%	13%
Don’t know	7%	8%	6%	7%	6%

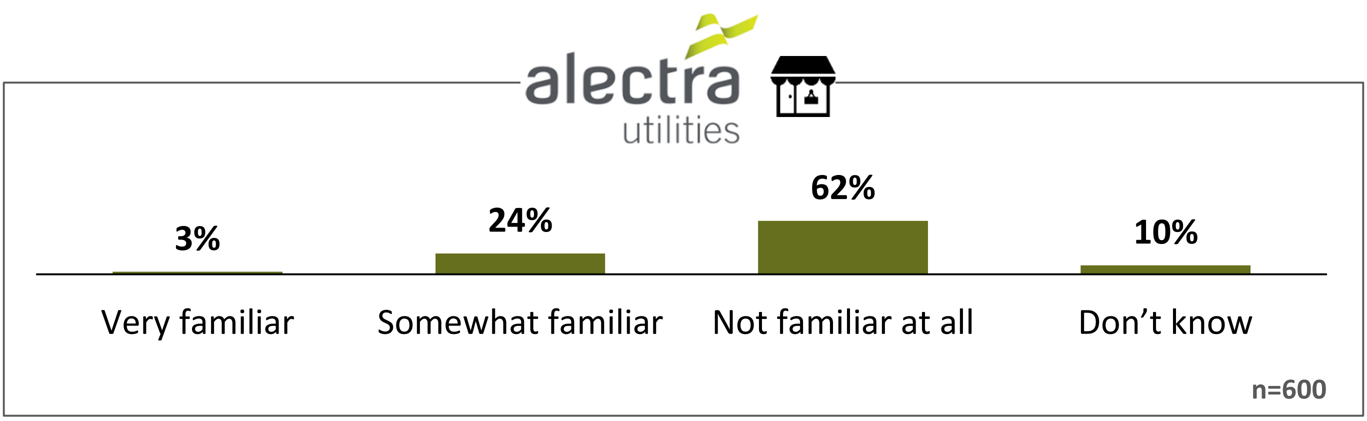
* Small sample size, interpret with caution.

Federal, provincial and municipal governments as well as regulators set requirements and standards that Alectra Utilities must satisfy. Mandatory investments can be broken down into three categories:

1. **Connecting customers:** This includes connecting customers to the grid when a new home or building is constructed or modified.
2. **Moving equipment:** This includes moving equipment like poles and cables for road widening.
3. **Mandated obligations:** This includes installing and maintaining customer meters and transferring electricity from the provincial transmission system.

These investments mean that about one-in-five dollars (20%) of your current rates are already committed and not available for other investments

Q Before this consultation, were you familiar that one-in-five dollars (20%) of your current rates are already committed to mandatory investments and not available for other projects?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Very familiar	5%	2%	2%	3%	0%
Somewhat familiar	25%	30%	24%	23%	25%
Not familiar at all	60%	62%	66%	62%	63%
Don't know	11%	6%	8%	12%	12%

* Small sample size, interpret with caution.

Online Workbook

Unplanned Repairs and Replacements

Small Business

On average, each year, Alectra Utilities spends approximately 19 million dollars or 6% of it's core budget to repair or replace equipment that has either failed, will fail imminently, or poses an imminent safety risk. This may include sudden equipment failure, or severe weather taking down a pole in front of your home or business.

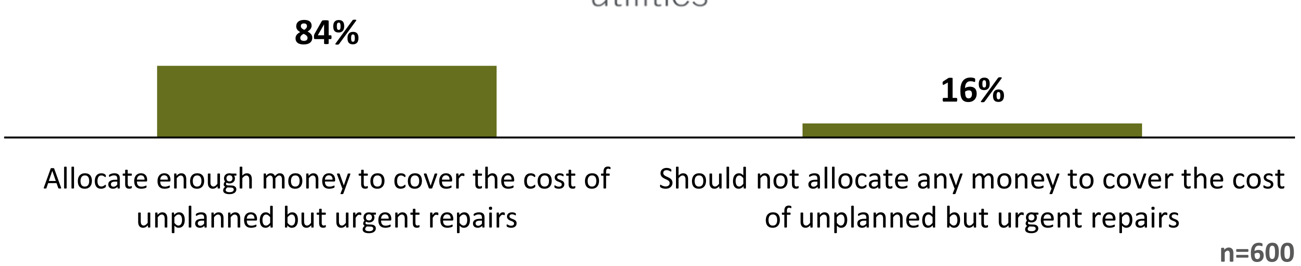
There are two possible approaches for how to fund these types of repairs:

1. By delaying other projects that had been planned but not started
2. By establishing an annual allocation for these unplanned repairs and replacements

If Alectra Utilities delays other projects, this can result in needs not being met and can create inefficiencies in project procurement and management.

If Alectra Utilities establishes an allocation for these unplanned repairs and replacements, that money is not available to fund other projects.

Q Which option do you prefer?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Alectra Utilities should allocate enough money (approximately 19 million or 6%) in its core budget to reactive capital to cover the cost of unplanned but urgent repairs	86%	87%	83%	82%	79%
Alectra Utilities should not allocate any money in its core budget to reactive capital and simply delay planned projects to cover the cost of unplanned but urgent repairs	14%	13%	17%	18%	21%

* Small sample size, interpret with caution.

Online Workbook

Eliminating Meter Data Security Risks

Within the former PowerStream area, Alectra Utilities has identified an older type of meter that could be hacked. These meters collect and transmit information to Alectra Utilities about how much electricity you use, and when you use it, but do not have access to any other personal information.

While these meters are at increased risk of hacking, there has not been a known data breach, and it's possible that they won't be hacked in the future.

Between 2015 and 2019, Alectra Utilities will have replaced 41,000 of these at-risk meters, however, an additional 91,000 will still be in service at the end of 2019.

Alectra Utilities has a decision to make about how quickly or slowly they replace these meters. It's your data and it's your money, so Alectra Utilities would like to know what your preference is.

Q Which of the following options would you prefer?

Option	Expected Outcome
Recommended Pace ***Additional*** *\$X.XX per month annually (\$Y.YY more per bill by 2024)*	Alectra Utilities will be able to address all the metering needs identified for the distribution system during 2020-2024 including the replacement of first generation smart meters that do not support modern levels of data encryption
Base Pace *Within current rates*	Alectra Utilities will be able to address some of the metering needs identified for the distribution system during 2020-2024. Replacement of first generation smart meters that do not support modern levels of data encryption would be deferred beyond 2024

Investment only in PowerStream RZ

n=234

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Keeping the Business Running

Alectra Utilities is more than just poles and wires – it's a business that needs to invest in equipment such as tools, trucks, buildings, computers and software.

When deciding whether to continue to maintain existing equipment or replace them, Alectra Utilities considers whether the risks and costs of continuing to use them outweigh the benefits of waiting longer to replace them. Alectra Utilities business planning process has identified more needs for equipment investments than current rates will allow.

To stay within existing rates, Alectra Utilities has identified the most urgent priorities, things like: keeping large "bucket" trucks on the road; replacing computer equipment that is no longer functional; and repairing leaking roofs. This would mean that less urgent investments, like vans and other equipment would be delayed.

Alectra Utilities recognizes that delaying the less pressing investments will make it harder for staff to do their jobs safely and maintain reliability and security standards.

Bucket trucks (left) have been identified as the most urgent priority, while investments in vans (right) would be delayed in the *base approach.*

Online Workbook

Keeping the Business Running

Q Which of the following options would you prefer?

Option	Outcome
Recommended Approach ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities staff will have access to equipment of the same standard as similar sized businesses
Base Approach *Within current rates*	Stay within its existing rates and only replace the equipment with the most urgent needs

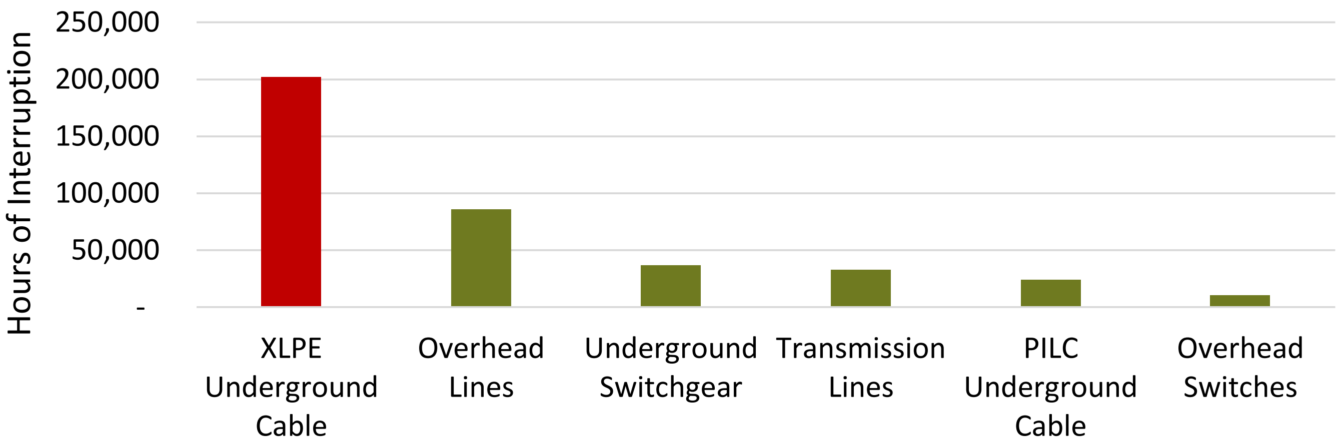
Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Recommended Approach	50%	51%	57%	43%	55%
Base Approach	50%	49%	43%	57%	45%

* Small sample size, interpret with caution.

Underground Asset Renewal

Equipment failure is the single largest cause of outages in Alectra Utilities' system. As the chart below illustrates, a particular type of equipment known as cross-linked polyethylene (XLPE) cable is the leading cause of outages across Alectra Utilities' system.

What type of equipment is causing the most outages? (5-year average)



Case Study

The deterioration of these cables is directly impacting customers. For example, the York/Hilda neighbourhood in Vaughan was originally scheduled to have its cables replaced in 2019. But in 2018, customers began to experience a cascading series of prolonged outages, due to cable failures. Cables repaired one week would fail again the next. In the summer, 250 customers experienced eight cable faults (one outage a week). As a result, the cable had to be replaced on an emergency basis at both a higher cost to Alectra Utilities and major inconvenience to the affected customers.

As Alectra Utilities reviewed all of its equipment across all of its operating areas, it became clear that replacing XLPE underground cable requires an accelerated investment plan. To provide the best value to customers, Alectra Utilities will be using two approaches:

- **Cable Rejuvenation**: Cable rejuvenation is a lower-cost solution that can extend the life of these cables without the need to excavate and replace the entire cable. While it is the better value for customers for cables in fair condition, it is not effective for cables that are already declining.

- **Cable Replacement**: In some cases, Alectra Utilities has no prudent choice but to replace the cable. Replacing this equipment now rather than trying to extend its life will cost more now, but will deliver superior reliability over time, relative to older standards of cable.

Alectra Utilities has a decision to make regarding the pace in which they invest in replacing or extending the life of at-risk underground equipment.

Online Workbook

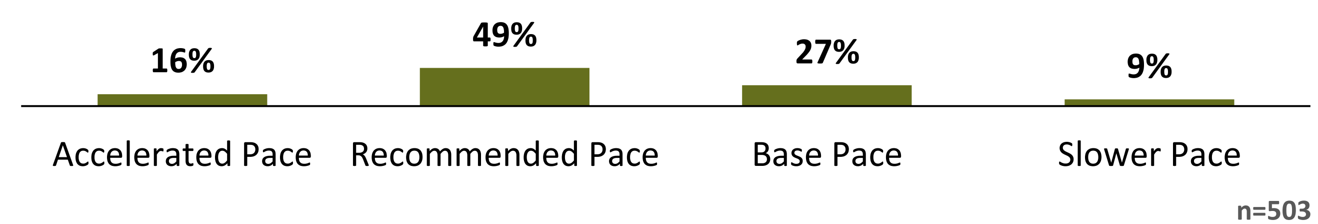
Pacing Investments in the Underground System

Small Business

Within current rates, the reliability of underground cable is expected to further worsen by approximately 4% from current 2018 levels. As such, Alectra Utilities is recommending a pace of cable replacement and rehabilitation that will maintain current levels of reliability.

Q Which of the following cable replacement strategies would you prefer?

Option	Cable replaced or rehabilitated	Expected Reliability Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**2,184 km** by 2024	Improve the reliability of cables by 8% from the current (2018) level
Recommended Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**1,978 km** by 2024	Maintain the reliability of cables at the current (2018) level
Base Pace *Within current rates*	**1,861 km** by 2024	Reliability of cables to further worsen by 4% from the current (2018) level
Slower Pace ***Decrease*** *of $X.XX per month annually* *($Y.YY less per bill by 2024)*	**1,624 km** by 2024	Reliability of cables expected to further worsen by 10% from the current (2018) level



Rate Zone Breakdown	ERZ	HRZ	PRZ
Accelerated Pace	16%	17%	15%
Recommended Pace	51%	58%	43%
Base Pace	24%	19%	33%
Slower Pace	9%	7%	9%

Keeping Pace with Overhead System Renewal

Compared to previous years, Alectra Utilities is considering slowing down its overall spending on poles and wires, known as the overhead system. There are two primary reasons for this proposed reduction in spending:

1. **Additional focus on the underground system:** As noted earlier, customers served by the underground system are having more reliability issues than customers served by overhead lines.

2. **New technology increasing the lifespan of poles:** Advancements in testing and inspections are enabling Alectra Utilities to keep overhead poles and wires in service for longer and have enabled the utility to be smarter about replacing aging equipment.

Based on a recent condition study, most poles in Alectra Utilities' overhead system are in good or excellent condition. However, the study identified that 8,110 or 7.5% of the poles in Alectra Utilities' system are currently in poor or very poor condition. Alectra Utilities also projects that a portion of the 15% of poles currently in fair condition will deteriorate into poor or very poor condition over the next five years and will need to be replaced.

Generally, Alectra Utilities tries to replace groups of poles in similar condition which allows for a lower average cost of replacement than replacing poles one at a time. While the slower option reduces the total amount of spending, the cost per pole is higher because it would involve doing more single-pole replacements and more replacements that require overtime labour.

Online Workbook

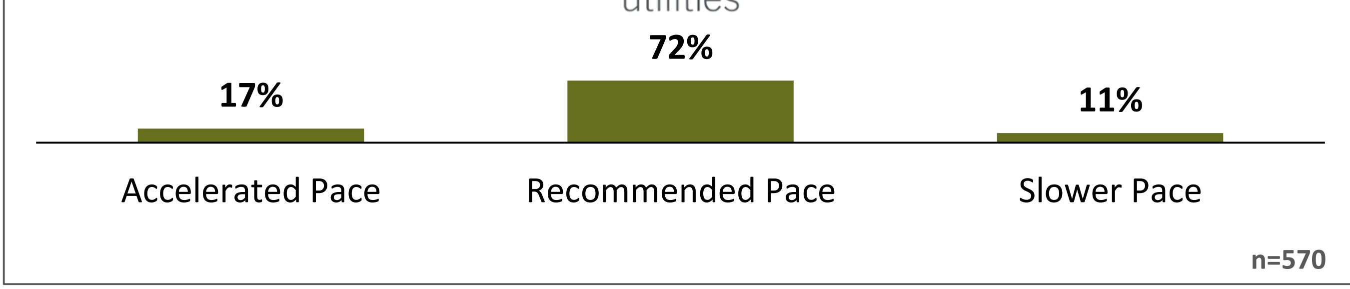
Keeping Pace with Overhead System Renewal

Small Business

Q Which of the following options would you prefer?

Option	Poles replaced	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**8,110** by 2024	Address **all of the poor and very poor poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Recommended Pace *Within current rates*	**4,830** by 2024	Address **most of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**3,190** by 2024	Address **half of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions

alectra utilities



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ
Accelerated Pace	16%	35%	12%	14%
Recommended Pace	77%	59%	81%	69%
Slower Pace	8%	6%	7%	17%

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Small Business

Overhead and Underground Renewal by Service Type

The questions below are broken down by the type of electricity service customers believe they receive.

- "Wires" refers to businesses that are serviced by the overhead system
- "Cables" refers to businesses that are serviced by the underground system

Q Underground System Renewal **by** Service Type

Rate Zone Breakdown	ERZ		HRZ		PRZ	
Service Type	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**
Accelerated Pace	25%	15%	24%	21%	10%	12%
Recommended Pace	42%	52%	48%	56%	44%	47%
Base Pace	24%	24%	19%	22%	41%	26%
Slower Pace	10%	10%	9%	0%	5%	15%

Small sample size, interpret with caution. **Considered directional only.**

Q Overheard System Renewal **by** Service Type

Rate Zone Breakdown	ERZ		BRZ		HRZ		PRZ	
Service Type	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**
Accelerated Pace	21%	15%	19%	29%	11%	22%	11%	12%
Recommended Pace	68%	79%	81%	66%	85%	74%	75%	72%
Slower Pace	11%	7%	0%	5%	4%	4%	13%	16%

Small sample size, interpret with caution. **Considered directional only.**

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Alectra Utilities' Transformer Replacement Program

Transformers are a critical piece of distribution equipment that reduce voltage from the higher levels that are more efficient to move electricity long distances to lower levels that are safer to connect to homes and offices. They can either be located on the ground, in underground vaults or attached to distribution poles

- Through the annual Asset Condition Assessment, Alectra Utilities has identified that 2,998 transformers are now in a *poor* or *very poor* condition. Alectra Utilities already has funded plans to replace 1,148 of these transformers. However, there will still be a need to replace 1,850 transformers based on present day condition assessments.
- Over the next five years, Alectra Utilities projects that another 2,000 transformers will deteriorate and will need to be replaced as well.
- In addition to the *poor* and *very poor* condition transformers, Alectra Utilities has identified another 900 transformers that need to be replaced due to unsafe legacy configurations or that are consistently overloaded in current conditions.

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Small Business

Alectra Utilities' Transformer Replacement Program

Q Which of the following options would you prefer?

Option	Transformers replaced	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**4,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations or are consistently overloaded. • Replace all transformers that will decline to poor and very poor condition over the next five years
Recommended Pace *Within current rates*	**2,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations that are consistently overloaded
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**1,850** by 2024	• Replace only transformers currently assessed to be in poor or very poor condition

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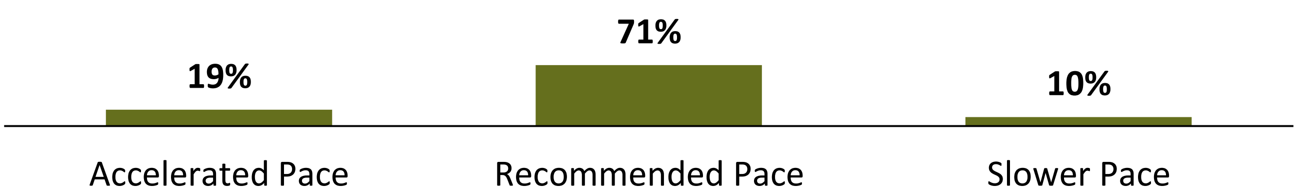

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Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Accelerated Pace	17%	32%	13%	18%	30%
Recommended Pace	75%	60%	80%	67%	63%
Slower Pace	8%	8%	7%	15%	8%

* Small sample size, interpret with caution.

Monitoring and Control Equipment

Using proven technology like pole top monitors and automated switches allows Alectra Utilities to automatically reroute power during outages and planned maintenance, reducing the length of time customers are without power and reducing reliance on crews who need to travel to the site to physically reroute power.

When Alectra Utilities is rebuilding existing lines, it typically replaces equipment that is like-for-like. That means, rebuilt older lines would not have monitoring and control equipment installed.

Alectra Utilities is proposing a different approach for its main feeder lines. Feeder lines are high capacity lines that bring electricity from substations to the lines that connect to homes or businesses. An outage on a feeder line can impact a 1,000 or more customers. Alectra Utilities is planning to phase in monitoring and control equipment to each feeder in the system, so that when power does go out, it can be quickly restored for large numbers of customers.

Each of the three options will continue to phase in this equipment during typical renewal. The difference is in how quickly they modify the remaining feeder lines.

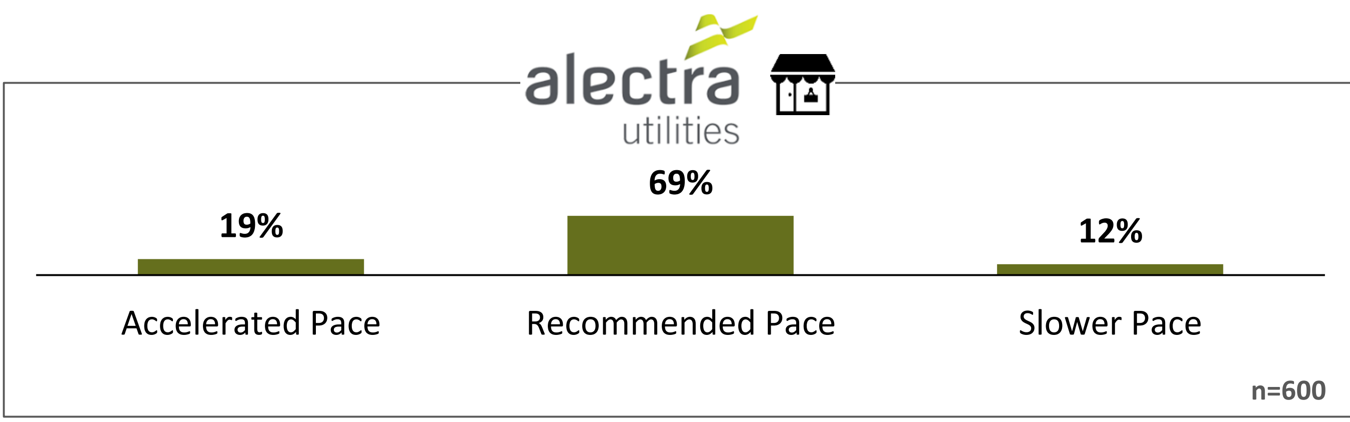
Online Workbook

Monitoring and Control Equipment

Small Business

Q Which of the following options would you prefer?

Option	Devices installed over next 5 years	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**284** 95 additional targeted reliability improvements	Projected to improve reliability by 17% for approximately 142,000 customers. All feeders would be automated in 10 years
Recommended Pace *Within current rates*	**189** 47 additional worst performing feeders	Projected to improve reliability by 17% for approximately 95,000 customers. All feeders would be automated in 15 years
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**142**	Projected to improve reliability by 17% for approximately 71,000 customer. All feeders would be automated in 20 years



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Accelerated Pace	20%	30%	17%	16%	20%
Recommended Pace	73%	63%	72%	67%	62%
Slower Pace	8%	8%	11%	17%	18%

* Small sample size, interpret with caution.

Converting Rear Lot Service

Alectra Utilities’ service area contains multiple older suburban and urban neighbourhoods with rear lot or “backyard” infrastructure. In general, rear lot electricity lines are 40 years of age or older. This type of equipment presents three primary problems:

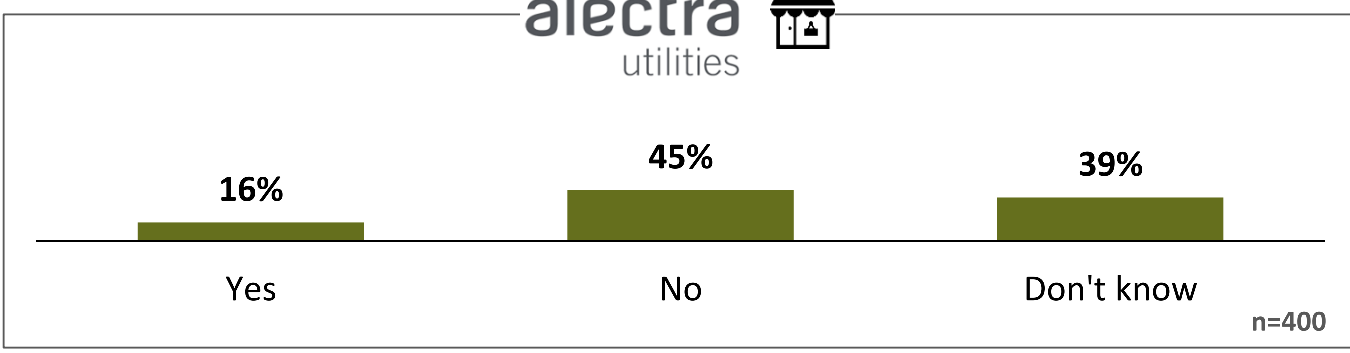
1. Repairs and maintenance are complicated because these lines are in the backyard of homes, rather than the front. Often regular equipment cannot access the backyards and repair crews need to work around trees, pools, sheds and other obstacles.

2. Rear lot equipment is subject to greater tree contact, especially during severe weather

3. The equipment presents elevated safety risks to the general public should the assets fail.

An Alectra Utilities study showed that rear lot restoration times are approximately 4.55 hours. This is three times higher than a comparable front lot restoration time of 1 to 1.4 hours.

Q To the best of your knowledge, does your power come from a line in a backyard behind your home or business?



Rate Zone Breakdown	HRZ	PRZ	GRZ*
Yes	17%	16%	15%
No	54%	39%	55%
Don’t know	29%	45%	30%

* Small sample size, interpret with caution.

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Converting Rear Lot Service

Alectra Utilities has two choices to make in dealing with rear lot service, a design choice and a timing choice. The first question relates to what design approach the utility chooses. The options below assume that all rear lot equipment is converted within the next 70 years.

Q Which of the following design approaches would you prefer?

Option	Rear lot or "backyard" equipment design choices
Reactive Approach ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Reactively** replace rear lot assets when they have reached their physical end-of-life criteria, knowing that there could be prolonged reliability impacts. This option leaves customers vulnerable to longer than average storm outages and resulting safety risks.
New poles in backyard ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** replace old poles and equipment, with new poles and equipment in backyards. This would improve day-to-day reliability but leaves customers vulnerable to longer than average storm outages, and resulting safety risks.
Partial Underground ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** re-locate some rear lot infrastructure to front lot underground. This would address some of the vulnerability to longer than average storm outages and resulting safety risks.
Full Underground ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** re-locate all rear lot infrastructure to front lot underground. This would completely resolve the vulnerability to longer than average storm outages and resulting safety risks.

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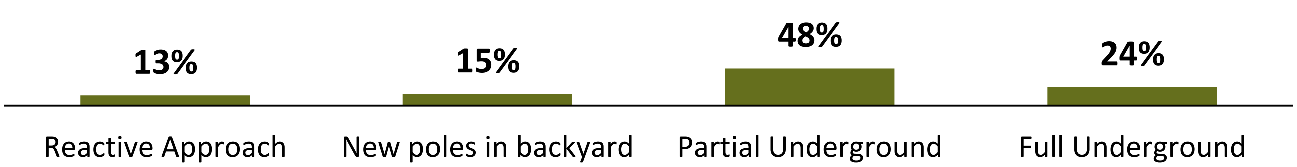

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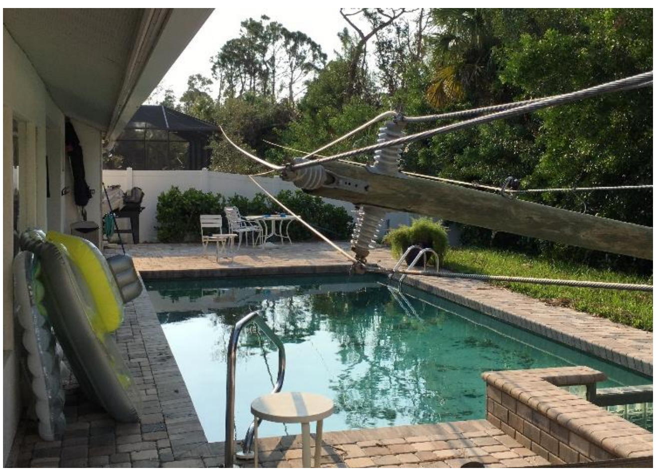
Rate Zone Breakdown	HRZ	PRZ	GRZ*
Reactive Approach	14%	13%	14%
New poles in backyard	13%	16%	16%
Partial Underground	53%	46%	44%
Full Underground	20%	26%	26%

Timing of a Rear Lot Conversion Program

Approximately 11,000 customers throughout the former Horizon, PowerStream and Guelph Hydro rate zones are supplied by rear lot lines.

Because rear lot lines have reasonable reliability in normal weather, Alectra Utilities has given other projects priority within its current approved rates. However because rear lot conversions will reduce customer exposure to prolonged outages, and safety risks, Alectra Utilities has identified three timing options to replace rear lot lines proactively.

The exact cost will depend on the design, but for your feedback the options assume the full replacement with front lot underground service.



Examples of rear lot equipment

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Timing of a Rear Lot Conversion Program

Q Which of the following timing options would you prefer?

Option	Pacing of renewal and conversion	Service renewed and converted over 5-year period
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **30 year period**	Approximately **1,810 customers** (16% of customer with rear lot)
Moderate Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **40 year period**	Approximately **1,360 customers** (12% of customer with rear lot)
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **70 year period**	Approximately **851 customers** (8% of customer with rear lot)
Base Pace *Within current rates*	Renew and convert existing rear lot overhead locations on a reactive emergency basis	Expose customers serviced by these lines to prolonged outage and safety risks

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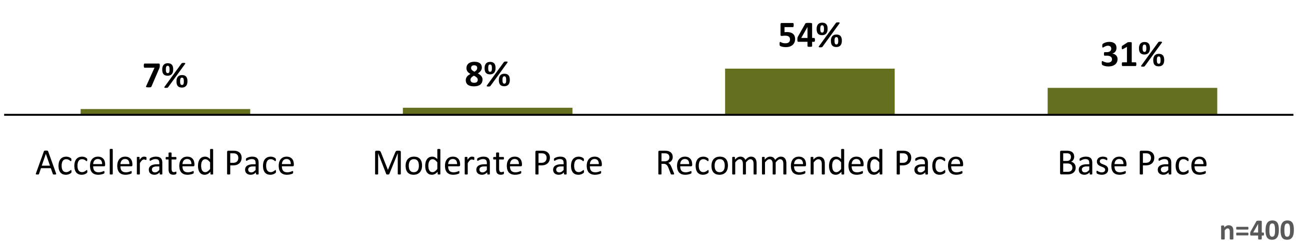

Rate Zone Breakdown	HRZ	PRZ	GRZ*
Accelerated Pace	3%	8%	13%
Moderate Pace	6%	9%	13%
Recommended Pace	65%	47%	56%
Base Pace	26%	36%	18%

* Small sample size, interpret with caution.

Online Workbook

Rear Lot Questions by Service Type

Q Converting Rear Lot Service (Design) **by** Service Type

Rate Zone Breakdown	Alectra Utilities	
Service Type	**Rear Lot**	**Not Rear Lot**
Reactive Approach	20%	10%
New poles in backyard	18%	16%
Partial Underground	44%	50%
Full Underground	18%	25%

Note: Due to small sample sizes, results from individual rate zones have been combined to create an Alectra Utilities average.

Q Timing of a Rear Lot Conversion Program (Timing) **by** Service Type

Rate Zone Breakdown	Alectra Utilities	
Service Type	**Rear Lot**	**Not Rear Lot**
Accelerated Pace	7%	5%
Moderate Pace	9%	8%
Recommended Pace	53%	55%
Base Pace	31%	32%

Note: Due to small sample sizes, results from individual rate zones have been combined to create an Alectra Utilities average.

Planning for Expansion, Intensification and Back-up

Expansion, increased intensification and increased back-up projects all involved adding high capacity feeder lines to the grid.

- **Expansion:** Where there is no line or a line might have been initially built to service a farm, it is now serving a subdivision and can no longer meet the needs of those customers.
- **Intensification and redevelopment:** Multiple downtown areas are becoming more densely populated, which has resulted in insufficient supply to meet the increased demand.
- **Back-up capacity:** Because of the way the grid has grown, there are certain areas within Alectra Utilities' service territory that no longer have access to adequate back-up capacity in the case of an outage.

While most expansion related projects cannot be deferred due to the obligation to connect new customers, some intensification and back-up capacity projects could be delayed.

Intensification:

- Since these projects are often completed with other infrastructure projects such as road widening and sewer work, deferral could lead to increased costs and service disruptions.
- Building expansion projects now allows the projects to be built at lower cost with less disruptions than waiting until development is underway and the need is pressing.

Back-up capacity:

- Deferral of back-up projects could lead to increased outage times during contingency condition and may cause reliability issues on some heavily loaded lines.
- Adding back-up capacity now allows for quicker restoration of power when caused by transmission system failures or severe weather events.

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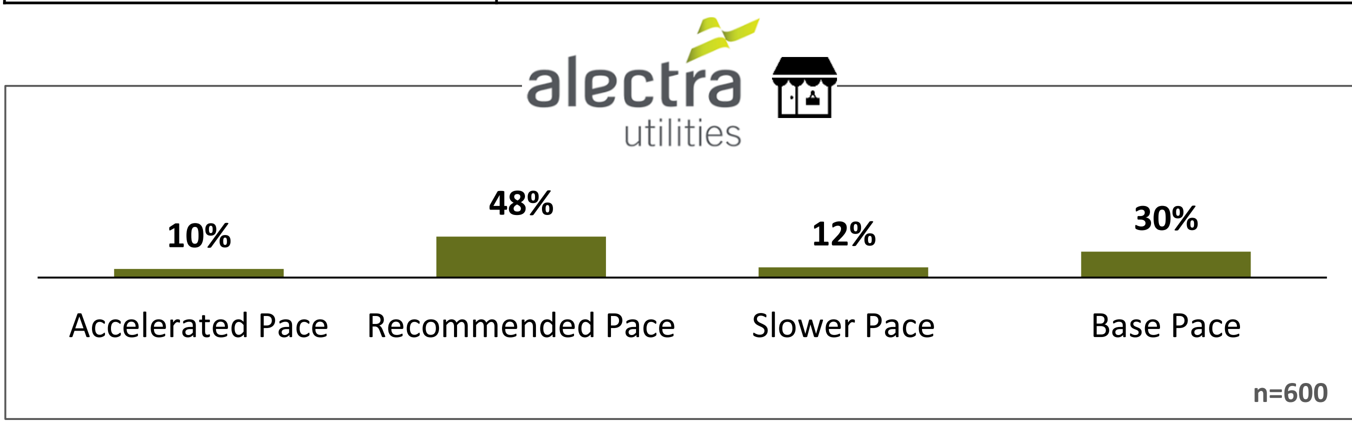
Planning for Expansion, Intensification and Back-up

Small Business

Q Which of the following timing options would you prefer?

Option	2020 – 2024 Expansion & Intensification Projects
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Address all the expansion, intensification and contingency needs identified for the distribution system during 2020-2024.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Address all the expansion needs and many of the intensification and required back-up projects. Some projects related to intensification or back-up capability will be deferred.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Address all expansion projects but defer majority of intensification and all required back-up capability projects. Reliability and power quality may be affected on heavily loaded feeders.
Base Pace *Within current rates*	Complete key expansion projects but defer significant amount of intensification and back up capability projects during 2020 -2024.



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Accelerated Pace	11%	27%	5%	8%	11%
Recommended Pace	52%	47%	58%	40%	51%
Slower Pace	10%	2%	10%	16%	16%
Base Pace	27%	24%	27%	37%	22%

* Small sample size, interpret with caution.

Voltage Conversion

About 8.5% of Alectra Utilities' customers are serviced by low voltage distribution systems. These lines were built in the 1950's and represent some of Alectra Utilities' oldest distribution assets. These lines have much less capacity than modern lines. During an outage, the modern lines cannot be used to restore power to the low voltage lines, because they don't operate at the same voltage levels.

This equipment has become functionally obsolete, and the risk of equipment failure is increasing. Since there is no urgent threat to reliability, there are no low voltage conversion investments included within existing rates.

However, investing in voltage conversion projects would:

- improve reliability through the new lines and transformers;
- provide access to increased supply from higher voltage substations; and
- improve outage restoration from the enhanced back-up and availability of tie points at this higher voltage level.

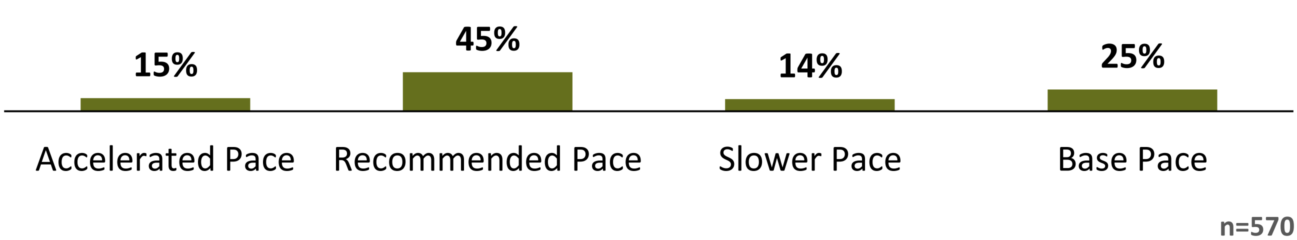
Online Workbook

Voltage Conversion

Small Business

Q Which of the following timing options would you prefer?

Option	Voltage Conversion	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **11** low voltage substations	Enable Alectra Utilities to convert 10,533 customers to present day supply voltage
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **9** low voltage substations	Enable Alectra Utilities to convert 9,984 customers to present day supply voltage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **5** low voltage substations	Enable Alectra Utilities to convert 6,566 customers to present day supply voltage
Base Pace *Within current rates*	Alectra Utilities will not decommission any stations	Current rates support the investment to enable Alectra Utilities to convert 3,600 customer to present day supply voltage



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ
Accelerated Pace	16%	25%	5%	18%
Recommended Pace	49%	45%	49%	41%
Slower Pace	15%	8%	20%	12%
Base Pace	21%	21%	26%	29%

Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity in order to provide electricity for existing and new developments; provide more resilience to deal with extreme weather event and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline in Alectra Utilities' quality of service to current customers.

Here in Mississauga, Alectra Utilities has two stations that need investment.

- The proposed new Duke station is located immediately north of Square One and will help serve the growing demands of that area.
- A station in the East Credit area of Mississauga is currently located on leased land that Alectra Utilities would like to purchase for long term security.

The lead time to build a station is 2 to 3 years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures.

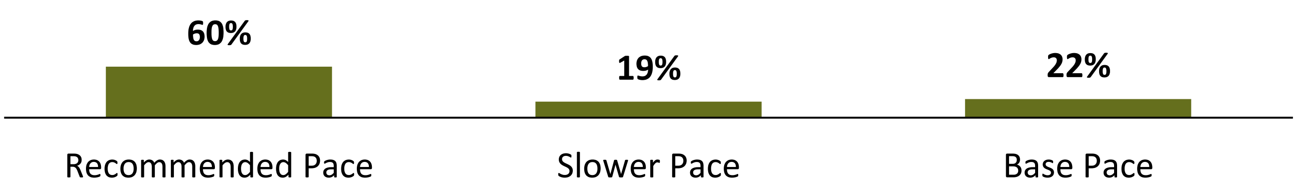
Online Workbook

Distribution Stations Capacity (ERZ)

Small Business

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station and increase capacity at one station	Enable Alectra Utilities to build Duke station as well as buy leased land at the East Credit area station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station	Enable Alectra Utilities to build Duke station, while assuming the risk that it will cost more to purchase leased land at a station in East Credit in the future.
Base Pace *Within current rates*	Delay any station capacity investments	Risk that it will cost more to purchase leased land in future. Existing stations likely to experience overloading and increased risk of reliability issues.



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Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity to provide electricity for existing and new developments; provide more resilience to deal with extreme weather events and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline Alectra Utilities' quality of service to current customers.

Here in the former PowerStream area, Alectra Utilities has four stations that need investment:

- The existing Melbourne station in Bradford is located on leased land that Alectra Utilities would like to purchase for long-term stability. Furthermore, this station requires an upgrade.
- Barrie and Alliston both have growing demand that will need Alectra Utilities to buy the land for and to build new stations.
- Growth in Markham and Richmond Hill requires building a new transformer station after 2024. However, prior to building this new station, an environmental assessment is needed.

The lead time to build a station is two to three years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures. Alectra Utilities has presented the following options that balance system needs and rate impacts.

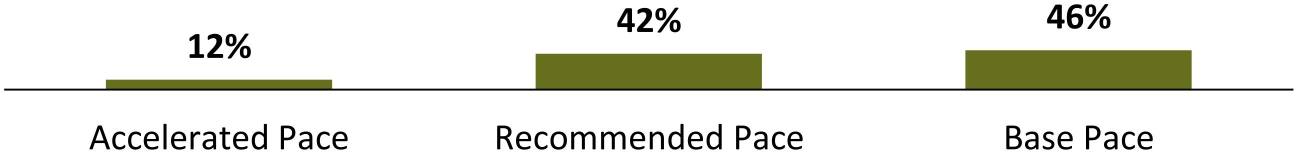
Online Workbook

Distribution Stations Capacity (PRZ)

Small Business

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build two new stations and increase capacity at one station	• Upgrade Bradford station • Build new stations in both Alliston and Barrie • Complete environmental assessment for Markham station.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new stations and increase capacity at one Station	• Upgrade Bradford station • Build station in Alliston • Complete environmental assessment for Markham station. Risk that existing Barrie stations will experience overloading and increased risk of reliability issues.
Base Pace *Within current rates*	Upgrade one station and secure land for future station build.	• Upgrade Bradford station • Complete environmental assessment for Markham station. Risk that existing Alliston and Barrie stations will experience overloading and increased risk of reliability issues.



Investment only in PowerStream RZ

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Additional Station Investments

Beyond the transformers and other equipment that directly operate the grid, other investments are required for security, communications and control systems. Distribution stations play an important role in Alectra Utilities' electricity grid, transforming high voltage electricity to a lower voltage that is suitable for distribution. A failure in a distribution station can result in an outage for thousands of customers.

- **Communications and control systems** allow Alectra Utilities staff in central control rooms to remotely monitor and control the equipment in distribution stations in order to avoid equipment failures and manage failures when they do occur. Monitoring equipment is also used for security purposes.

While new investments to keep these systems up to date would help to maintain reliability and security, delaying these investment is less likely to cause problems compared to delaying other projects discussed earlier.

To manage within existing rates, Alectra Utilities is proposing to postpone any investments in distribution station, communications and control systems. Managers know that as these systems age, there will likely be more outages, but it is not possible to estimate the exact risks involved.

Online Workbook

Additional Station Investments

Small Business

Q Which of the following timing options would you prefer?

Option	Level of Investment	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew communication, replace end-of-life station equipment, obsolete protection equipment and upgrade station facilities.	• Maintain reliability • Ensure reliable communication performance of the system • Increases security at the station.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication, replace end of life station equipment and obsolete protection equipment.	• Maintain reliability • Ensure reliable communication performance of the system • Does not increase security at the station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication and replace end of life station equipment.	• Maintain reliability • Ensure reliable communication infrastructure. • Does not increase security at the station.
Base Pace *Within current rates*	Monitor station equipment and reactively replace when necessary. Defer other investments beyond 2024	This option would require allocating funds from the reactive budget as necessary.

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Accelerated Pace	15%	24%	11%	11%	21%
Recommended Pace	52%	55%	60%	37%	60%
Slower Pace	11%	0%	8%	18%	-
Base Pace	22%	21%	21%	34%	19%

Combined Alectra Utilities results not shown because “slower pace” option was not presented in the Guelph rate zone.

* Small sample size, interpret with caution.

Preparing for More Consumer Choice

New technologies are changing the way that consumers are able to interact with the electricity system. Emerging technologies like solar power, battery storage and electric vehicles are constantly evolving; they are becoming more affordable, more widely available, and better performing.

Properly planned and managed, the integration of these technologies with Alectra Utilities' traditional "poles and wires" equipment is expected to provide benefits to customers by way of:

- reducing the amount of infrastructure costs related to meeting the increased demand for electricity; and
- generating electricity more locally, reducing the amount of generation that is needed elsewhere in the province.

Regardless of whether you are considering new energy choices like an electric vehicle for yourself today, the market is changing quickly, and Alectra Utilities must be prepared as adoption becomes more widespread over the next five years. For instance, charging each electric vehicle draws as much energy as two average homes. If a dozen or so people come home and start changing their vehicles at a period of peak demand, it could overload the grid in that neighbourhood. Not being prepared could result in increased equipment failure due to overloaded lines, as well as costly infrastructure upgrades to meet the demand posed by this technology.

Alectra Utilities has identified three pilot projects to ensure the system is ready when more consumers adopt this technology. These pilots are intended to answer questions like;

- *How will the grid respond if a neighbourhood rapidly adopts new technology, such as electric vehicles?*
- *How can Alectra Utilities reduce the strain on the system by using smart technology to dispatch electricity?*

These pilots are not required to meet immediate reliability issues, however, they will help to ensure that Alectra Utilities is able to meet the challenged as more consumers embrace this technology in the next few years.

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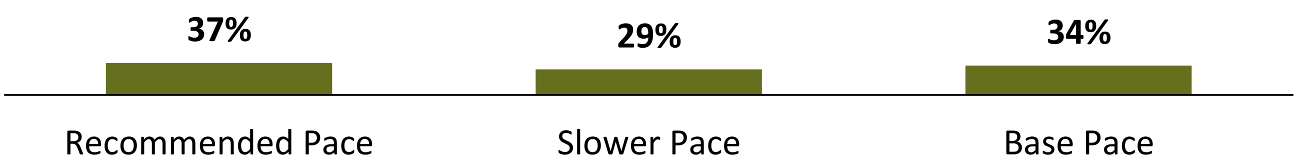
Preparing for More Consumer Choice

Q Which of the following timing options would you prefer?

Option	Approach
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Conduct three pilot projects to prepare to integrate new technology like electric vehicles, solar power and battery storage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Wait until new technology like electric vehicles, solar power and battery storage becomes more widely adopted
Base Pace *Within current rates*	Reactively respond to technology uptake by investing in traditional 'poles and wires' infrastructure as reliability and capacity issues become apparent



Investment only in PowerStream RZ

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Investment Alternative Summary

Throughout this workbook, you have been asked about some key choices that could impact your rates. Below is a summary of your answers to the questions that could impact your rates.

At the bottom of this page you will find the total bill impact of all the answers you gave that would result in a bill increase.

Having seen the total bill impact, please review your answers and change your responses if you desire; your potential rate impact will be re-calculated. You will have the opportunity to adjust your answers again until you feel you've reached the best balance for you.

Q Small Business Customer Bill Impact Change and Magnitude of Bill Impact

Bill Impact Analysis	ERZ	BRZ	HRZ	PRZ	GRZ**
Average $ Initial	$0.46	$0.37	$0.39	$0.45	$0.16
Average $ Final	$0.45	$0.38	$0.38	$0.42	$0.16
Difference: Initial VS. Final	-($0.01)	$0.01	-($0.01)	-($0.02)*	$0.00

Differences that are statistically significant at 95% are noted by an asterisk (*).

** Small sample size, interpret with caution.

Impact of Choices on Rates

As noted earlier, all the projects identified in this workbook have been evaluated and found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Under the OEB rules, Alectra Utilities can apply for additional rates, beyond the scheduled 1.2% increase, to pay for these improvements.

Alectra Utilities has calculated the rate impact of implementing the options recommended by their planners.

These priorities may change based on your input but give you a sense of the cost for an investment program that aims to:

- maintain reliability for the average customer;
- fix or avoid equipment issues that cause below average reliability for some customers; and
- help the system do a better job of responding to major outages caused by severe weather or transmission grid failures.

Following Alectra Utilities planners' recommended approach would result in an average additional [PIPE-RID1] cents per month annually for the typical customer in your rate class.

At the end of the 5-year plan, the typical customer in your rate class would see the distribution portion of their electricity bill increase by [PIPE-RID2] above the current projected rate of [PIPE-TOT] in 2024.

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
[PIPE-RID1]	$0.68	$0.56	$0.61	$0.83	$0.22
[PIPE-RID2]	$3.38	$2.78	$3.05	$4.13	$1.12
[PIPE-TOT]	$79.63	$66.21	$70.09	$75.09	$48.44

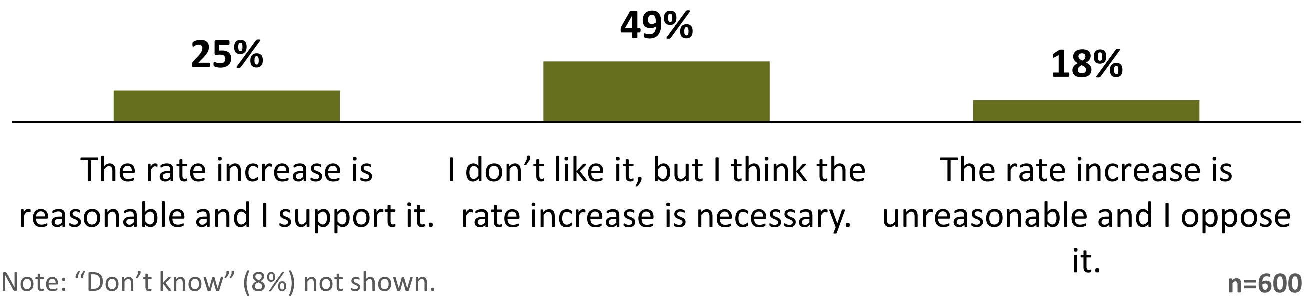
Online Workbook

Impact of Choices on Rates

Small Business

Q Which of the following statements best represents your view?

alectra utilities



Note: "Don't know" (8%) not shown.

n=600

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
The rate increase is reasonable and I support it	31%	20%	26%	23%	28%
I don't like it, but I think the rate increase is necessary	46%	67%	45%	47%	53%
The rate increase is unreasonable and I oppose it	18%	4%	22%	19%	20%
Don't know	6%	10%	7%	11%	0%
Reasonable and support it + don't like it, but think it's necessary	**77%**	**86%**	**71%**	**70%**	**80%**

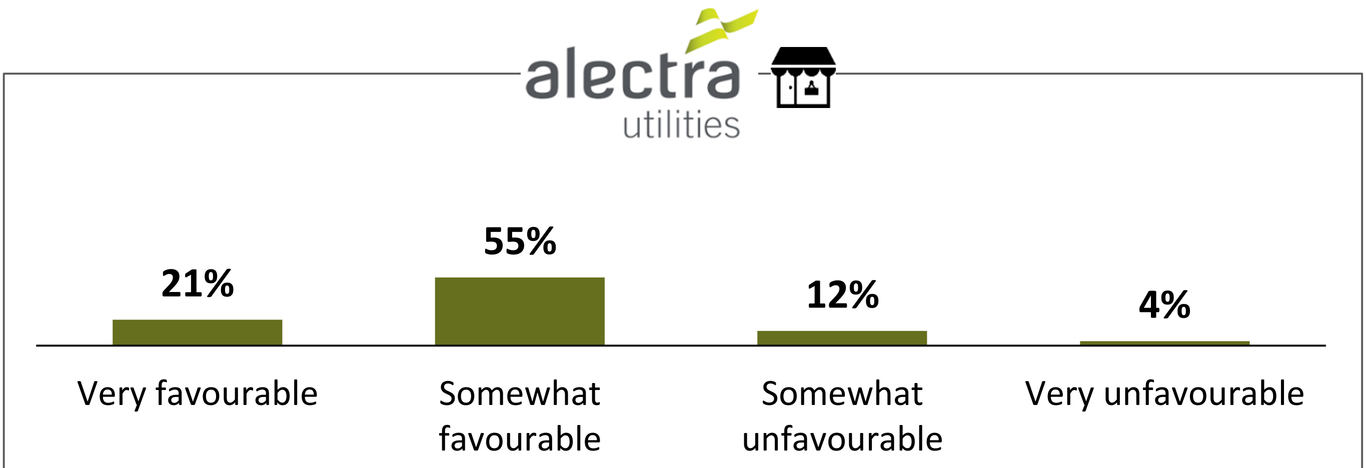
* Small sample size, interpret with caution.

Online Workbook

Workbook Diagnostics | Overall Impression

Small Business

Q Did you have a favourable or unfavourable impression of the workbook you just completed?



Note: "Don't know" (9%) not shown. n=600

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Very favourable	25%	27%	18%	19%	12%
Somewhat favourable	57%	48%	62%	49%	71%
Somewhat unfavourable	11%	10%	10%	15%	4%
Very unfavourable	0%	5%	6%	4%	2%
Don't know	7%	11%	4%	13%	11%
Favourable	**82%**	**75%**	**80%**	**69%**	**83%**
Unfavourable	**11%**	**14%**	**16%**	**19%**	**6%**

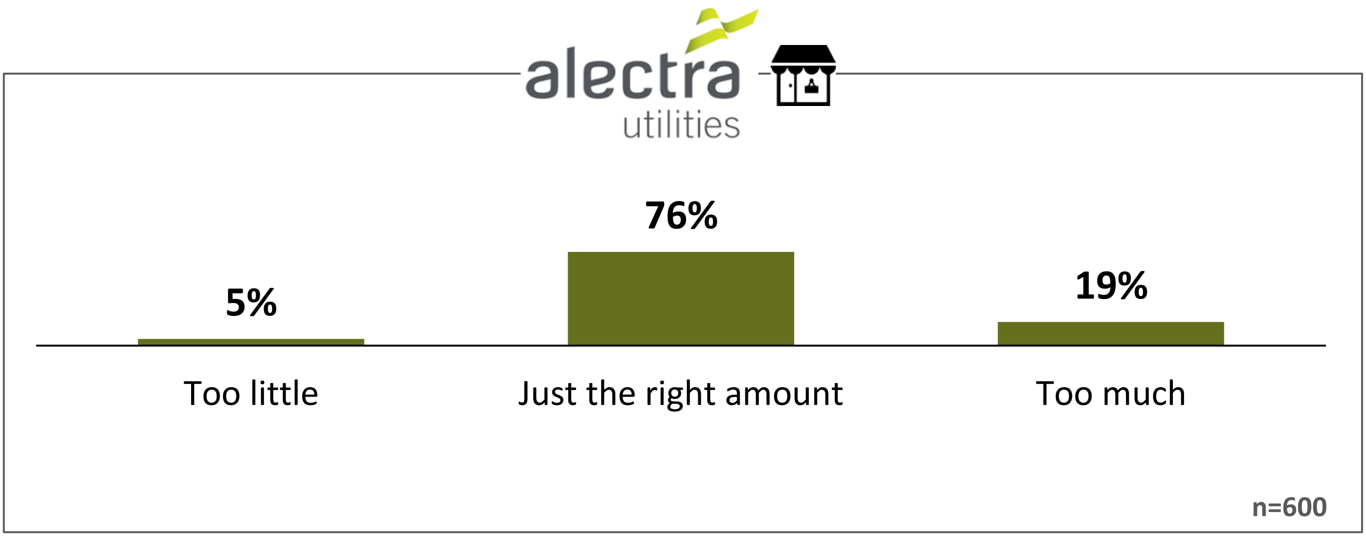
* Small sample size, interpret with caution.

INNOVATIVE RESEARCH GROUP

Online Workbook

Workbook Diagnostics | Volume of Information

Q Did Alectra Utilities provide too much information, not enough, or just the right amount?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ*
Too little	4%	4%	6%	7%	2%
Just the right amount	80%	87%	71%	71%	88%
Too much	16%	9%	23%	22%	10%

* Small sample size, interpret with caution.

INNOVATIVE RESEARCH GROUP

GS > 50 kW – 4,999 Customers

Online Workbook Results

Methodology

GS > 50 kW – 4,999 Online Workbook

INNOVATIVE was engaged by Alectra Utilities Corporation (Alectra Utilities) in this study to gather input on preferences on program timing and balancing outcomes. **Pages 138 to 183** show the actual pages of the workbook that was sent and completed by customers. The only additions are the actual results.

Field Dates & Workbook Delivery

The **GS > 50 kW – 4,999 Online Workbook** was sent to all Alectra Utilities GS > 50 kW – 4,999 customers who have provided the utility with an email address. Customers had an opportunity to complete the workbook between April 18th and May 15st, 2019. Follow-up telephone calls were placed by INNOVATIVE in order to encourage GS > 50 kW – 4,999 participation in the survey.

Each customer received a workbook customised to their rate zone and class using a unique URL that could be linked back to their annual consumption, region and rate class.

GS > 50 kW – 4,999 Online Workbook Completes

A total of **158** (unweighted) Alectra Utilities GS > 50 kW – 4,999 customers completed the online workbook via a unique URL.

Sample Weighting

Due to sample size and distribution across Alectra Utilities' service territory, this data has not been weighted by rate zone and consumption quartiles.

The table below summarizes the unweighted sample breakdown by rate zone and quartile.

Unweighted Sample	Consumption Quartiles				Total	Distribution
	Low	Medium-Low	Medium-High	High		
Enersource	16	11	10	14	51	**32%**
Brampton	1	1	3	1	6	**4%**
Horizon	2	8	4	10	24	**15%**
PowerStream	22	16	14	10	62	**39%**
Guelph	2	5	6	2	15	**9%**
Total	**43**	**41**	**37**	**37**	**158**	**100%**

Note: *Graphs and tables may not always total 100% due to rounding values rather than any error in data. Sums are added before rounding numbers. Caution interpreting results with small n-sizes.*

Online Workbook

GS > 50 kW – 4,999

Welcome to Alectra Utilities' planning consultation!

We need your input on choices that will affect the service you receive and the price you pay.

1. Alectra Utilities is developing its investment plan for 2020 to 2024. This plan will determine the investments Alectra Utilities makes in equipment and infrastructure, the services it provides, and the rates you pay.

2. **Alectra will be accountable to the public regulator, both in terms of sharing what customers say and demonstrating how they considered those views.**

3. You don't need to be an electricity expert to participate in this consultation. This workbook is focused on basic choices and provides the background information you need to answer the questions.

4. All you need to do is provide your feedback on between **7 and 13 choices.** If you can give half an hour now, Alectra Utilities can finalize its plan to serve customers like you for the next five years.

Those who complete the questions that follow will be invited to enter a draw to win <u>one of ten (10)</u> $500 prepaid credit cards.

All of your individual responses will be kept confidential. Innovative Research Group (INNOVATIVE), an independent research company, has been hired to gather your feedback.

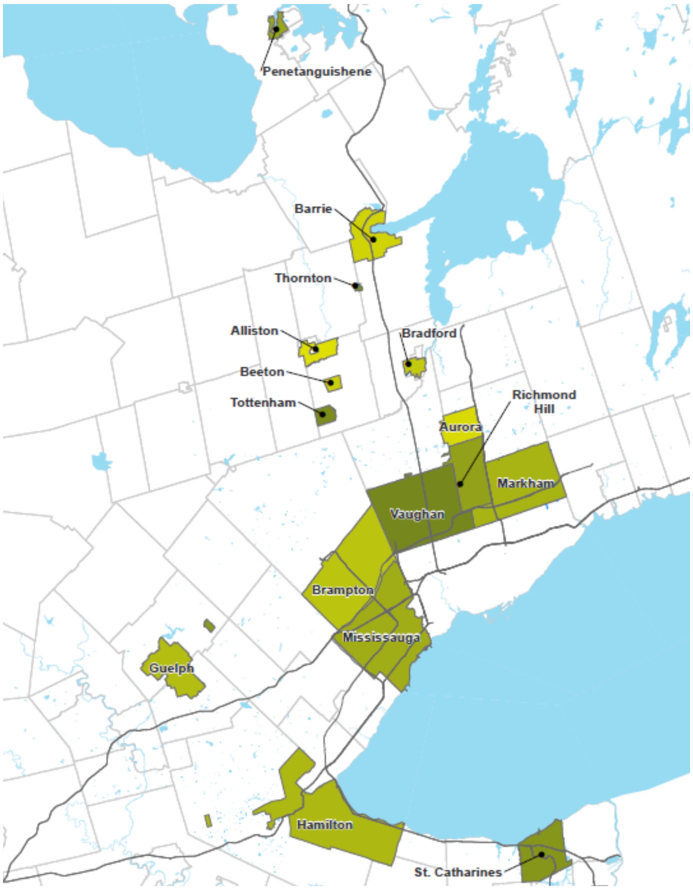
If you are reading this on a smaller mobile device, you may want to consider accessing the survey from a tablet, desktop or laptop instead so that it is easier for you to read.

INNOVATIVE RESEARCH GROUP

Who is Alectra Utilities?

Alectra Utilities is preparing its first consolidated Distribution System Plan. Alectra Utilities is the union of five leading Ontario utilities – Enersource, Horizon Utilities, Brampton Hydro, PowerStream and Guelph Hydro. Alectra Utilities now serves over one million customers.

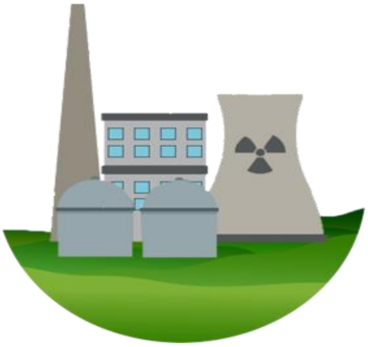
Guelph Hydro Electric Systems Inc. + hydro one Brampton + horizon UTILITIES Looking beyond + enersource + PowerStream = alectra utilities



Alectra Utilities provides services to customers in all of these areas. However, customer rates are based on the cost of serving only the area that you live in.

Understanding Alectra Utilities' role in Ontario's electricity system

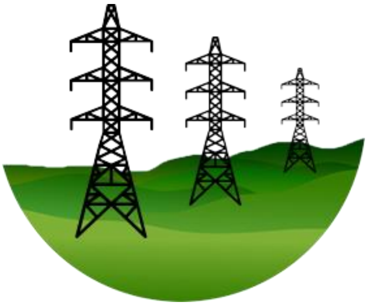
Ontario's electricity system is owned and operated by public, private and municipal corporations across the province. It is made up of three components: generation, transmission and distribution.



1 Generation

Where electricity comes from.

Ontario's electricity is generated by nuclear, natural gas, hydroelectric and renewable technologies, such as wind and solar. In Ontario, about 50% of electricity is generated by Ontario Power Generation, which has generation stations across the province.



2 Transmission

Electricity travels across Ontario.

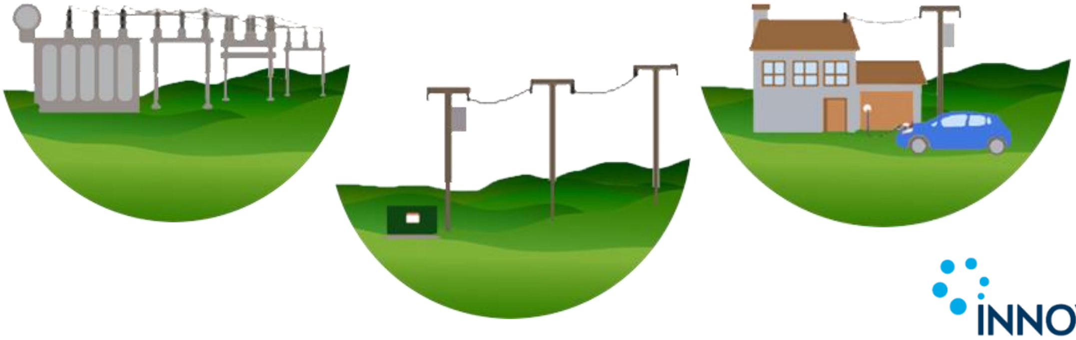
Once electricity is generated, it must be transported to urban and rural areas across the province. This happens by way of high voltage transmission lines that serve as highways for electricity. The province has more than 30,000 kilometres of transmission lines.

3 Local Distribution

Delivering power to homes and businesses in your community.

Alectra Utilities is responsible for the last step of the journey: distributing electricity to customers through its distribution network. This local grid includes transformer stations of various sizes and designs that decrease the voltage of the electricity so it can be used in your home or business.

Across Alectra Utilities' service territory, there are 16,400 km of overhead powerlines and 22,140 km of underground cable.

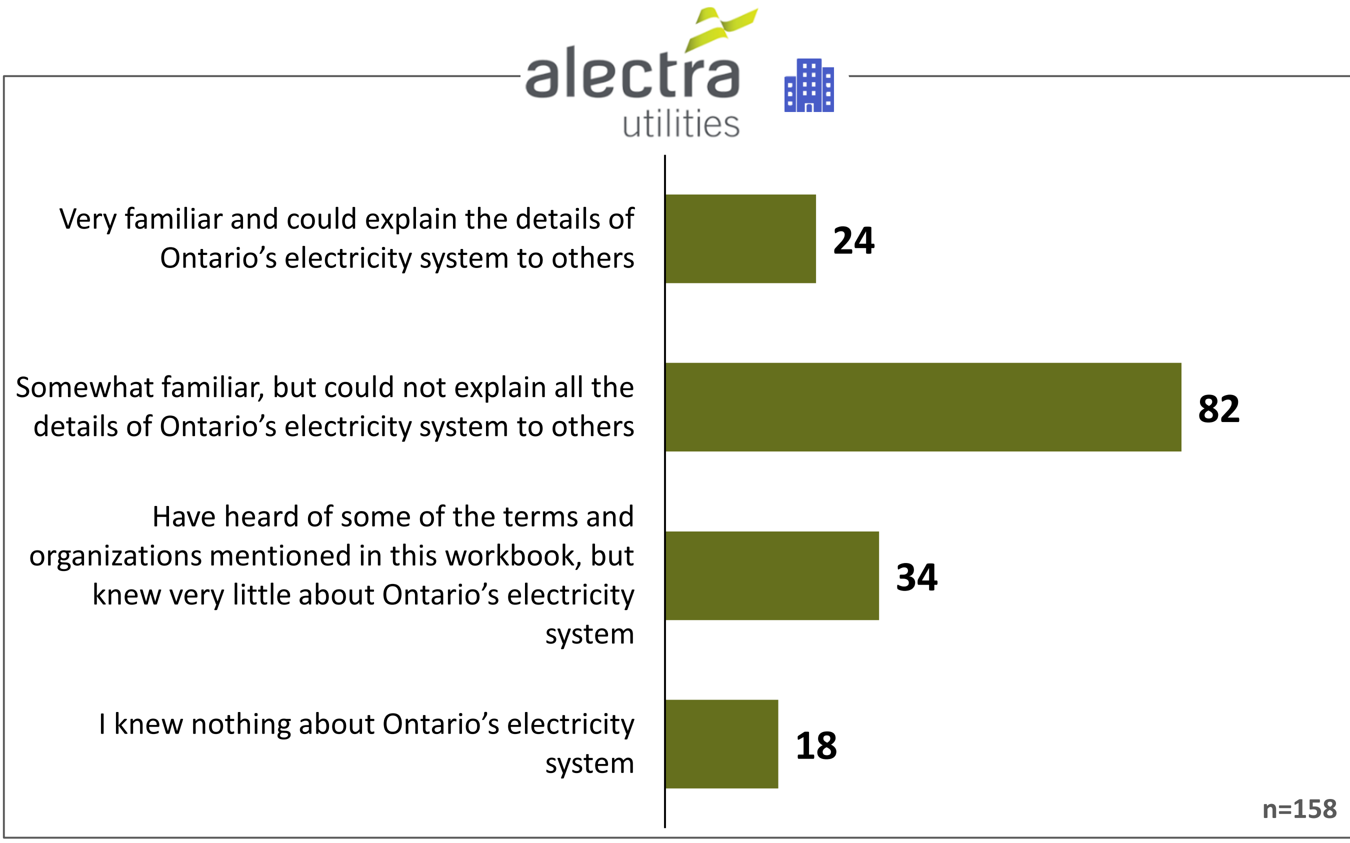


Online Workbook

GS > 50 kW – 4,999

Understanding Alectra Utilities' role in Ontario's electricity system

Q Before this consultation, how familiar were you with the various parts of the electricity system and how they work together?



Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Very familiar	5	-	6	11	2
Somewhat familiar	24	4	11	35	8
Heard of some of the terms and organizations	14	1	6	9	4
Knew nothing about the electricity system	8	1	1	7	1

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

GS > 50 kW – 4,999

How much of you bill goes to Alectra Utilities?

How much of you bill goes to Alectra Utilities?

- Every item and charge on your bill is mandated by the provincial government or regulated by the **Ontario Energy Board (OEB)**, the provincial energy regulator.
- While Alectra Utilities is responsible for collecting payment for the entire electricity bill, it retains only the distribution portion of the delivery charge.
- **Distribution makes up about [PIPE-PER] of the typical mid-sized or commercial/ industrial customer's bill.**
- The rest of your bill is passed onto provincial transmission companies, power generation companies, the government and regulatory agencies.

Typical Mid-Sized Business Bill

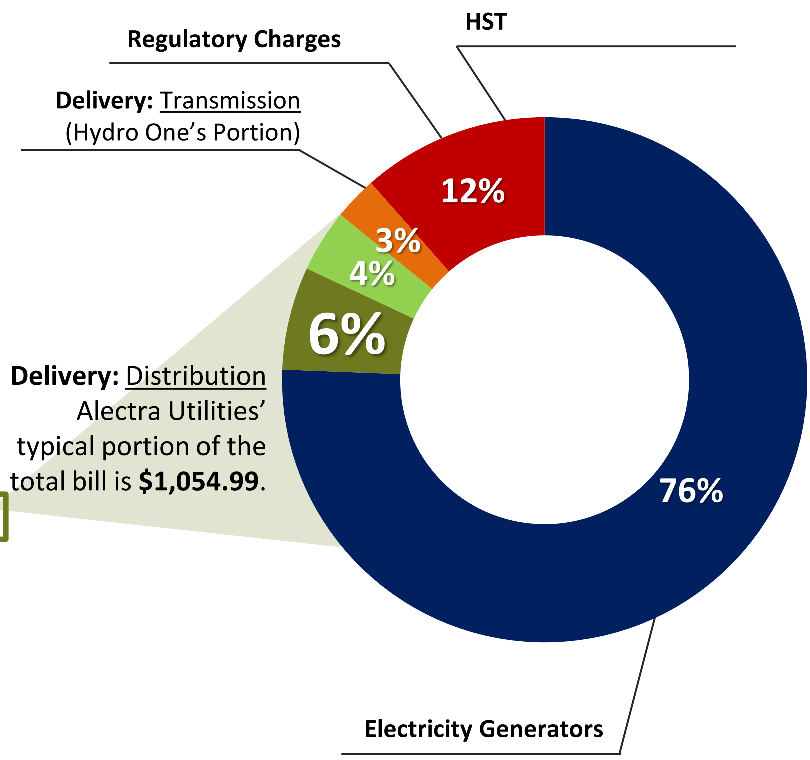
Sample Alectra Utilities Monthly Bill
(Based on 250 kW Monthly Demand)

Account Number:
000 000 000 000 0000

Meter Number:
00000000

Alectra Utilities' portion: **$1,054.99**

Your Electricity Charges	
Electricity Commodity*	$12,570.01
*Commodity based on average IESO wholesale market price	
Delivery	$1,695.60
Regulatory Charges (IESO)	$445.26
Total Electricity Charges	**$14,710.87**
HST	$1,912.41
Total Amount	**$16,623.28**



Note: Graphs may not always total 100% due to rounding.

Note: Sample bills were customized for each rate zone and rate class. The above represents a sample mid-sized business bill in the Horizon rate zone.

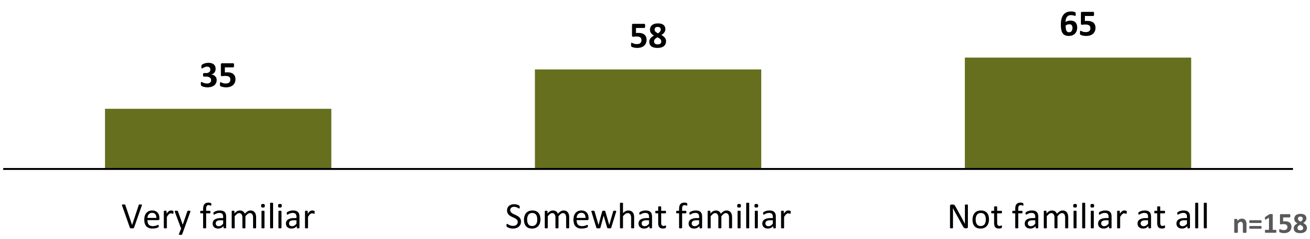
Online Workbook

GS > 50 kW – 4,999

Percentage of bill that goes to Alectra Utilities

Q Before this consultation, how familiar were you with the percentage of your electricity bill that goes to Alectra Utilities?

alectra utilities



Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Very familiar	10	2	7	12	4
Somewhat familiar	16	1	10	27	4
Not familiar at all	25	3	7	23	7

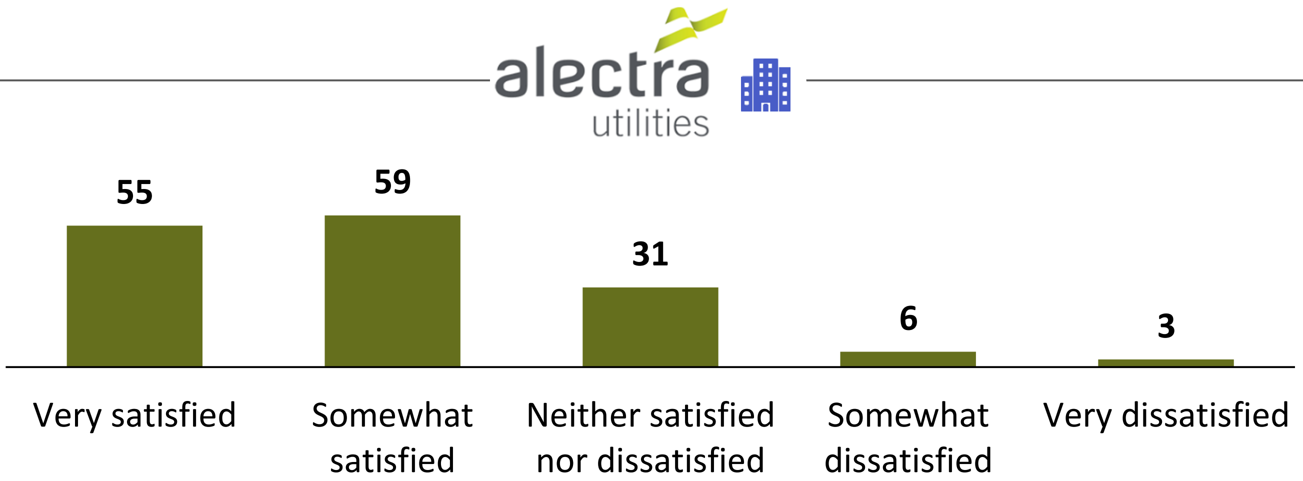
* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

GS > 50 kW – 4,999

Overall satisfaction with Alectra Utilities

Q Generally, how satisfied or dissatisfied are you with the services you receive from Alectra Utilities?



Note: "Don't know" (n=4) not shown.

n=158

Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Very satisfied	20	-	7	22	6
Somewhat satisfied	13	4	7	29	6
Neutral	12	2	8	7	2
Somewhat dissatisfied	-	-	2	3	1
Very dissatisfied	2	-	-	1	-
Don't know	4	-	-	-	-
Overall satisfied	**33**	**4**	**14**	**51**	**12**
Overall dissatisfied	**2**	**-**	**2**	**4**	**1**

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Reliability Experience | Preamble

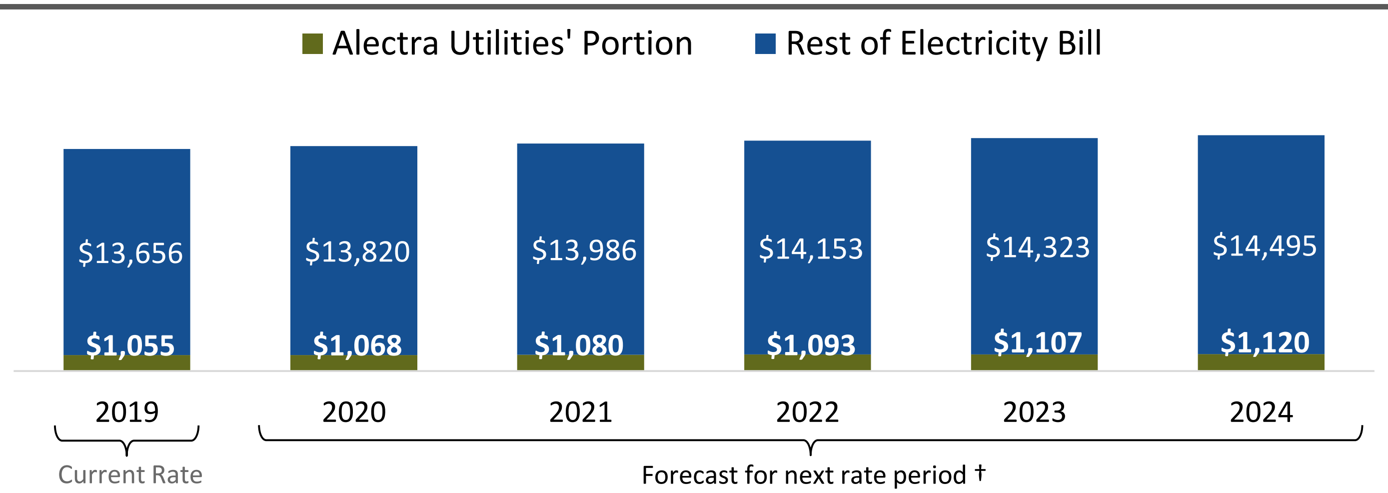
GS > 50 kW – 4,999

How much can you expect to pay over the next few years?

Prior to the Alectra Utilities' merger, each predecessor utility had their rates set by the OEB. Until rates are rebased in 2027, your future rate increases will be limited by an OEB-set Price Cap Formula. Each year Alectra Utilities is permitted to increase rates to reflect inflation minus savings targets established by the OEB. **This requires Alectra Utilities to keep cost increases below inflation.**

For customers in your area and rate class, the distribution charge for **the typical bill is estimated to increase by 1.2%** on average for the next five years.

Estimated Typical Mid-Sized Business Annual Increase in Monthly Bill (Before Tax) ††



Note: Sample bills were customized for each rate zone and rate class. The above represents a sample mid-sized business bill in the Horizon rate zone.

Where does your money go?

Alectra Utilities has two budgets; **operating and capital.** The operating budget covers recurring expenses, such as salaries, taxes, fuel costs and rent. Under the Price Cap Formula, Alectra Utilities cannot ask for any additional money for operating expenses.

This consultation is about the capital budget. This budget covers things like poles, wires, cables, transformers, computers and programs, vehicles, and buildings.

†† On November 23, 2018, the OEB calculated the value of the inflation factor for incentive rate setting under the Price Cap IR plan of 1.5% for rate changes effective 2019. With a stretch factor of 0.3%, the Price Cap Adjustment for Alectra Utilities was 1.2%. This rate has been used to forecast the rates for 2020-2024. The 2020-2024 rates assumes no changes to electricity rates or the Group 1 riders over the 2020 to 2024 period. The OEB approved bill impact for 2019 was used as the basis for the calculation of forecasted rates for 2020-2024.

INNOVATIVE RESEARCH GROUP

Online Workbook

What is this consultation about?

This consultation is about finding the right balance between reliability and the price you pay.

The point of this workbook is to allow customers, like yourself, to provide feedback on whether the planners have found the right balance or whether they should consider different options that better reflect your views.

Alectra Utilities is now creating its first overall investment plan as a merged utility. The process started with Alectra Utilities asking customers whether they had any unmet needs and which outcomes Alectra Utilities' plan should focus on. Click here to see more.

Using that input, Alectra Utilities' managers reviewed each part of the utility's business. All the projects identified in this workbook have been found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Now Alectra Utilities is coming back to customers with a final set of choices.

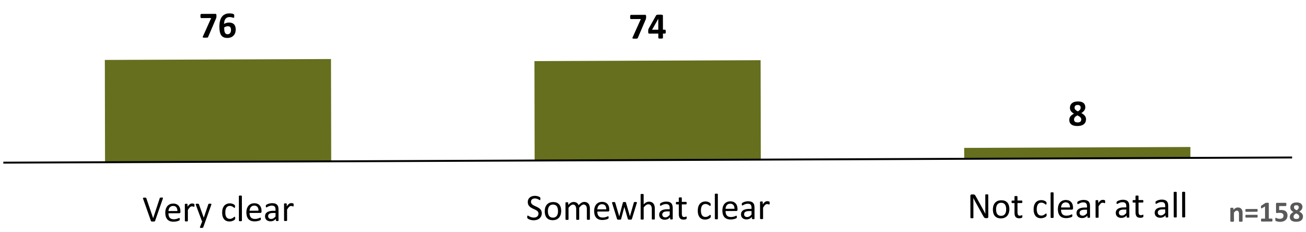
- For each choice, Alectra Utilities has identified an option to stay within existing rates under the price cap formula. It has also identified options to increase investments and, in some areas, where practical, options to reduce investments to make room for increased investments in more pressing areas.
- Planners have indicated the option that in their view provides the best balance between any potential rate increase with the intention to maintain reliability and to fix or avoid pockets of customers that are having significantly below average experiences.
- At the end of the these questions, you will have an opportunity to review your responses and total rate impact of those choices. You will be able to change your responses until you feel you have found the right mix of investments and rate impact, in your view.
- If your preferences result in higher levels of investment than current rates support, Alectra Utilities may apply for a rate increase under the rules established by the OEB. While the exact amount of any rate increase would consider the views collected in this consultation, the workbook will ask you for your views on a rate increase that will be sufficient to pay for the planners' recommended options.

Online Workbook

GS > 50 kW – 4,999

What is this consultation about?

Q Do you feel that the purpose of Alectra Utilities' customer consultation is clear?



Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Very clear	23	1	10	32	10
Somewhat clear	24	4	13	28	5
Not clear at all	4	1	1	2	-

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Reliability Experience | Preamble

Reliability Experience

Reliability is a key priority for Alectra Utilities. Since 2014, both the average **number** and **duration** of outages has increased for the typical Alectra Utilities customer.

- The average number of outages (excluding major event days) has increased by an average of 6% per year from 2014-2018, rising from **1.27 to 1.53** over this period.

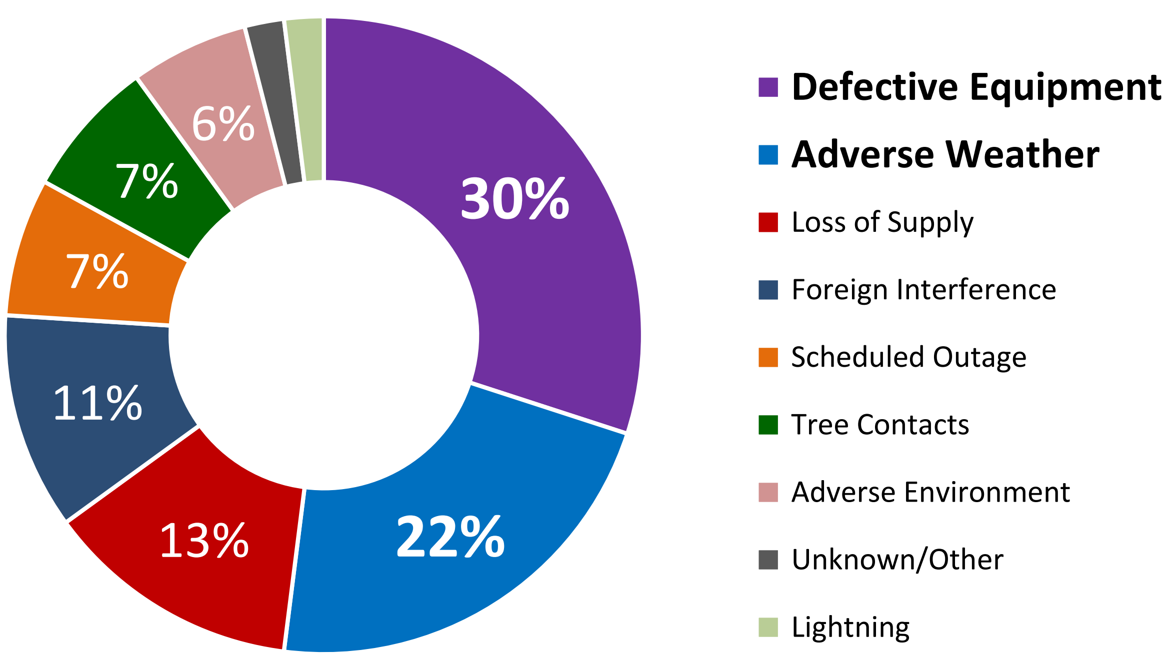
- The average duration of outages (excluding major event days) has increased by an average of 8% per year from 2014-2018, rising from **0.88 hours to 1.14** hours over this period.

The two primary contributors to outages account for more than 50% of all outages.

1. **Defective equipment** accounted for 30% of customer hours of interruption between 2014-2018, the single largest outage cause.

2. **Adverse weather** is the second leading cause of outages. It accounted for 22% of customer hours of interruption over the same period.

Customer Outage Duration (Hours) by Cause 2014-2018



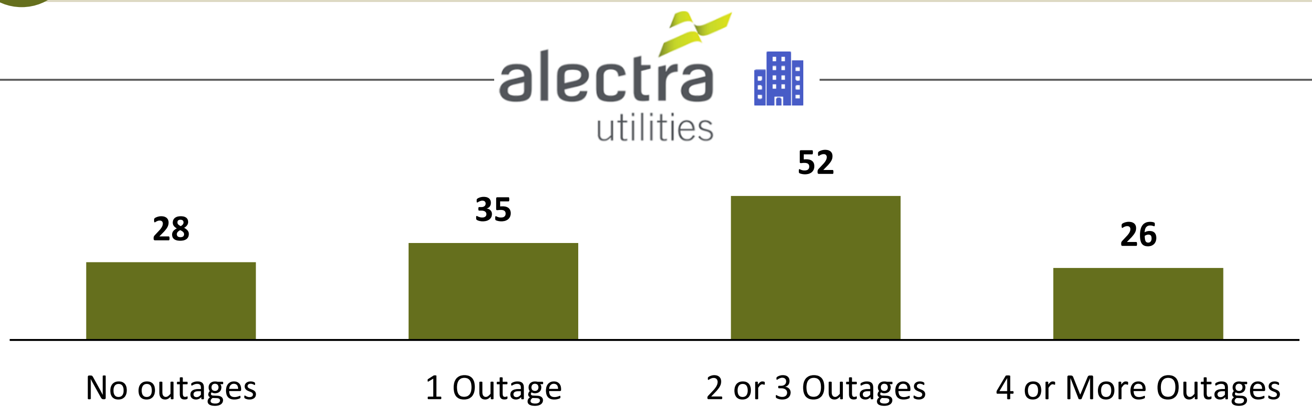
Depending on what rate zone you are in, the subsequent pages will ask you to review between 7 and 13 choices, many of which address the issues identified in the chart above.

Online Workbook

Reliability Experience

GS > 50 kW – 4,999

Q In the past 12 months, how many power outages do you recall experiencing at home/your organization?



Note: "Don't know" (n=17) not shown.

n=158

Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
No outages	11	1	3	9	4
1 outage	10	1	6	12	6
2 or 3 outages	15	3	10	23	1
4 or more outages	7	0	3	14	2
Don't know	8	1	2	4	2

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Mandatory Investments

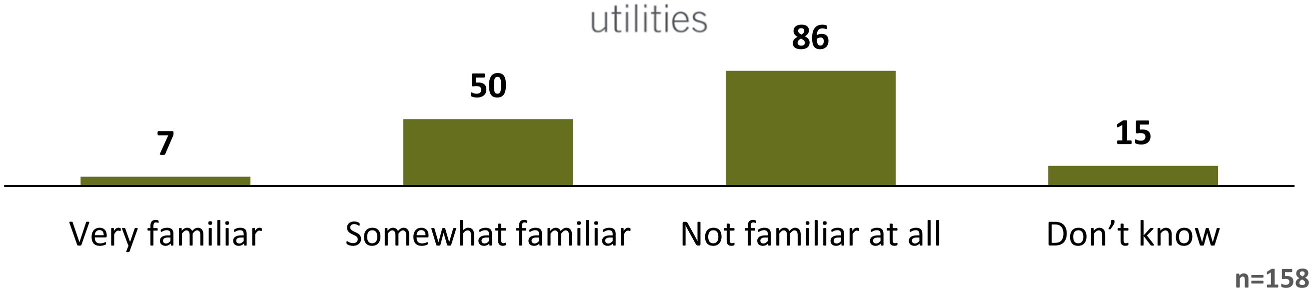
GS > 50 kW – 4,999

Federal, provincial and municipal governments as well as regulators set requirements and standards that Alectra Utilities must satisfy. Mandatory investments can be broken down into three categories:

1. **Connecting customers:** This includes connecting customers to the grid when a new home or building is constructed or modified.
2. **Moving equipment:** This includes moving equipment like poles and cables for road widening.
3. **Mandated obligations:** This includes installing and maintaining customer meters and transferring electricity from the provincial transmission system.

These investments mean that about one-in-five dollars (20%) of your current rates are already committed and not available for other investments

Q Before this consultation, were you familiar that one-in-five dollars (20%) of your current rates are already committed to mandatory investments and not available for other projects?



Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Very familiar	2	-	2	2	1
Somewhat familiar	12	4	7	23	4
Not familiar at all	28	2	13	34	9
Don’t know	9	-	2	3	1

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Unplanned Repairs and Replacements

On average, each year, Alectra Utilities spends approximately 19 million dollars or 6% of it's core budget to repair or replace equipment that has either failed, will fail imminently, or poses an imminent safety risk. This may include sudden equipment failure, or severe weather taking down a pole in front of your home or business.

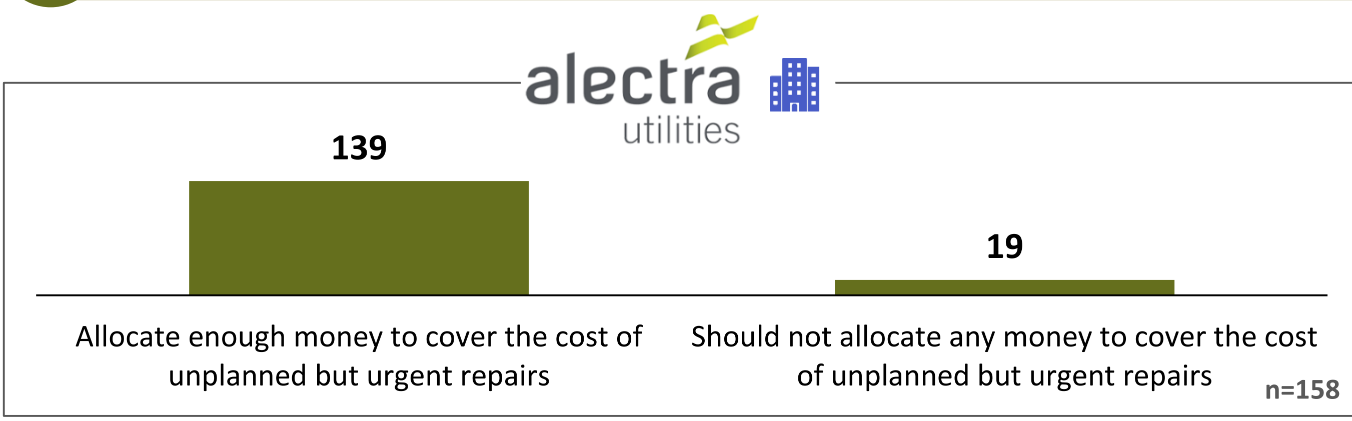
There are two possible approaches for how to fund these types of repairs:

1. By delaying other projects that had been planned but not started
2. By establishing an annual allocation for these unplanned repairs and replacements

If Alectra Utilities delays other projects, this can result in needs not being met and can create inefficiencies in project procurement and management.

If Alectra Utilities establishes an allocation for these unplanned repairs and replacements, that money is not available to fund other projects.

Q Which option do you prefer?



Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Alectra Utilities should allocate enough money (approximately 19 million or 6%) in its core budget to reactive capital to cover the cost of unplanned but urgent repairs	45	5	18	58	13
Alectra Utilities should not allocate any money in its core budget to reactive capital and simply delay planned projects to cover the cost of unplanned but urgent repairs	6	1	6	4	2

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Eliminating Meter Data Security Risks

GS > 50 kW – 4,999

Within the former PowerStream area, Alectra Utilities has identified an older type of meter that could be hacked. These meters collect and transmit information to Alectra Utilities about how much electricity you use, and when you use it, but do not have access to any other personal information.

While these meters are at increased risk of hacking, there has not been a known data breach, and it's possible that they won't be hacked in the future.

Between 2015 and 2019, Alectra Utilities will have replaced 41,000 of these at-risk meters, however, an additional 91,000 will still be in service at the end of 2019.

Alectra Utilities has a decision to make about how quickly or slowly they replace these meters. It's your data and it's your money, so Alectra Utilities would like to know what your preference is.

Q Which of the following options would you prefer?

Option	Expected Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities will be able to address all the metering needs identified for the distribution system during 2020-2024 including the replacement of first generation smart meters that do not support modern levels of data encryption
Base Pace *Within current rates*	Alectra Utilities will be able to address some of the metering needs identified for the distribution system during 2020-2024. Replacement of first generation smart meters that do not support modern levels of data encryption would be deferred beyond 2024

Investment only in PowerStream RZ. **n-size shown.** **n=62**

Keeping the Business Running

Alectra Utilities is more than just poles and wires – it's a business that needs to invest in equipment such as tools, trucks, buildings, computers and software.

When deciding whether to continue to maintain existing equipment or replace them, Alectra Utilities considers whether the risks and costs of continuing to use them outweigh the benefits of waiting longer to replace them. Alectra Utilities business planning process has identified more needs for equipment investments than current rates will allow.

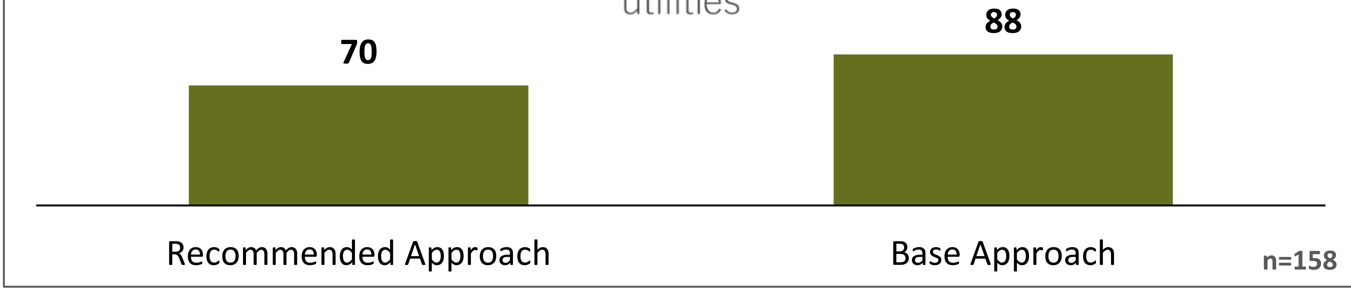
To stay within existing rates, Alectra Utilities has identified the most urgent priorities, things like: keeping large "bucket" trucks on the road; replacing computer equipment that is no longer functional; and repairing leaking roofs. This would mean that less urgent investments, like vans and other equipment would be delayed.

Alectra Utilities recognizes that delaying the less pressing investments will make it harder for staff to do their jobs safely and maintain reliability and security standards.

Bucket trucks (left) have been identified as the most urgent priority, while investments in vans (right) would be delayed in the *base approach.*

Q Which of the following options would you prefer?

Option	Outcome
Recommended Approach ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities staff will have access to equipment of the same standard as similar sized businesses
Base Approach *Within current rates*	Stay within its existing rates and only replace the equipment with the most urgent needs



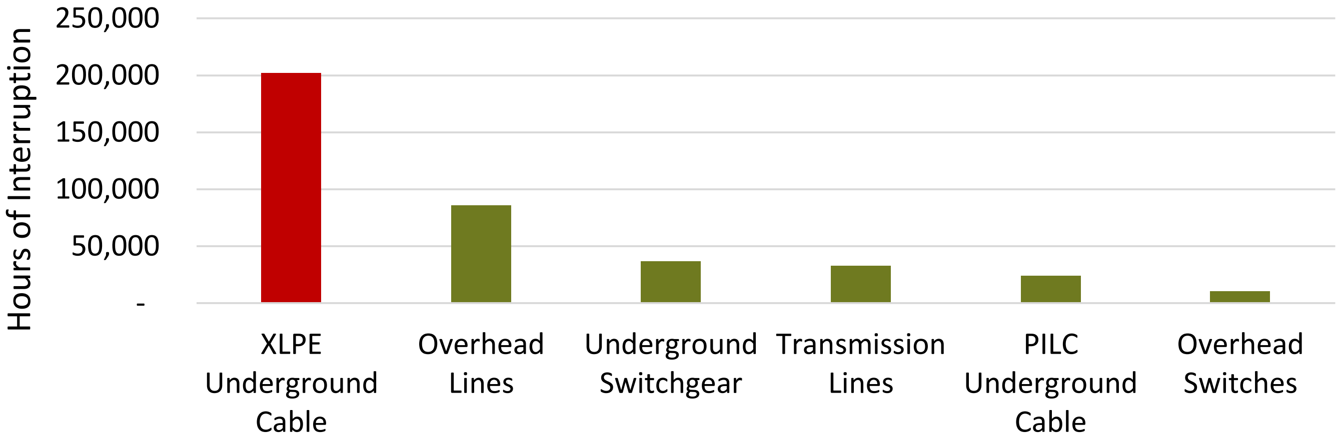
Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Recommended Approach	18	3	14	31	4
Base Approach	33	3	10	31	11

* Small sample size, interpret with caution. **n-size shown.**

Underground Asset Renewal

Equipment failure is the single largest cause of outages in Alectra Utilities' system. As the chart below illustrates, a particular type of equipment known as cross-linked polyethylene (XLPE) cable is the leading cause of outages across Alectra Utilities' system.

What type of equipment is causing the most outages? (5-year average)



Case Study

The deterioration of these cables is directly impacting customers. For example, the York/Hilda neighbourhood in Vaughan was originally scheduled to have its cables replaced in 2019. But in 2018, customers began to experience a cascading series of prolonged outages, due to cable failures. Cables repaired one week would fail again the next. In the summer, 250 customers experienced eight cable faults (one outage a week). As a result, the cable had to be replaced on an emergency basis at both a higher cost to Alectra Utilities and major inconvenience to the affected customers.

As Alectra Utilities reviewed all of its equipment across all of its operating areas, it became clear that replacing XLPE underground cable requires an accelerated investment plan. To provide the best value to customers, Alectra Utilities will be using two approaches:

- **Cable Rejuvenation**: Cable rejuvenation is a lower-cost solution that can extend the life of these cables without the need to excavate and replace the entire cable. While it is the better value for customers for cables in fair condition, it is not effective for cables that are already declining.

- **Cable Replacement**: In some cases, Alectra Utilities has no prudent choice but to replace the cable. Replacing this equipment now rather than trying to extend its life will cost more now, but will deliver superior reliability over time, relative to older standards of cable.

Alectra Utilities has a decision to make regarding the pace in which they invest in replacing or extending the life of at-risk underground equipment.

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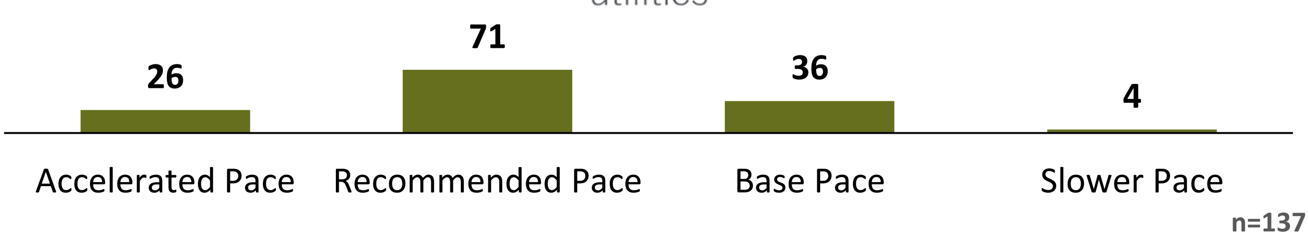
Pacing Investments in the Underground System

Within current rates, the reliability of underground cable is expected to further worsen by approximately 4% from current 2018 levels. As such, Alectra Utilities is recommending a pace of cable replacement and rehabilitation that will maintain current levels of reliability.

Q Which of the following cable replacement strategies would you prefer?

Option	Cable replaced or rehabilitated	Expected Reliability Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually (\$Y.YY more per bill by 2024)*	**2,184 km** by 2024	Improve the reliability of cables by 8% from the current (2018) level
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**1,978 km** by 2024	Maintain the reliability of cables at the current (2018) level
Base Pace *Within current rates*	**1,861 km** by 2024	Reliability of cables to further worsen by 4% from the current (2018) level
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**1,624 km** by 2024	Reliability of cables expected to further worsen by 10% from the current (2018) level



Rate Zone Breakdown	ERZ	HRZ*	PRZ
Accelerated Pace	10	6	10
Recommended Pace	24	11	36
Base Pace	15	6	15
Slower Pace	2	1	1

* Small sample size, interpret with caution. **n-size shown.**

Keeping Pace with Overhead System Renewal

Compared to previous years, Alectra Utilities is considering slowing down its overall spending on poles and wires, known as the overhead system. There are two primary reasons for this proposed reduction in spending:

1. **Additional focus on the underground system:** As noted earlier, customers served by the underground system are having more reliability issues than customers served by overhead lines.

2. **New technology increasing the lifespan of poles:** Advancements in testing and inspections are enabling Alectra Utilities to keep overhead poles and wires in service for longer and have enabled the utility to be smarter about replacing aging equipment.

Based on a recent condition study, most poles in Alectra Utilities' overhead system are in good or excellent condition. However, the study identified that 8,110 or 7.5% of the poles in Alectra Utilities' system are currently in poor or very poor condition. Alectra Utilities also projects that a portion of the 15% of poles currently in fair condition will deteriorate into poor or very poor condition over the next five years and will need to be replaced.

Generally, Alectra Utilities tries to replace groups of poles in similar condition which allows for a lower average cost of replacement than replacing poles one at a time. While the slower option reduces the total amount of spending, the cost per pole is higher because it would involve doing more single-pole replacements and more replacements that require overtime labour.

Online Workbook

GS > 50 kW – 4,999

Keeping Pace with Overhead System Renewal

Q Which of the following options would you prefer?

Option	Poles replaced	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**8,110** by 2024	Address **all of the poor and very poor poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Recommended Pace *Within current rates*	**4,830** by 2024	Address **most of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**3,190** by 2024	Address **half of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions

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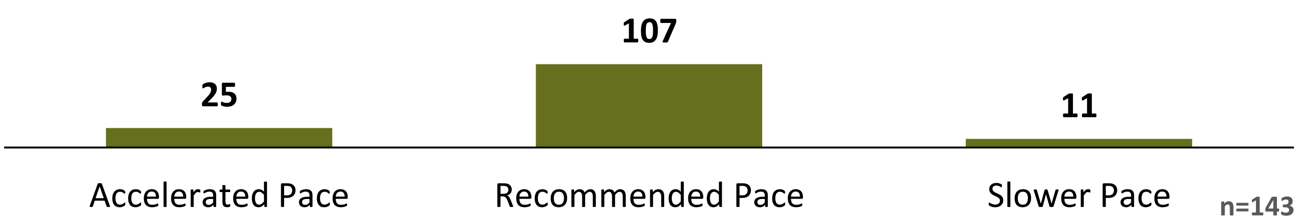

Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ*
Accelerated Pace	12	2	4	7
Recommended Pace	35	3	20	49
Slower Pace	4	1	-	6

* Small sample size, interpret with caution. **n-size shown.**

Alectra Utilities' Transformer Replacement Program

Transformers are a critical piece of distribution equipment that reduce voltage from the higher levels that are more efficient to move electricity long distances to lower levels that are safer to connect to homes and offices. They can either be located on the ground, in underground vaults or attached to distribution poles

- Through the annual Asset Condition Assessment, Alectra Utilities has identified that 2,998 transformers are now in a *poor* or *very poor* condition. Alectra Utilities already has funded plans to replace 1,148 of these transformers. However, there will still be a need to replace 1,850 transformers based on present day condition assessments.
- Over the next five years, Alectra Utilities projects that another 2,000 transformers will deteriorate and will need to be replaced as well.
- In addition to the *poor* and *very poor* condition transformers, Alectra Utilities has identified another 900 transformers that need to be replaced due to unsafe legacy configurations or that are consistently overloaded in current conditions.

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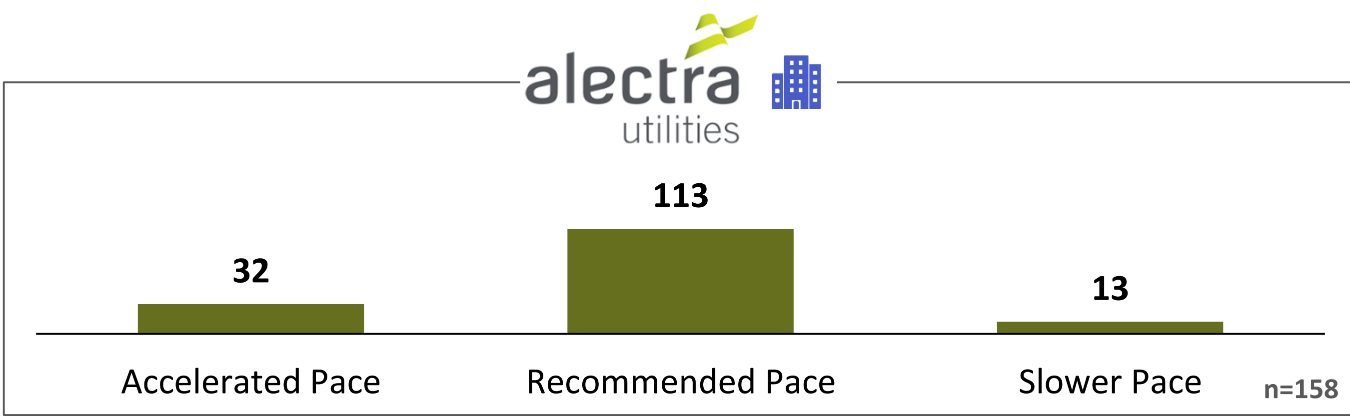
Alectra Utilities' Transformer Replacement Program

Q Which of the following options would you prefer?

Option	Transformers replaced	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**4,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations or are consistently overloaded. • Replace all transformers that will decline to poor and very poor condition over the next five years
Recommended Pace *Within current rates*	**2,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations that are consistently overloaded
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**1,850** by 2024	• Replace only transformers currently assessed to be in poor or very poor condition



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	10	2	5	14	1
Recommended Pace	38	4	17	41	13
Slower Pace	3	-	2	7	1

* Small sample size, interpret with caution. **n-size shown.**

Monitoring and Control Equipment

Using proven technology like pole top monitors and automated switches allows Alectra Utilities to automatically reroute power during outages and planned maintenance, reducing the length of time customers are without power and reducing reliance on crews who need to travel to the site to physically reroute power.

When Alectra Utilities is rebuilding existing lines, it typically replaces equipment that is like-for-like. That means, rebuilt older lines would not have monitoring and control equipment installed.

Alectra Utilities is proposing a different approach for its main feeder lines. Feeder lines are high capacity lines that bring electricity from substations to the lines that connect to homes or businesses. An outage on a feeder line can impact a 1,000 or more customers. Alectra Utilities is planning to phase in monitoring and control equipment to each feeder in the system, so that when power does go out, it can be quickly restored for large numbers of customers.

Each of the three options will continue to phase in this equipment during typical renewal. The difference is in how quickly they modify the remaining feeder lines.

Online Workbook
Monitoring and Control Equipment

GS > 50 kW – 4,999

Q Which of the following options would you prefer?

Option	Devices installed over next 5 years	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**284** 95 additional targeted reliability improvements	Projected to improve reliability by 17% for approximately 142,000 customers. All feeders would be automated in 10 years
Recommended Pace *Within current rates*	**189** 47 additional worst performing feeders	Projected to improve reliability by 17% for approximately 95,000 customers. All feeders would be automated in 15 years
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**142**	Projected to improve reliability by 17% for approximately 71,000 customer. All feeders would be automated in 20 years

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Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	10	2	4	12	-
Recommended Pace	38	4	16	45	12
Slower Pace	3	-	4	5	3

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Converting Rear Lot Service | Preamble

GS > 50 kW – 4,999

Converting Rear Lot Service

Alectra Utilities' service area contains multiple older suburban and urban neighbourhoods with rear lot or "backyard" infrastructure. In general, rear lot electricity lines are 40 years of age or older. This type of equipment presents three primary problems:

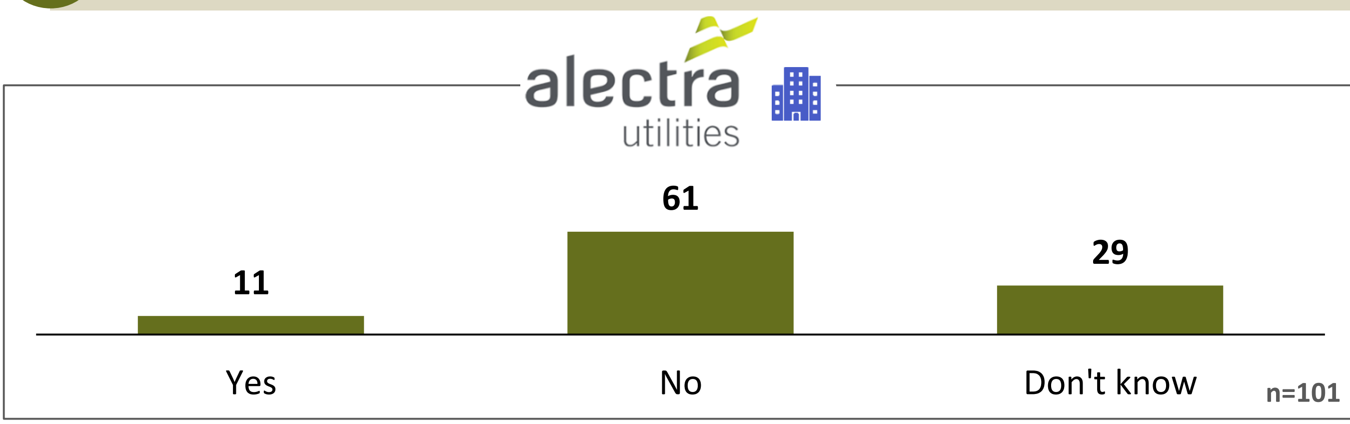
1. Repairs and maintenance are complicated because these lines are in the backyard of homes, rather than the front. Often regular equipment cannot access the backyards and repair crews need to work around trees, pools, sheds and other obstacles.

2. Rear lot equipment is subject to greater tree contact, especially during severe weather

3. The equipment presents elevated safety risks to the general public should the assets fail.

An Alectra Utilities study showed that rear lot restoration times are approximately 4.55 hours. This is three times higher than a comparable front lot restoration time of 1 to 1.4 hours.

Q To the best of your knowledge, does your power come from a line in a backyard behind your home or business?



Rate Zone Breakdown	HRZ*	PRZ	GRZ*
Yes	3	6	2
No	15	38	8
Don't know	6	18	5

* Small sample size, interpret with caution. **n-size shown.**

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Online Workbook

Converting Rear Lot Service

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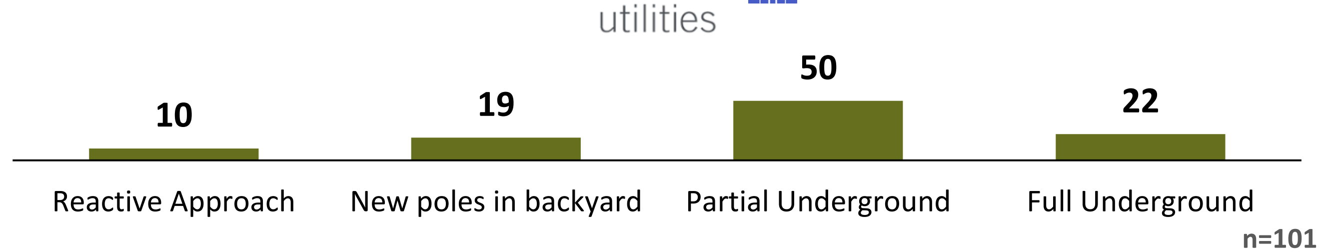
Alectra Utilities has two choices to make in dealing with rear lot service, a design choice and a timing choice. The first question relates to what design approach the utility chooses. The options below assume that all rear lot equipment is converted within the next 70 years.

Q Which of the following design approaches would you prefer?

Option	Rear lot or "backyard" equipment design choices
Reactive Approach ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**Reactively** replace rear lot assets when they have reached their physical end-of-life criteria, knowing that there could be prolonged reliability impacts. This option leaves customers vulnerable to longer than average storm outages and resulting safety risks.
New poles in backyard ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**Proactively** replace old poles and equipment, with new poles and equipment in backyards. This would improve day-to-day reliability but leaves customers vulnerable to longer than average storm outages, and resulting safety risks.
Partial Underground ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**Proactively** re-locate some rear lot infrastructure to front lot underground. This would address some of the vulnerability to longer than average storm outages and resulting safety risks.
Full Underground ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**Proactively** re-locate all rear lot infrastructure to front lot underground. This would completely resolve the vulnerability to longer than average storm outages and resulting safety risks.



Rate Zone Breakdown	HRZ*	PRZ	GRZ*
Reactive Approach	2	7	1
New poles in backyard	6	9	4
Partial Underground	12	29	9
Full Underground	4	17	1

* Small sample size, interpret with caution. **n-size shown.**

Timing of a Rear Lot Conversion Program

Approximately 11,000 customers throughout the former Horizon, PowerStream and Guelph Hydro rate zones are supplied by rear lot lines.

Because rear lot lines have reasonable reliability in normal weather, Alectra Utilities has given other projects priority within its current approved rates. However because rear lot conversions will reduce customer exposure to prolonged outages, and safety risks, Alectra Utilities has identified three timing options to replace rear lot lines proactively.

The exact cost will depend on the design, but for your feedback the options assume the full replacement with front lot underground service.

Examples of rear lot equipment

Online Workbook

Timing of a Rear Lot Conversion Program

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Q Which of the following timing options would you prefer?

Option	Pacing of renewal and conversion	Service renewed and converted over 5-year period
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **30 year period**	Approximately **1,810 customers** (16% of customer with rear lot)
Moderate Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **40 year period**	Approximately **1,360 customers** (12% of customer with rear lot)
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **70 year period**	Approximately **851 customers** (8% of customer with rear lot)
Base Pace *Within current rates*	Renew and convert existing rear lot overhead locations on a reactive emergency basis	Expose customers serviced by these lines to prolonged outage and safety risks

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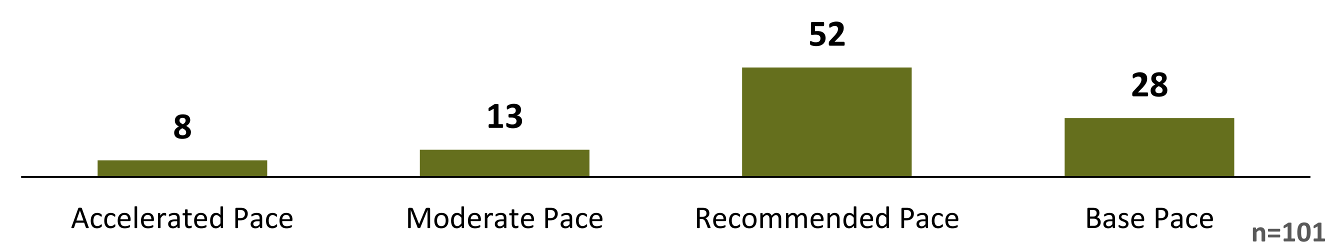

Rate Zone Breakdown	HRZ*	PRZ	GRZ*
Accelerated Pace	1	7	-
Moderate Pace	4	6	3
Recommended Pace	14	33	5
Base Pace	5	16	7

* Small sample size, interpret with caution. **n-size shown.**

Planning for Expansion, Intensification and Back-up

Expansion, increased intensification and increased back-up projects all involved adding high capacity feeder lines to the grid.

- **Expansion:** Where there is no line or a line might have been initially built to service a farm, it is now serving a subdivision and can no longer meet the needs of those customers.
- **Intensification and redevelopment:** Multiple downtown areas are becoming more densely populated, which has resulted in insufficient supply to meet the increased demand.
- **Back-up capacity:** Because of the way the grid has grown, there are certain areas within Alectra Utilities' service territory that no longer have access to adequate back-up capacity in the case of an outage.

While most expansion related projects cannot be deferred due to the obligation to connect new customers, some intensification and back-up capacity projects could be delayed.

Intensification:

- Since these projects are often completed with other infrastructure projects such as road widening and sewer work, deferral could lead to increased costs and service disruptions.
- Building expansion projects now allows the projects to be built at lower cost with less disruptions than waiting until development is underway and the need is pressing.

Back-up capacity:

- Deferral of back-up projects could lead to increased outage times during contingency condition and may cause reliability issues on some heavily loaded lines.
- Adding back-up capacity now allows for quicker restoration of power when caused by transmission system failures or severe weather events.

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GS > 50 kW – 4,999

Planning for Expansion, Intensification and Back-up

Q Which of the following timing options would you prefer?

Option	2020 – 2024 Expansion & Intensification Projects
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Address all the expansion, intensification and contingency needs identified for the distribution system during 2020-2024.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Address all the expansion needs and many of the intensification and required back-up projects. Some projects related to intensification or back-up capability will be deferred.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Address all expansion projects but defer majority of intensification and all required back-up capability projects. Reliability and power quality may be affected on heavily loaded feeders.
Base Pace *Within current rates*	Complete key expansion projects but defer significant amount of intensification and back up capability projects during 2020 -2024.

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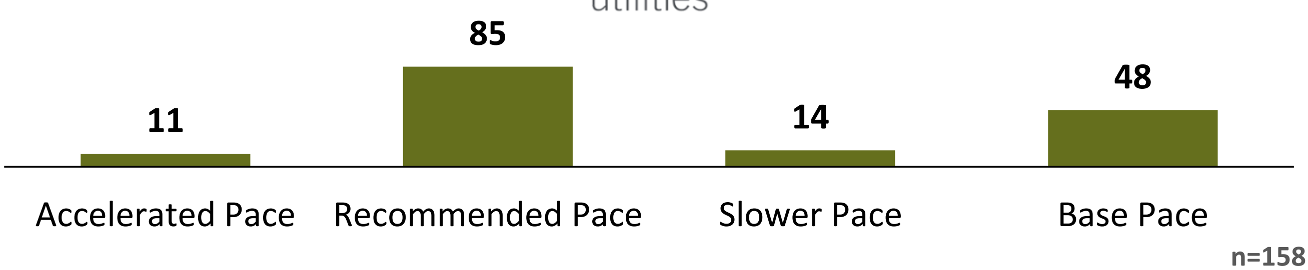

Rate Zone Breakdown	ERZ	BRZ*	HRZ	PRZ	GRZ*
Accelerated Pace	4	-	1	6	-
Recommended Pace	33	3	14	30	5
Slower Pace	3	1	5	4	1
Base Pace	11	2	4	22	9

* Small sample size, interpret with caution. **n-size shown.**

Voltage Conversion

About 8.5% of Alectra Utilities' customers are serviced by low voltage distribution systems. These lines were built in the 1950's and represent some of Alectra Utilities' oldest distribution assets. These lines have much less capacity than modern lines. During an outage, the modern lines cannot be used to restore power to the low voltage lines, because they don't operate at the same voltage levels.

This equipment has become functionally obsolete, and the risk of equipment failure is increasing. Since there is no urgent threat to reliability, there are no low voltage conversion investments included within existing rates.

However, investing in voltage conversion projects would:

- improve reliability through the new lines and transformers;
- provide access to increased supply from higher voltage substations; and
- improve outage restoration from the enhanced back-up and availability of tie points at this higher voltage level.

Online Workbook

Voltage Conversion

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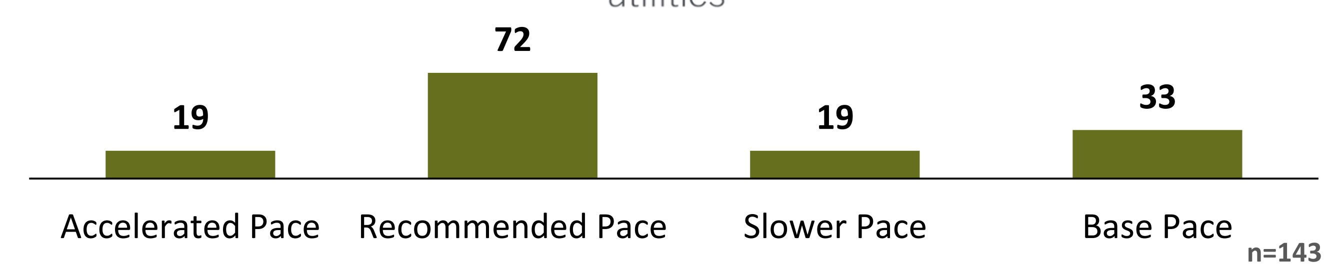
Q Which of the following timing options would you prefer?

Option	Voltage Conversion	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **11** low voltage substations	Enable Alectra Utilities to convert 10,533 customers to present day supply voltage
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **9** low voltage substations	Enable Alectra Utilities to convert 9,984 customers to present day supply voltage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **5** low voltage substations	Enable Alectra Utilities to convert 6,566 customers to present day supply voltage
Base Pace *Within current rates*	Alectra Utilities will not decommission any stations	Current rates support the investment to enable Alectra Utilities to convert 3,600 customer to present day supply voltage



Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ
Accelerated Pace	5	2	1	11
Recommended Pace	30	2	9	31
Slower Pace	5	-	8	6
Base Pace	11	2	6	14

* Small sample size, interpret with caution. **n-size shown.**

Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity in order to provide electricity for existing and new developments; provide more resilience to deal with extreme weather event and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline in Alectra Utilities' quality of service to current customers.

Here in Mississauga, Alectra Utilities has two stations that need investment.

- The proposed new Duke station is located immediately north of Square One and will help serve the growing demands of that area.
- A station in the East Credit area of Mississauga is currently located on leased land that Alectra Utilities would like to purchase for long term security.

The lead time to build a station is 2 to 3 years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures.

Online Workbook

Distribution Stations Capacity (ERZ)

GS > 50 kW – 4,999

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station and increase capacity at one station	Enable Alectra Utilities to build Duke station as well as buy leased land at the East Credit area station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station	Enable Alectra Utilities to build Duke station, while assuming the risk that it will cost more to purchase leased land at a station in East Credit in the future.
Base Pace *Within current rates*	Delay any station capacity investments	Risk that it will cost more to purchase leased land in future. Existing stations likely to experience overloading and increased risk of reliability issues.

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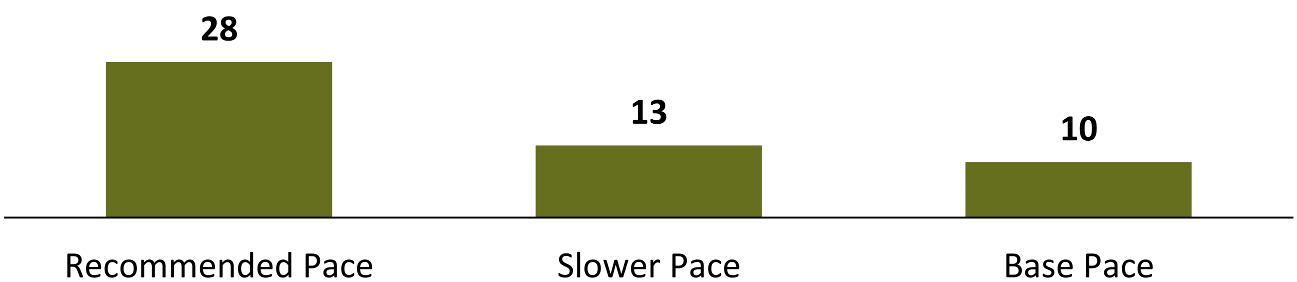


Investment only in Enersource RZ. **n-size shown.**

n=51

Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity to provide electricity for existing and new developments; provide more resilience to deal with extreme weather events and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline Alectra Utilities' quality of service to current customers.

Here in the former PowerStream area, Alectra Utilities has four stations that need investment:

- The existing Melbourne station in Bradford is located on leased land that Alectra Utilities would like to purchase for long-term stability. Furthermore, this station requires an upgrade.
- Barrie and Alliston both have growing demand that will need Alectra Utilities to buy the land for and to build new stations.
- Growth in Markham and Richmond Hill requires building a new transformer station after 2024. However, prior to building this new station, an environmental assessment is needed.

The lead time to build a station is two to three years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures. Alectra Utilities has presented the following options that balance system needs and rate impacts.

Online Workbook

Distribution Stations Capacity (PRZ)

GS > 50 kW – 4,999

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Accelerated Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build two new stations and increase capacity at one station	• Upgrade Bradford station • Build new stations in both Alliston and Barrie • Complete environmental assessment for Markham station.
Recommended Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new stations and increase capacity at one Station	• Upgrade Bradford station • Build station in Alliston • Complete environmental assessment for Markham station. Risk that existing Barrie stations will experience overloading and increased risk of reliability issues.
Base Pace *Within current rates*	Upgrade one station and secure land for future station build.	• Upgrade Bradford station • Complete environmental assessment for Markham station. Risk that existing Alliston and Barrie stations will experience overloading and increased risk of reliability issues.

Investment only in PowerStream RZ. **n-size shown.** **n=62**

Online Workbook

Additional Station Investments | Preamble

GS > 50 kW – 4,999

Additional Station Investments

Beyond the transformers and other equipment that directly operate the grid, other investments are required for security, communications and control systems. Distribution stations play an important role in Alectra Utilities' electricity grid, transforming high voltage electricity to a lower voltage that is suitable for distribution. A failure in a distribution station can result in an outage for thousands of customers.

- **Communications and control systems** allow Alectra Utilities staff in central control rooms to remotely monitor and control the equipment in distribution stations in order to avoid equipment failures and manage failures when they do occur. Monitoring equipment is also used for security purposes.

While new investments to keep these systems up to date would help to maintain reliability and security, delaying these investment is less likely to cause problems compared to delaying other projects discussed earlier.

To manage within existing rates, Alectra Utilities is proposing to postpone any investments in distribution station, communications and control systems. Managers know that as these systems age, there will likely be more outages, but it is not possible to estimate the exact risks involved.

Online Workbook

Additional Station Investments

GS > 50 kW – 4,999

Q Which of the following timing options would you prefer?

Option	Level of Investment	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew communication, replace end-of-life station equipment, obsolete protection equipment and upgrade station facilities.	• Maintain reliability • Ensure reliable communication performance of the system • Increases security at the station.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication, replace end of life station equipment and obsolete protection equipment.	• Maintain reliability • Ensure reliable communication performance of the system • Does not increase security at the station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication and replace end of life station equipment.	• Maintain reliability • Ensure reliable communication infrastructure. • Does not increase security at the station.
Base Pace *Within current rates*	Monitor station equipment and reactively replace when necessary. Defer other investments beyond 2024	This option would require allocating funds from the reactive budget as necessary.

Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Accelerated Pace	6	-	4	8	0
Recommended Pace	32	4	15	33	8
Slower Pace	1	-	2	11	-
Base Pace	12	2	3	10	7

* Small sample size, interpret with caution. **n-size shown.**

Preparing for More Consumer Choice

New technologies are changing the way that consumers are able to interact with the electricity system. Emerging technologies like solar power, battery storage and electric vehicles are constantly evolving; they are becoming more affordable, more widely available, and better performing.

Properly planned and managed, the integration of these technologies with Alectra Utilities' traditional "poles and wires" equipment is expected to provide benefits to customers by way of:

- reducing the amount of infrastructure costs related to meeting the increased demand for electricity; and
- generating electricity more locally, reducing the amount of generation that is needed elsewhere in the province.

Regardless of whether you are considering new energy choices like an electric vehicle for yourself today, the market is changing quickly, and Alectra Utilities must be prepared as adoption becomes more widespread over the next five years. For instance, charging each electric vehicle draws as much energy as two average homes. If a dozen or so people come home and start changing their vehicles at a period of peak demand, it could overload the grid in that neighbourhood. Not being prepared could result in increased equipment failure due to overloaded lines, as well as costly infrastructure upgrades to meet the demand posed by this technology.

Alectra Utilities has identified three pilot projects to ensure the system is ready when more consumers adopt this technology. These pilots are intended to answer questions like;

- *How will the grid respond if a neighbourhood rapidly adopts new technology, such as electric vehicles?*
- *How can Alectra Utilities reduce the strain on the system by using smart technology to dispatch electricity?*

These pilots are not required to meet immediate reliability issues, however, they will help to ensure that Alectra Utilities is able to meet the challenged as more consumers embrace this technology in the next few years.

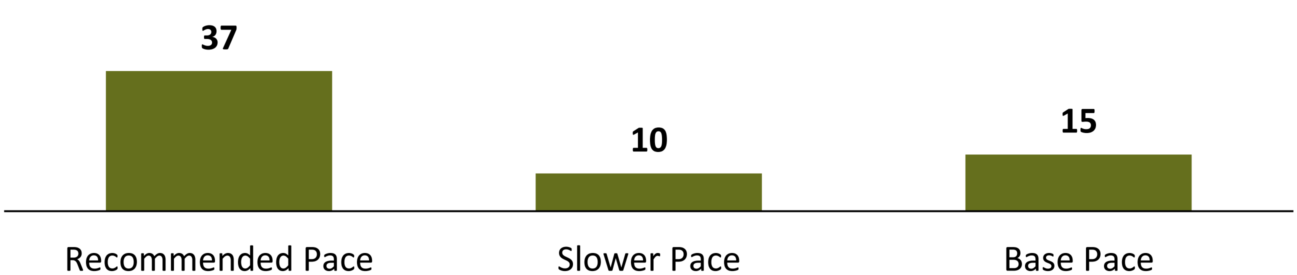
Online Workbook

Preparing for More Consumer Choice

GS > 50 kW – 4,999

Q Which of the following timing options would you prefer?

Option	Approach
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Conduct three pilot projects to prepare to integrate new technology like electric vehicles, solar power and battery storage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Wait until new technology like electric vehicles, solar power and battery storage becomes more widely adopted
Base Pace *Within current rates*	Reactively respond to technology uptake by investing in traditional 'poles and wires' infrastructure as reliability and capacity issues become apparent



Investment only in PowerStream RZ. Small sample size, interpret with caution. **n-size shown.** **n=62**

Investment Alternative Summary

Throughout this workbook, you have been asked about some key choices that could impact your rates. Below is a summary of your answers to the questions that could impact your rates.

At the bottom of this page you will find the total bill impact of all the answers you gave that would result in a bill increase.

Having seen the total bill impact, please review your answers and change your responses if you desire; your potential rate impact will be re-calculated. You will have the opportunity to adjust your answers again until you feel you've reached the best balance for you.

Q GS>50 Customer Bill Impact Change and Magnitude of Bill Impact

Bill Impact Analysis	ERZ	BRZ**	HRZ**	PRZ	GRZ**
Average $ Initial	8.41	9.35	7.05	9.99	2.74
Average $ Final	8.16	7.80	6.84	9.84	3.02
Difference: Initial VS. Final	-($0.24)	-($1.55)	-($0.22)	-($0.15)	$0.27

Differences that are statistically significant at 95% are noted by an asterisk (*).

** Small sample size, interpret with caution.

Online Workbook

Impact of Choices on Rates | Preamble

GS > 50 kW – 4,999

Impact of Choices on Rates

As noted earlier, all the projects identified in this workbook have been evaluated and found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Under the OEB rules, Alectra Utilities can apply for additional rates, beyond the scheduled 1.2% increase, to pay for these improvements.

Alectra Utilities has calculated the rate impact of implementing the options recommended by their planners.

These priorities may change based on your input but give you a sense of the cost for an investment program that aims to:

- maintain reliability for the average customer;
- fix or avoid equipment issues that cause below average reliability for some customers; and
- help the system do a better job of responding to major outages caused by severe weather or transmission grid failures.

Following Alectra Utilities planners' recommended approach would result in an average additional [PIPE-RID1] per month annually for the typical customer in your rate class.

At the end of the 5-year plan, the typical customer in your rate class would see the distribution portion of their electricity bill increase by [PIPE-RID2] above the current projected rate of [PIPE-TOT] in 2024.

Rate Zone Breakdown	ERZ (500-4999kW)	BRZ (700-4999kW)	HRZ	PRZ	GRZ
[PIPE-RID1]	$12.00 ($74.75)	$15.79 ($59.80)	$10.70	$16.23	$8.38
[PIPE-RID2]	$60.00 ($373.75)	$78.96 ($299.02)	$53.49	$81.14	$41.90
[PIPE-TOT]	$1,448.34 ($8,550.9)	$1,710.21 ($6,456.2)	$1,119.83	$1,356.05	$1,712.78

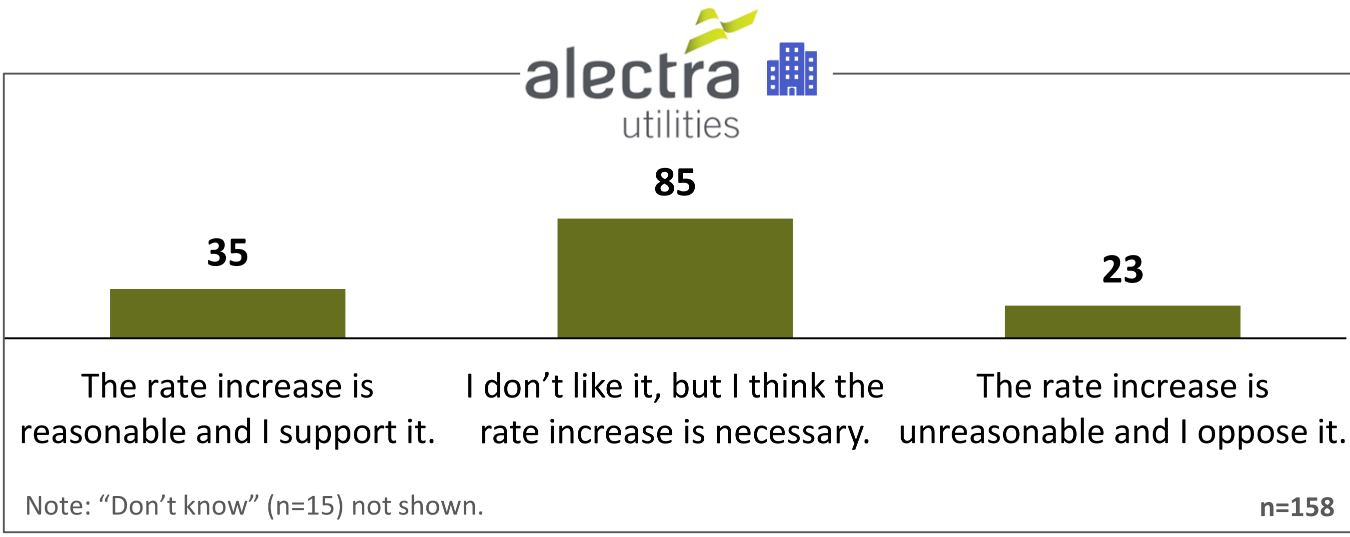
INNOVATIVE RESEARCH GROUP

Online Workbook

Impact of Choices on Rates

GS > 50 kW – 4,999

Q Which of the following statements best represents your view?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
The rate increase is reasonable and I support it	13	2	3	16	1
I don't like it, but I think the rate increase is necessary	27	2	16	31	9
The rate increase is unreasonable and I oppose it	8	2	1	9	3
Don't know	3	-	4	6	2
Reasonable and support it + don't like it, but think it's necessary	**40/51**	**4/6**	**19/24**	**47/62**	**10/15**

* Small sample size, interpret with caution. **n-size shown.**

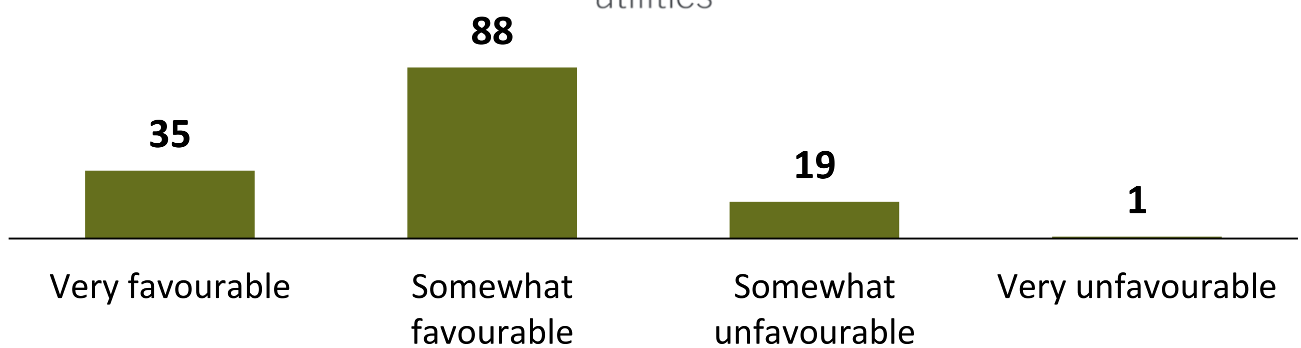
Online Workbook

Workbook Diagnostics | Overall Impression

GS > 50 kW – 4,999

Q Did you have a favourable or unfavourable impression of the workbook you just completed?

alectra utilities



Note: "Don't know" (n=15) not shown.

n=158

Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Very favourable	12	2	4	12	5
Somewhat favourable	29	2	15	37	5
Somewhat unfavourable	4	2	1	8	4
Very unfavourable	1	-	-	-	-
Don't know	5	-	4	5	1
Favourable	**41**	**4**	**19**	**49**	**10**
Unfavourable	**5**	**2**	**1**	**8**	**4**

* Small sample size, interpret with caution. **n-size shown.**

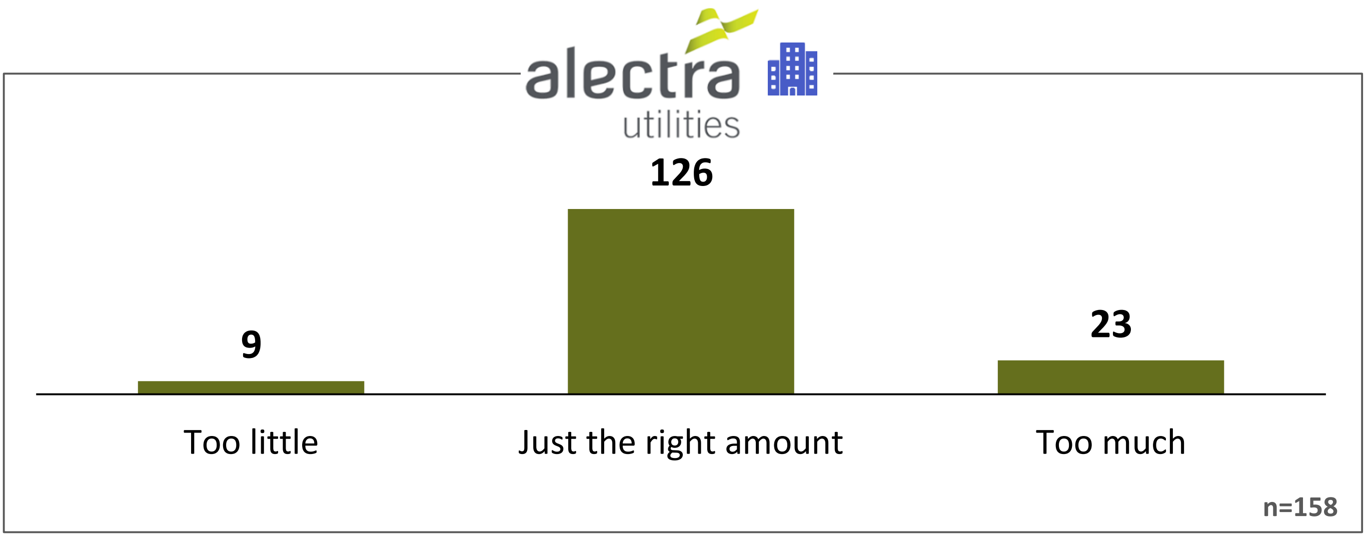
INNOVATIVE RESEARCH GROUP

Online Workbook

GS > 50 kW – 4,999

Workbook Diagnostics | Volume of Information

Q Did Alectra Utilities provide too much information, not enough, or just the right amount?



Rate Zone Breakdown	ERZ	BRZ*	HRZ*	PRZ	GRZ*
Too little	1	1	1	4	2
Just the right amount	36	5	20	53	12
Too much	14	-	3	5	1

* Small sample size, interpret with caution. **n-size shown.**

Large Use Customers

Online Workbook Results

Methodology

Large Use Online Workbook

INNOVATIVE was engaged by Alectra Utilities Corporation (Alectra Utilities) in this study to gather input on preferences on program timing and balancing outcomes. **Pages 185 to 230** show the actual pages of the workbook that was sent and completed by customers. The only additions are the actual results.

Field Dates & Workbook Delivery

The **Large Use Online Workbook** was sent to all Alectra Utilities Large Use customers, all of whom have provided Alectra Utilities with a direct email address. Customers had an opportunity to complete the workbook between April 29th and May 15th, 2019.

Each customer received a workbook customised to their rate zone and class using a unique URL that could be linked back to their consumption data, region and rate class. Alectra Utilities Key Account representative followed-up with each of these customers by telephone in order to encourage their participation.

Large Use Online Workbook Completes

A total of **18** (unweighted) Alectra Utilities Large Use customers completed the online workbook via a unique URL.

Alectra Utilities provided INNOVATIVE with an email contact list consisting of the prime contact for each of its 28 Large Use customers. Only customers identified by Alectra Utilities were able to complete the survey and complete the survey only once.

The analysis of this report is based on 18 of 28 Large Use customers (a survey completion rate of 64%).

Individual Large Use customer responses were anonymous and no identifiable respondent information was shared with Alectra Utilities. Responses were combined to protect the confidentiality of individual customers.

Rate Zone	# of Large Use customers who completed workbook
Enersource	n=5
Brampton	n=5
Horizon	n=7
PowerStream	n=1
Guelph	n=0
Total	**n=18**

Online Workbook

Large Use

Welcome to Alectra Utilities' planning consultation!

We need your input on choices that will affect the service you receive and the price you pay.

1. Alectra Utilities is developing its investment plan for 2020 to 2024. This plan will determine the investments Alectra Utilities makes in equipment and infrastructure, the services it provides, and the rates you pay.
2. **Alectra will be accountable to the public regulator, both in terms of sharing what customers say and demonstrating how they considered those views.**
3. You don't need to be an electricity expert to participate in this consultation. This workbook is focused on basic choices and provides the background information you need to answer the questions.
4. All you need to do is provide your feedback on between **7 and 13 choices.** If you can give half an hour now, Alectra Utilities can finalize its plan to serve customers like you for the next five years.

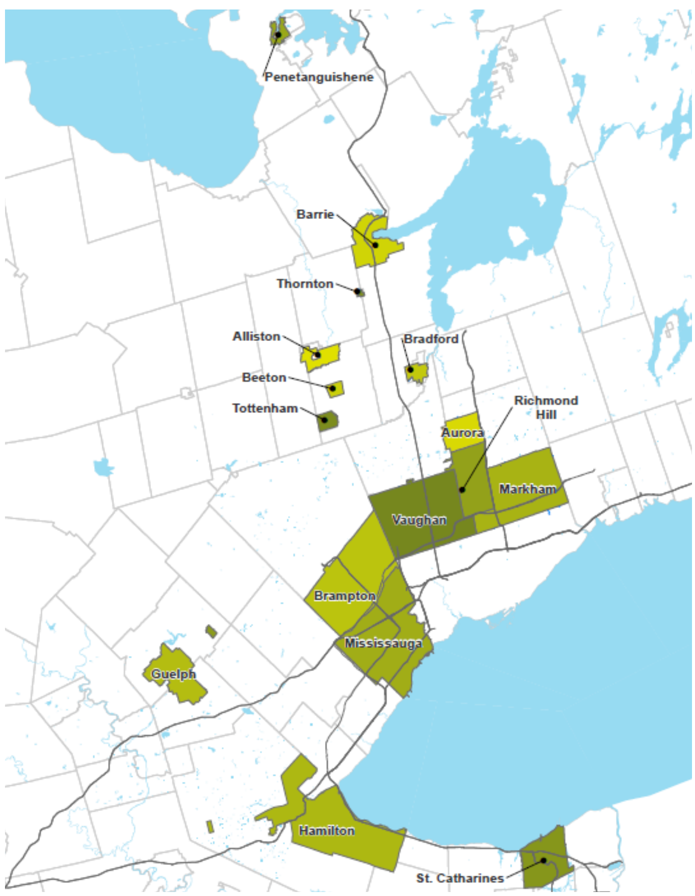
Those who complete the questions that follow will be invited to enter a draw to win one of ten (10) $500 prepaid credit cards.

All of your individual responses will be kept confidential. Innovative Research Group (INNOVATIVE), an independent research company, has been hired to gather your feedback.

If you are reading this on a smaller mobile device, you may want to consider accessing the survey from a tablet, desktop or laptop instead so that it is easier for you to read.

Who is Alectra Utilities?

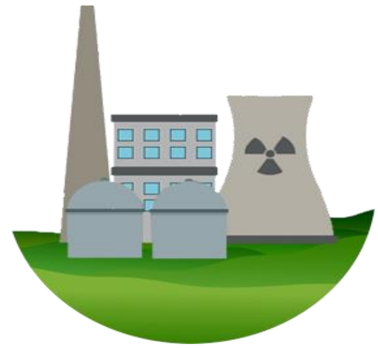
Alectra Utilities is preparing its first consolidated Distribution System Plan. Alectra Utilities is the union of five leading Ontario utilities – Enersource, Horizon Utilities, Brampton Hydro, PowerStream and Guelph Hydro. Alectra Utilities now serves over one million customers.



Alectra Utilities provides services to customers in all of these areas. However, customer rates are based on the cost of serving only the area that you live in.

Understanding Alectra Utilities' role in Ontario's electricity system

Ontario's electricity system is owned and operated by public, private and municipal corporations across the province. It is made up of three components: generation, transmission and distribution.



1 Generation

Where electricity comes from.

Ontario's electricity is generated by nuclear, natural gas, hydroelectric and renewable technologies, such as wind and solar. In Ontario, about 50% of electricity is generated by Ontario Power Generation, which has generation stations across the province.

2 Transmission

Electricity travels across Ontario.

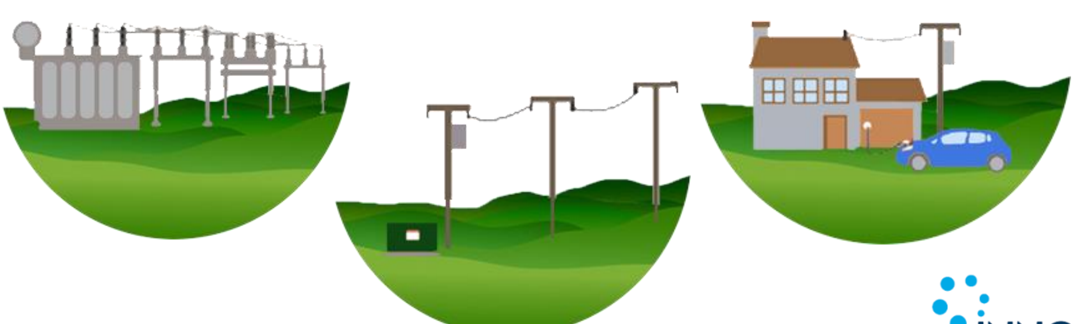
Once electricity is generated, it must be transported to urban and rural areas across the province. This happens by way of high voltage transmission lines that serve as highways for electricity. The province has more than 30,000 kilometres of transmission lines.

3 Local Distribution

Delivering power to homes and businesses in your community.

Alectra Utilities is responsible for the last step of the journey: distributing electricity to customers through its distribution network. This local grid includes transformer stations of various sizes and designs that decrease the voltage of the electricity so it can be used in your home or business.

Across Alectra Utilities' service territory, there are 16,400 km of overhead powerlines and 22,140 km of underground cable.

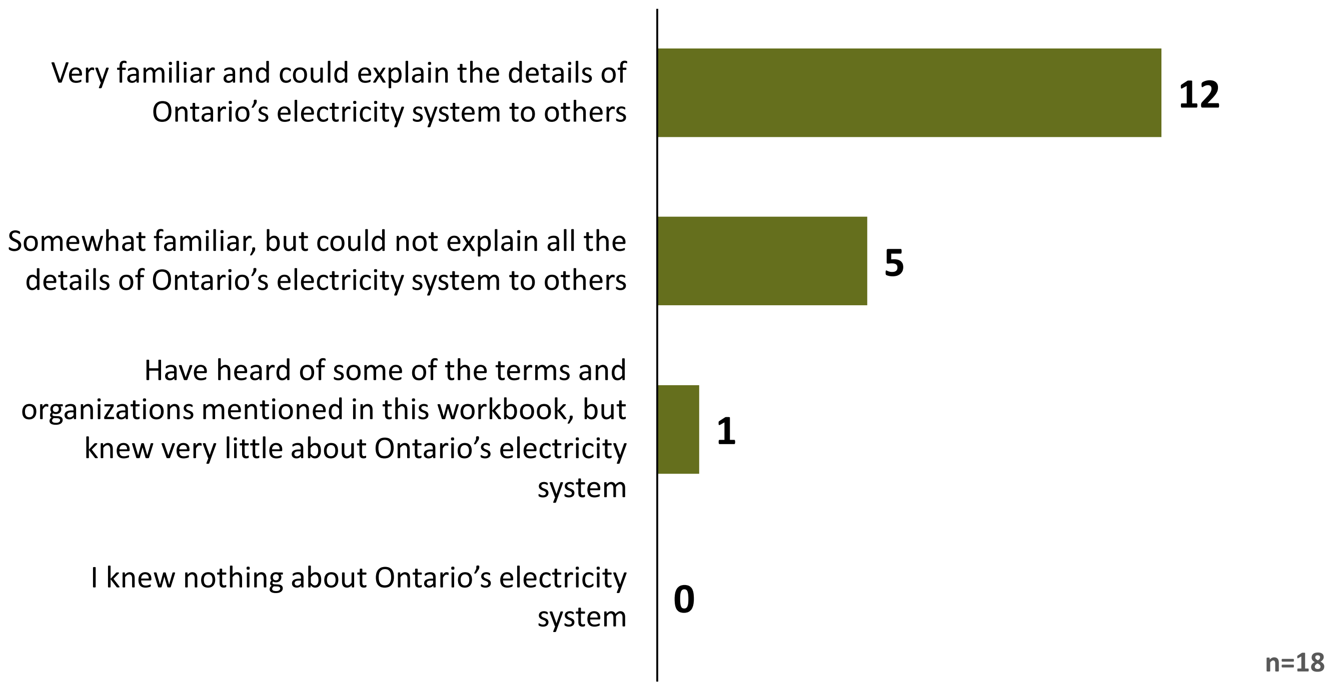


Online Workbook

Large Use

Understanding Alectra Utilities' role in Ontario's electricity system

Q Before this consultation, how familiar were you with the various parts of the electricity system and how they work together?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very familiar	2	4	5	1	-
Somewhat familiar	2	1	2	-	-
Heard of some of the terms and organizations	1	-	-	-	-
Knew nothing about the electricity system	-	-	-	-	-

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

How much of you bill goes to Alectra Utilities?

Large Use

How much of you bill goes to Alectra Utilities?

- Every item and charge on your bill is mandated by the provincial government or regulated by the **Ontario Energy Board (OEB)**, the provincial energy regulator.
- While Alectra Utilities is responsible for collecting payment for the entire electricity bill, it retains only the distribution portion of the delivery charge.
- **Distribution makes up about [PIPE-PER] of the typical Large Use customer's bill.**
- The rest of your bill is passed onto provincial transmission companies, power generation companies, the government and regulatory agencies.

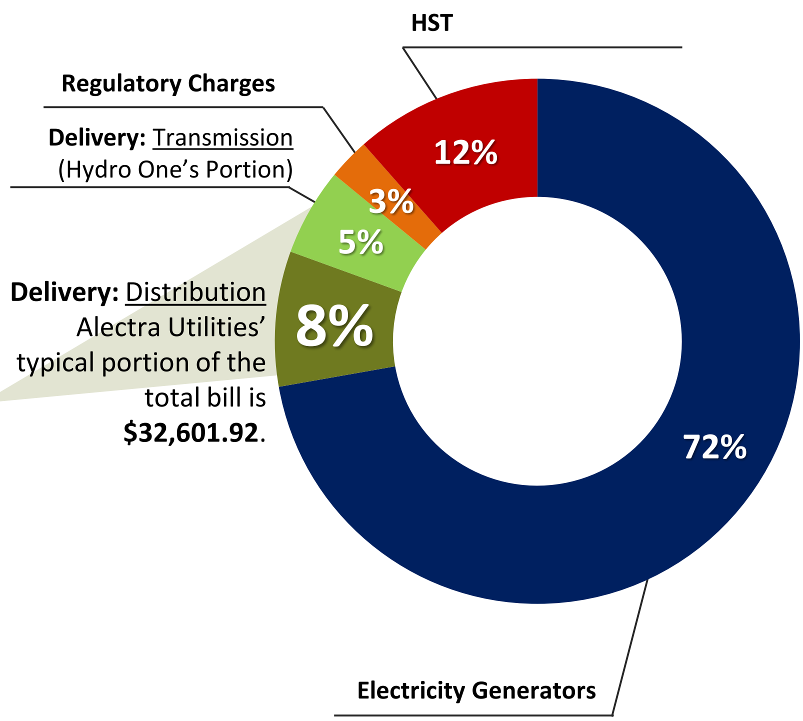
Typical Large Use Customer Bill

Sample Alectra Utilities Monthly Bill
(Based on 5,000 kW Monthly Demand)

Account Number:
000 000 000 000 0000

Meter Number:
00000000

Your Electricity Charges	
Electricity Commodity*	$282,993.33
*Commodity based on average IESO wholesale market price	
Delivery	$53,737.86
Regulatory Charges (IESO)	$10,024.29
Total Electricity Charges	**$346,755.48**
HST	$45,078.21
Total Amount	**$391,833.69**



Note: Graphs may not always total 100% due to rounding.

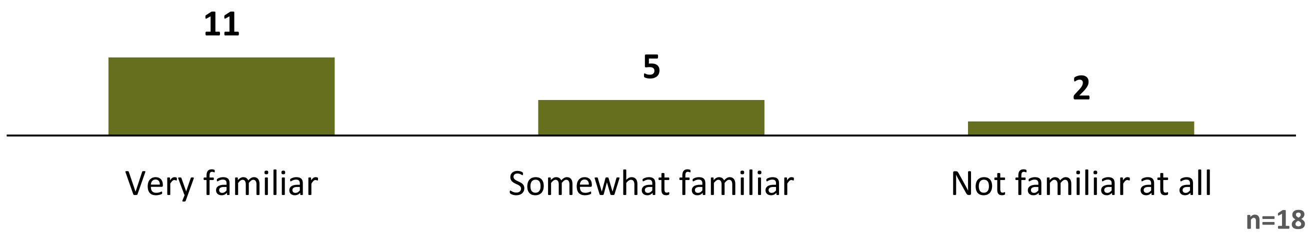
Note: Sample bills were customized for each rate zone and rate class. The above represents a sample Large Use bill in the Horizon rate zone.

Online Workbook

Percentage of bill that goes to Alectra Utilities

Large Use

Q Before this consultation, how familiar were you with the percentage of your electricity bill that goes to Alectra Utilities?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very familiar	2	3	5	1	-
Somewhat familiar	2	2	1	-	-
Not familiar at all	1	-	1	-	-

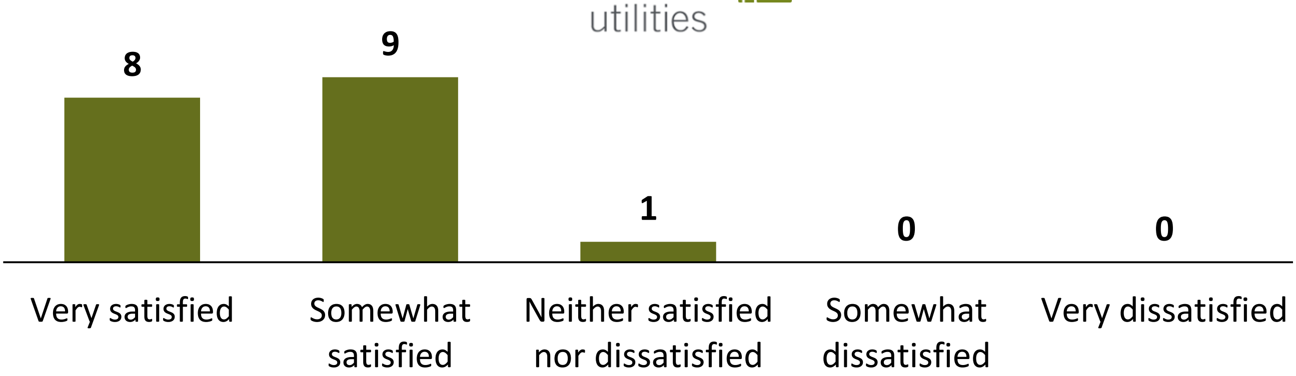
* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Overall satisfaction with Alectra Utilities

Large Use

Q Generally, how satisfied or dissatisfied are you with the services you receive from Alectra Utilities?



Note: “Don’t know” (n=0) not shown.

n=18

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very satisfied	3	4	1	-	-
Somewhat satisfied	2	-	6	1	-
Neutral	-	1	-	-	-
Somewhat dissatisfied	-	-	-	-	-
Very dissatisfied	-	-	-	-	-
Don’t know	-	-	-	-	-

* Small sample size, interpret with caution. **n-size shown.**

INNOVATIVE RESEARCH GROUP

Online Workbook

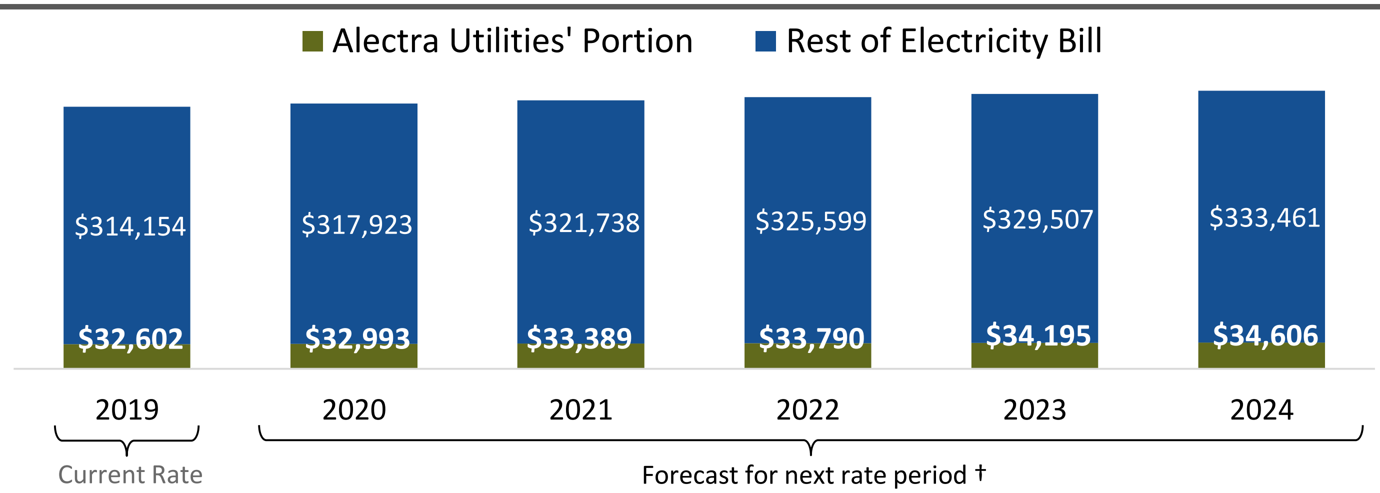
Reliability Experience | Preamble

How much can you expect to pay over the next few years?

Prior to the Alectra Utilities' merger, each predecessor utility had their rates set by the OEB. Until rates are rebased in 2027, your future rate increases will be limited by an OEB-set Price Cap Formula. Each year Alectra Utilities is permitted to increase rates to reflect inflation minus savings targets established by the OEB. **This requires Alectra Utilities to keep cost increases below inflation.**

For customers in your area and rate class, the distribution charge for **the typical bill is estimated to increase by 1.2%** on average for the next five years.

Estimated Typical Large Use Annual Increase in Monthly Bill (Before Tax) ††



Note: Sample bills were customized for each rate zone and rate class. The above represents a sample Large Use bill in the Horizon rate zone.

Where does your money go?

Alectra Utilities has two budgets; **operating and capital.** The operating budget covers recurring expenses, such as salaries, taxes, fuel costs and rent. Under the Price Cap Formula, Alectra Utilities cannot ask for any additional money for operating expenses.

This consultation is about the capital budget. This budget covers things like poles, wires, cables, transformers, computers and programs, vehicles, and buildings.

†† On November 23, 2018, the OEB calculated the value of the inflation factor for incentive rate setting under the Price Cap IR plan of 1.5% for rate changes effective 2019. With a stretch factor of 0.3%, the Price Cap Adjustment for Alectra Utilities was 1.2%. This rate has been used to forecast the rates for 2020-2024. The 2020-2024 rates assumes no changes to electricity rates or the Group 1 riders over the 2020 to 2024 period. The OEB approved bill impact for 2019 was used as the basis for the calculation of forecasted rates for 2020-2024.

Online Workbook

What is this consultation about? | Preamble

What is this consultation about?

This consultation is about finding the right balance between reliability and the price you pay.

The point of this workbook is to allow customers, like yourself, to provide feedback on whether the planners have found the right balance or whether they should consider different options that better reflect your views.

Alectra Utilities is now creating its first overall investment plan as a merged utility. The process started with Alectra Utilities asking customers whether they had any unmet needs and which outcomes Alectra Utilities' plan should focus on. Click here to see more.

Using that input, Alectra Utilities' managers reviewed each part of the utility's business. All the projects identified in this workbook have been found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Now Alectra Utilities is coming back to customers with a final set of choices.

- For each choice, Alectra Utilities has identified an option to stay within existing rates under the price cap formula. It has also identified options to increase investments and, in some areas, where practical, options to reduce investments to make room for increased investments in more pressing areas.
- Planners have indicated the option that in their view provides the best balance between any potential rate increase with the intention to maintain reliability and to fix or avoid pockets of customers that are having significantly below average experiences.
- At the end of the these questions, you will have an opportunity to review your responses and total rate impact of those choices. You will be able to change your responses until you feel you have found the right mix of investments and rate impact, in your view.
- If your preferences result in higher levels of investment than current rates support, Alectra Utilities may apply for a rate increase under the rules established by the OEB. While the exact amount of any rate increase would consider the views collected in this consultation, the workbook will ask you for your views on a rate increase that will be sufficient to pay for the planners' recommended options.

Online Workbook

What is this consultation about?

Large Use

Q Do you feel that the purpose of Alectra Utilities' customer consultation is clear?

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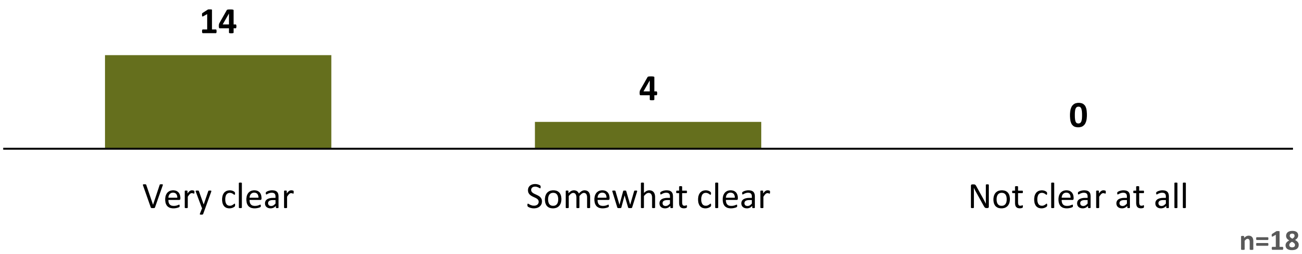


Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very clear	5	4	4	1	-
Somewhat clear	-	1	3	-	-
Not clear at all	-	-	-	-	-

* Small sample size, interpret with caution. **n-size shown.**

INNOVATIVE RESEARCH GROUP

Online Workbook

Reliability Experience | Preamble

Large Use

Reliability Experience

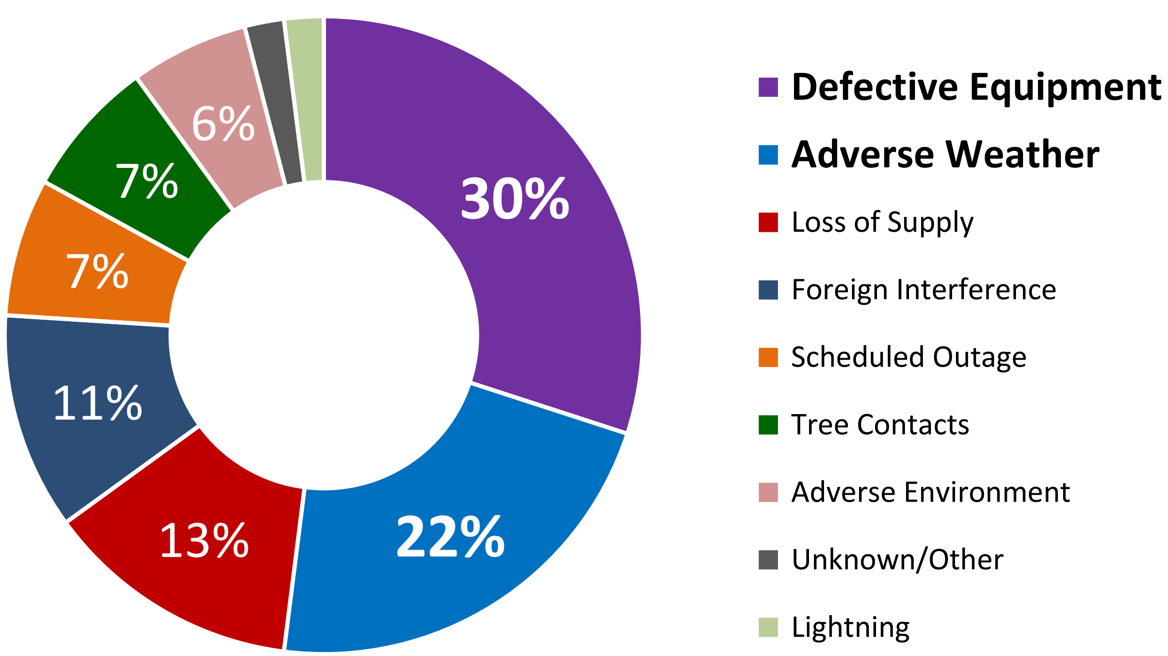
Reliability is a key priority for Alectra Utilities. Since 2014, both the average **number** and **duration** of outages has increased for the typical Alectra Utilities customer.

- The average number of outages (excluding major event days) has increased by an average of 6% per year from 2014-2018, rising from **1.27 to 1.53** over this period.
- The average duration of outages (excluding major event days) has increased by an average of 8% per year from 2014-2018, rising from **0.88 hours to 1.14** hours over this period.

The two primary contributors to outages account for more than 50% of all outages.

1. **Defective equipment** accounted for 30% of customer hours of interruption between 2014-2018, the single largest outage cause.
2. **Adverse weather** is the second leading cause of outages. It accounted for 22% of customer hours of interruption over the same period.

Customer Outage Duration (Hours) by Cause 2014-2018

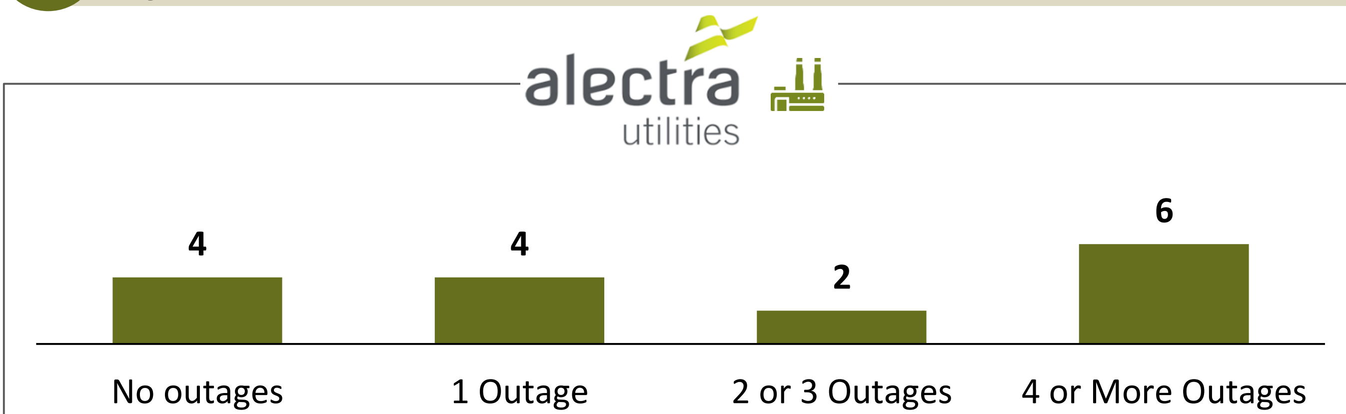


Depending on what rate zone you are in, the subsequent pages will ask you to review between 7 and 13 choices, many of which address the issues identified in the chart above.

Online Workbook
Reliability Experience

Large Use

Q In the past 12 months, how many power outages do you recall experiencing at home/your organization?



Note: "Don't know" (n=2) not shown. **n=18**

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
No outages	1	1	2	-	-
1 outage	-	2	2	-	-
2 or 3 outages	1	-	1	-	-
4 or more outages	3	2	-	1	-
Don't know	-	-	2	-	-

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Mandatory Investments

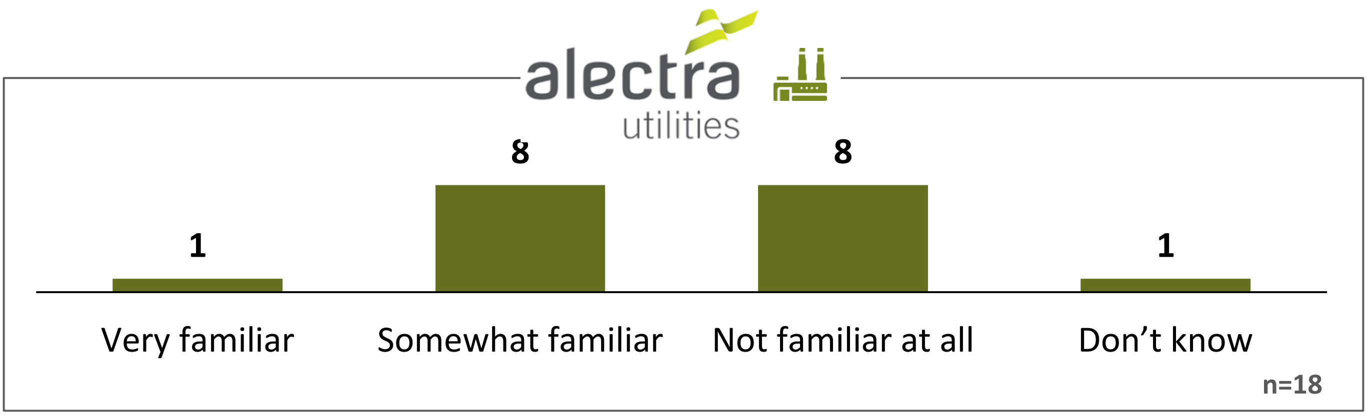
Large Use

Federal, provincial and municipal governments as well as regulators set requirements and standards that Alectra Utilities must satisfy. Mandatory investments can be broken down into three categories:

1. **Connecting customers:** This includes connecting customers to the grid when a new home or building is constructed or modified.
2. **Moving equipment:** This includes moving equipment like poles and cables for road widening.
3. **Mandated obligations:** This includes installing and maintaining customer meters and transferring electricity from the provincial transmission system.

These investments mean that about one-in-five dollars (20%) of your current rates are already committed and not available for other investments

Q Before this consultation, were you familiar that one-in-five dollars (20%) of your current rates are already committed to mandatory investments and not available for other projects?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very familiar	1	-	-	-	-
Somewhat familiar	1	3	4	-	-
Not familiar at all	3	1	3	1	-
Don't know	-	1	-	-	-

* Small sample size, interpret with caution. **n-size shown.**

INNOVATIVE RESEARCH GROUP

Online Workbook

Unplanned Repairs and Replacements

Large Use

On average, each year, Alectra Utilities spends approximately 19 million dollars or 6% of it's core budget to repair or replace equipment that has either failed, will fail imminently, or poses an imminent safety risk. This may include sudden equipment failure, or severe weather taking down a pole in front of your home or business.

There are two possible approaches for how to fund these types of repairs:

1. By delaying other projects that had been planned but not started
2. By establishing an annual allocation for these unplanned repairs and replacements

If Alectra Utilities delays other projects, this can result in needs not being met and can create inefficiencies in project procurement and management.

If Alectra Utilities establishes an allocation for these unplanned repairs and replacements, that money is not available to fund other projects.

Q Which option do you prefer?

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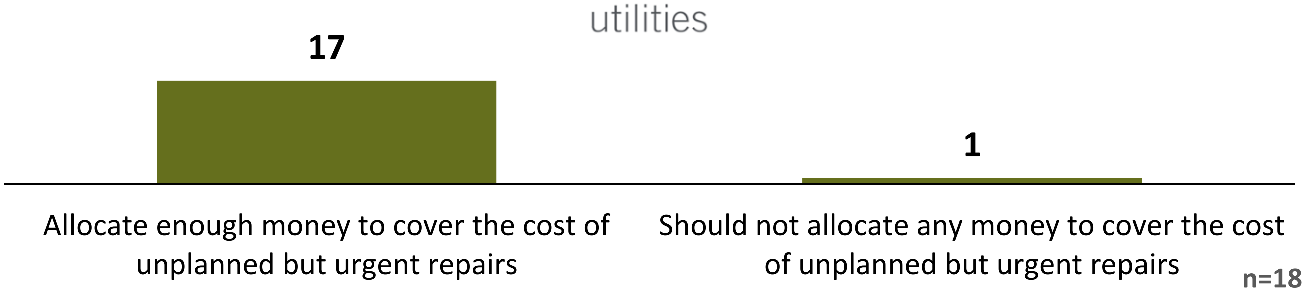


Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Alectra Utilities should allocate enough money (approximately 19 million or 6%) in its core budget to reactive capital to cover the cost of unplanned but urgent repairs	4	5	7	1	-
Alectra Utilities should not allocate any money in its core budget to reactive capital and simply delay planned projects to cover the cost of unplanned but urgent repairs	1	-	-	-	-

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Eliminating Meter Data Security Risks

Large Use

Within the former PowerStream area, Alectra Utilities has identified an older type of meter that could be hacked. These meters collect and transmit information to Alectra Utilities about how much electricity you use, and when you use it, but do not have access to any other personal information.

While these meters are at increased risk of hacking, there has not been a known data breach, and it's possible that they won't be hacked in the future.

Between 2015 and 2019, Alectra Utilities will have replaced 41,000 of these at-risk meters, however, an additional 91,000 will still be in service at the end of 2019.

Alectra Utilities has a decision to make about how quickly or slowly they replace these meters. It's your data and it's your money, so Alectra Utilities would like to know what your preference is.

Q Which of the following options would you prefer?

Option	Expected Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities will be able to address all the metering needs identified for the distribution system during 2020-2024 including the replacement of first generation smart meters that do not support modern levels of data encryption
Base Pace *Within current rates*	Alectra Utilities will be able to address some of the metering needs identified for the distribution system during 2020-2024. Replacement of first generation smart meters that do not support modern levels of data encryption would be deferred beyond 2024

Investment only in PowerStream RZ. Small sample size, interpret with caution. **n-size shown.** **n=1**

Keeping the Business Running

Alectra Utilities is more than just poles and wires – it's a business that needs to invest in equipment such as tools, trucks, buildings, computers and software.

When deciding whether to continue to maintain existing equipment or replace them, Alectra Utilities considers whether the risks and costs of continuing to use them outweigh the benefits of waiting longer to replace them. Alectra Utilities business planning process has identified more needs for equipment investments than current rates will allow.

To stay within existing rates, Alectra Utilities has identified the most urgent priorities, things like: keeping large "bucket" trucks on the road; replacing computer equipment that is no longer functional; and repairing leaking roofs. This would mean that less urgent investments, like vans and other equipment would be delayed.

Alectra Utilities recognizes that delaying the less pressing investments will make it harder for staff to do their jobs safely and maintain reliability and security standards.

Bucket trucks (left) have been identified as the most urgent priority, while investments in vans (right) would be delayed in the *base approach.*

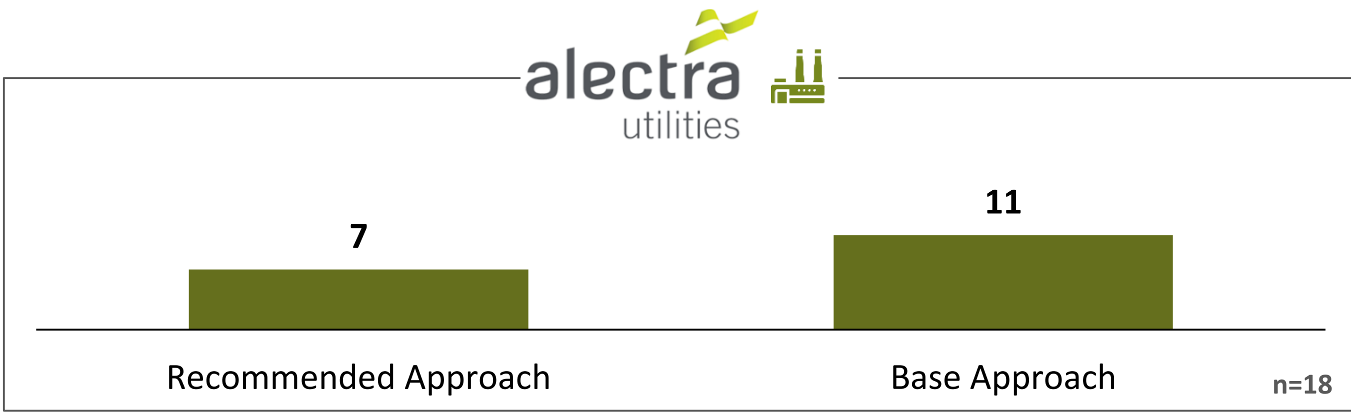
Online Workbook

Keeping the Business Running

Large Use

Q Which of the following options would you prefer?

Option	Outcome
Recommended Approach ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities staff will have access to equipment of the same standard as similar sized businesses
Base Approach *Within current rates*	Stay within its existing rates and only replace the equipment with the most urgent needs



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Recommended Approach	2	2	3	-	-
Base Approach	3	3	4	1	-

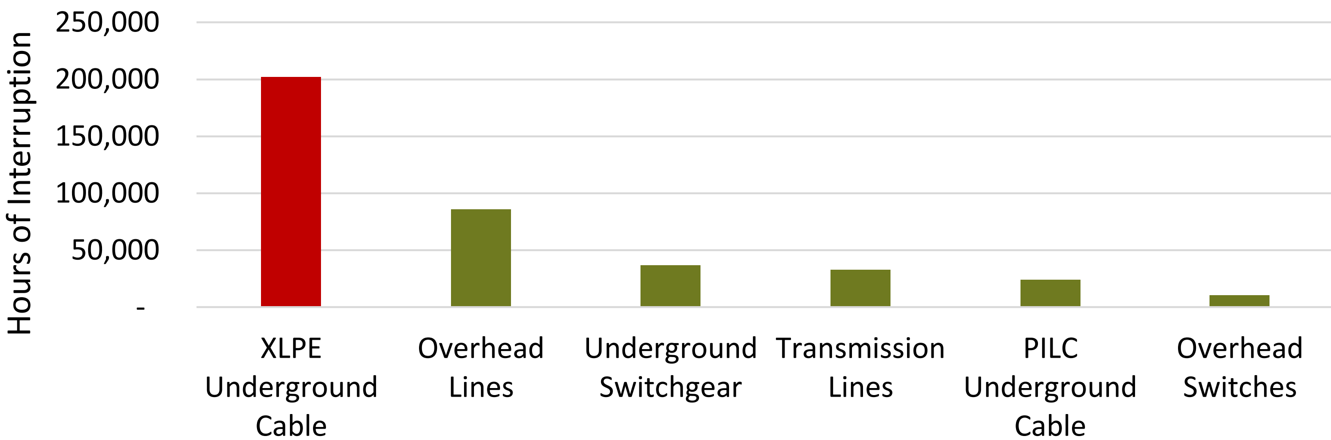
* Small sample size, interpret with caution. **n-size shown.**

INNOVATIVE RESEARCH GROUP

Underground Asset Renewal

Equipment failure is the single largest cause of outages in Alectra Utilities' system. As the chart below illustrates, a particular type of equipment known as cross-linked polyethylene (XLPE) cable is the leading cause of outages across Alectra Utilities' system.

What type of equipment is causing the most outages? (5-year average)



Case Study

The deterioration of these cables is directly impacting customers. For example, the York/Hilda neighbourhood in Vaughan was originally scheduled to have its cables replaced in 2019. But in 2018, customers began to experience a cascading series of prolonged outages, due to cable failures. Cables repaired one week would fail again the next. In the summer, 250 customers experienced eight cable faults (one outage a week). As a result, the cable had to be replaced on an emergency basis at both a higher cost to Alectra Utilities and major inconvenience to the affected customers.

As Alectra Utilities reviewed all of its equipment across all of its operating areas, it became clear that replacing XLPE underground cable requires an accelerated investment plan. To provide the best value to customers, Alectra Utilities will be using two approaches:

- **Cable Rejuvenation**: Cable rejuvenation is a lower-cost solution that can extend the life of these cables without the need to excavate and replace the entire cable. While it is the better value for customers for cables in fair condition, it is not effective for cables that are already declining.

- **Cable Replacement**: In some cases, Alectra Utilities has no prudent choice but to replace the cable. Replacing this equipment now rather than trying to extend its life will cost more now, but will deliver superior reliability over time, relative to older standards of cable.

Alectra Utilities has a decision to make regarding the pace in which they invest in replacing or extending the life of at-risk underground equipment.

Online Workbook

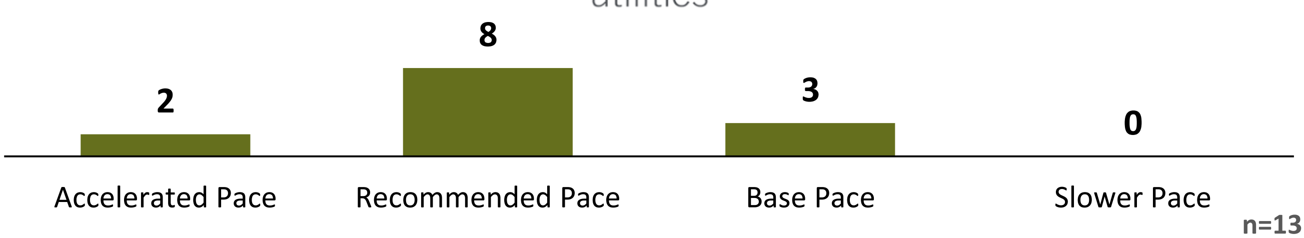
Pacing Investments in the Underground System

Large Use

Within current rates, the reliability of underground cable is expected to further worsen by approximately 4% from current 2018 levels. As such, Alectra Utilities is recommending a pace of cable replacement and rehabilitation that will maintain current levels of reliability.

Q Which of the following cable replacement strategies would you prefer?

Option	Cable replaced or rehabilitated	Expected Reliability Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**2,184 km** by 2024	Improve the reliability of cables by 8% from the current (2018) level
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**1,978 km** by 2024	Maintain the reliability of cables at the current (2018) level
Base Pace *Within current rates*	**1,861 km** by 2024	Reliability of cables to further worsen by 4% from the current (2018) level
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**1,624 km** by 2024	Reliability of cables expected to further worsen by 10% from the current (2018) level



Rate Zone Breakdown	ERZ	HRZ	PRZ
Accelerated Pace	1	-	1
Recommended Pace	3	5	-
Base Pace	1	2	-
Slower Pace	-	-	-

* Small sample size, interpret with caution. **n-size shown.**

Keeping Pace with Overhead System Renewal

Compared to previous years, Alectra Utilities is considering slowing down its overall spending on poles and wires, known as the overhead system. There are two primary reasons for this proposed reduction in spending:

1. **Additional focus on the underground system:** As noted earlier, customers served by the underground system are having more reliability issues than customers served by overhead lines.

2. **New technology increasing the lifespan of poles:** Advancements in testing and inspections are enabling Alectra Utilities to keep overhead poles and wires in service for longer and have enabled the utility to be smarter about replacing aging equipment.

Based on a recent condition study, most poles in Alectra Utilities' overhead system are in good or excellent condition. However, the study identified that 8,110 or 7.5% of the poles in Alectra Utilities' system are currently in poor or very poor condition. Alectra Utilities also projects that a portion of the 15% of poles currently in fair condition will deteriorate into poor or very poor condition over the next five years and will need to be replaced.

Generally, Alectra Utilities tries to replace groups of poles in similar condition which allows for a lower average cost of replacement than replacing poles one at a time. While the slower option reduces the total amount of spending, the cost per pole is higher because it would involve doing more single-pole replacements and more replacements that require overtime labour.

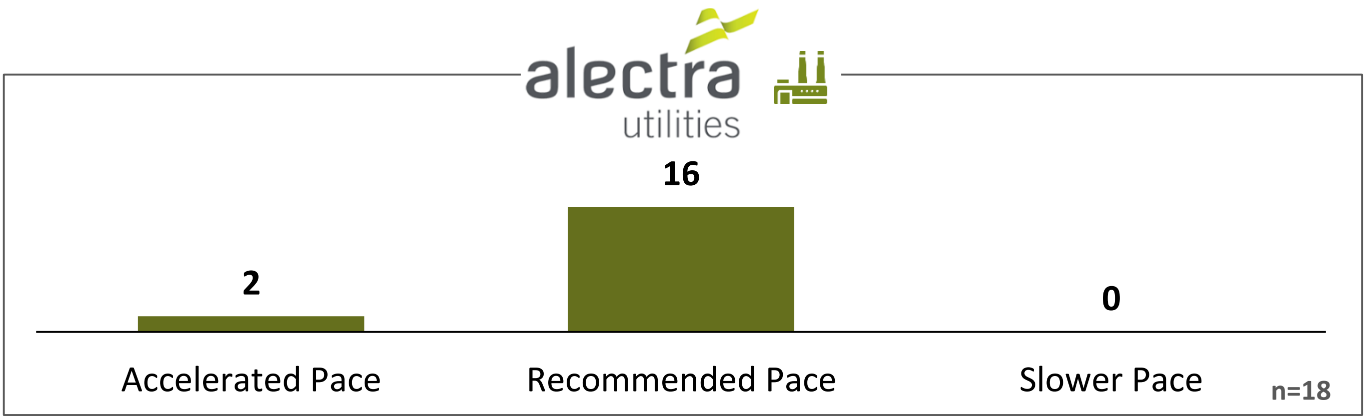
Online Workbook

Keeping Pace with Overhead System Renewal

Large Use

Q Which of the following options would you prefer?

Option	Poles replaced	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**8,110** by 2024	Address **all of the poor and very poor poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Recommended Pace *Within current rates*	**4,830** by 2024	Address **most of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**3,190** by 2024	Address **half of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ
Accelerated Pace	1	1	-	-
Recommended Pace	4	4	7	1
Slower Pace	-	-	-	-

* Small sample size, interpret with caution. **n-size shown.**

Alectra Utilities' Transformer Replacement Program

Transformers are a critical piece of distribution equipment that reduce voltage from the higher levels that are more efficient to move electricity long distances to lower levels that are safer to connect to homes and offices. They can either be located on the ground, in underground vaults or attached to distribution poles

- Through the annual Asset Condition Assessment, Alectra Utilities has identified that 2,998 transformers are now in a *poor* or *very poor* condition. Alectra Utilities already has funded plans to replace 1,148 of these transformers. However, there will still be a need to replace 1,850 transformers based on present day condition assessments.
- Over the next five years, Alectra Utilities projects that another 2,000 transformers will deteriorate and will need to be replaced as well.
- In addition to the *poor* and *very poor* condition transformers, Alectra Utilities has identified another 900 transformers that need to be replaced due to unsafe legacy configurations or that are consistently overloaded in current conditions.

Online Workbook

Alectra Utilities' Transformer Replacement Program

Large Use

Q Which of the following options would you prefer?

Option	Transformers replaced	Expected Outcome
Accelerated Pace ***Additional*** *\$X.XX per month annually (\$Y.YY more per bill by 2024)*	**4,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations or are consistently overloaded. • Replace all transformers that will decline to poor and very poor condition over the next five years
Recommended Pace *Within current rates*	**2,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations that are consistently overloaded
Slower Pace ***Decrease*** *of \$X.XX per month annually (\$Y.YY less per bill by 2024)*	**1,850** by 2024	• Replace only transformers currently assessed to be in poor or very poor condition

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Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	-	1	-	-	-
Recommended Pace	5	3	6	1	-
Slower Pace	-	1	1	-	-

* Small sample size, interpret with caution. **n-size shown.**

Monitoring and Control Equipment

Using proven technology like pole top monitors and automated switches allows Alectra Utilities to automatically reroute power during outages and planned maintenance, reducing the length of time customers are without power and reducing reliance on crews who need to travel to the site to physically reroute power.

When Alectra Utilities is rebuilding existing lines, it typically replaces equipment that is like-for-like. That means, rebuilt older lines would not have monitoring and control equipment installed.

Alectra Utilities is proposing a different approach for its main feeder lines. Feeder lines are high capacity lines that bring electricity from substations to the lines that connect to homes or businesses. An outage on a feeder line can impact a 1,000 or more customers. Alectra Utilities is planning to phase in monitoring and control equipment to each feeder in the system, so that when power does go out, it can be quickly restored for large numbers of customers.

Each of the three options will continue to phase in this equipment during typical renewal. The difference is in how quickly they modify the remaining feeder lines.

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Monitoring and Control Equipment

Q Which of the following options would you prefer?

Option	Devices installed over next 5 years	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**284** 95 additional targeted reliability improvements	Projected to improve reliability by 17% for approximately 142,000 customers. <u>All feeders would be automated in 10 years</u>
Recommended Pace *Within current rates*	**189** 47 additional worst performing feeders	Projected to improve reliability by 17% for approximately 95,000 customers. <u>All feeders would be automated in 15 years</u>
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**142**	Projected to improve reliability by 17% for approximately 71,000 customer. <u>All feeders would be automated in 20 years</u>

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	2	1	3	1	-
Recommended Pace	3	4	3	-	-
Slower Pace	-	-	1	-	-

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Converting Rear Lot Service | Preamble

Converting Rear Lot Service

Alectra Utilities' service area contains multiple older suburban and urban neighbourhoods with rear lot or "backyard" infrastructure. In general, rear lot electricity lines are 40 years of age or older. This type of equipment presents three primary problems:

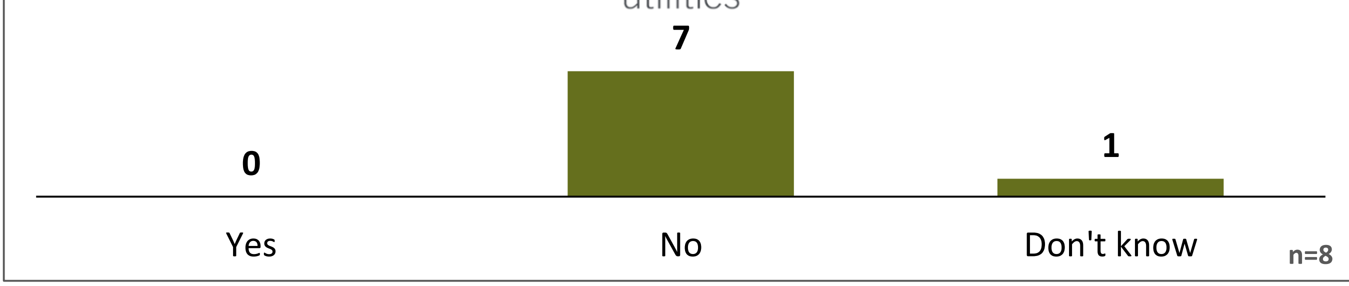
1. Repairs and maintenance are complicated because these lines are in the backyard of homes, rather than the front. Often regular equipment cannot access the backyards and repair crews need to work around trees, pools, sheds and other obstacles.

2. Rear lot equipment is subject to greater tree contact, especially during severe weather

3. The equipment presents elevated safety risks to the general public should the assets fail.

An Alectra Utilities study showed that rear lot restoration times are approximately 4.55 hours. This is three times higher than a comparable front lot restoration time of 1 to 1.4 hours.

Q To the best of your knowledge, does your power come from a line in a backyard behind your home?



Rate Zone Breakdown	HRZ	PRZ	GRZ
Yes	-	-	-
No	6	1	-
Don't know	1	-	-

* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Converting Rear Lot Service

Large Use

Alectra Utilities has two choices to make in dealing with rear lot service, a design choice and a timing choice. The first question relates to what design approach the utility chooses. The options below assume that all rear lot equipment is converted within the next 70 years.

Q Which of the following design approaches would you prefer?

Option	Rear lot or "backyard" equipment design choices
Reactive Approach ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Reactively** replace rear lot assets when they have reached their physical end-of-life criteria, knowing that there could be prolonged reliability impacts. This option leaves customers vulnerable to longer than average storm outages and resulting safety risks.
New poles in backyard ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** replace old poles and equipment, with new poles and equipment in backyards. This would improve day-to-day reliability but leaves customers vulnerable to longer than average storm outages, and resulting safety risks.
Partial Underground ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** re-locate some rear lot infrastructure to front lot underground. This would address some of the vulnerability to longer than average storm outages and resulting safety risks.
Full Underground ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** re-locate all rear lot infrastructure to front lot underground. This would completely resolve the vulnerability to longer than average storm outages and resulting safety risks.

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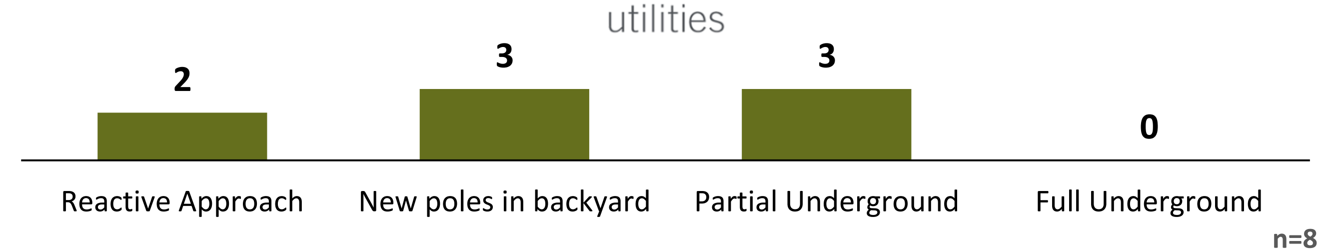

Rate Zone Breakdown	HRZ	PRZ	GRZ
Reactive Approach	1	1	-
New poles in backyard	3	-	-
Partial Underground	3	-	-
Full Underground	-	-	-

* Small sample size, interpret with caution. **n-size shown.**

Timing of a Rear Lot Conversion Program

Approximately 11,000 customers throughout the former Horizon, PowerStream and Guelph Hydro rate zones are supplied by rear lot lines.

Because rear lot lines have reasonable reliability in normal weather, Alectra Utilities has given other projects priority within its current approved rates. However because rear lot conversions will reduce customer exposure to prolonged outages, and safety risks, Alectra Utilities has identified three timing options to replace rear lot lines proactively.

The exact cost will depend on the design, but for your feedback the options assume the full replacement with front lot underground service.

Examples of rear lot equipment

Online Workbook

Timing of a Rear Lot Conversion Program

Large Use

Q Which of the following timing options would you prefer?

Option	Pacing of renewal and conversion	Service renewed and converted over 5-year period
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **30 year period**	Approximately **1,810 customers** (16% of customer with rear lot)
Moderate Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **40 year period**	Approximately **1,360 customers** (12% of customer with rear lot)
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **70 year period**	Approximately **851 customers** (8% of customer with rear lot)
Base Pace *Within current rates*	Renew and convert existing rear lot overhead locations on a reactive emergency basis	Expose customers serviced by these lines to prolonged outage and safety risks

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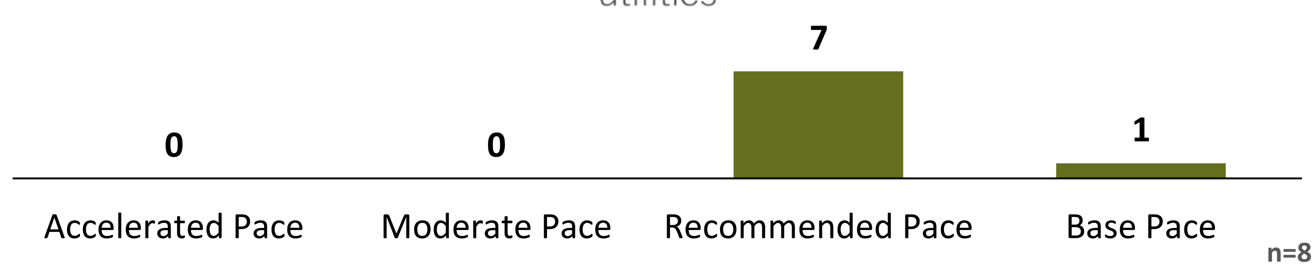

Rate Zone Breakdown	HRZ	PRZ	GRZ
Accelerated Pace	-	-	-
Moderate Pace	-	-	-
Recommended Pace	6	1	-
Base Pace	1	-	-

* Small sample size, interpret with caution. **n-size shown.**

Planning for Expansion, Intensification and Back-up

Expansion, increased intensification and increased back-up projects all involved adding high capacity feeder lines to the grid.

- **Expansion:** Where there is no line or a line might have been initially built to service a farm, it is now serving a subdivision and can no longer meet the needs of those customers.
- **Intensification and redevelopment:** Multiple downtown areas are becoming more densely populated, which has resulted in insufficient supply to meet the increased demand.
- **Back-up capacity:** Because of the way the grid has grown, there are certain areas within Alectra Utilities' service territory that no longer have access to adequate back-up capacity in the case of an outage.

While most expansion related projects cannot be deferred due to the obligation to connect new customers, some intensification and back-up capacity projects could be delayed.

Intensification:

- Since these projects are often completed with other infrastructure projects such as road widening and sewer work, deferral could lead to increased costs and service disruptions.
- Building expansion projects now allows the projects to be built at lower cost with less disruptions than waiting until development is underway and the need is pressing.

Back-up capacity:

- Deferral of back-up projects could lead to increased outage times during contingency condition and may cause reliability issues on some heavily loaded lines.
- Adding back-up capacity now allows for quicker restoration of power when caused by transmission system failures or severe weather events.

Online Workbook

Planning for Expansion, Intensification and Back-up

Large Use

Q Which of the following timing options would you prefer?

Option	2020 – 2024 Expansion & Intensification Projects
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Address all the expansion, intensification and contingency needs identified for the distribution system during 2020-2024.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Address all the expansion needs and many of the intensification and required back-up projects. Some projects related to intensification or back-up capability will be deferred.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Address all expansion projects but defer majority of intensification and all required back-up capability projects. Reliability and power quality may be affected on heavily loaded feeders.
Base Pace *Within current rates*	Complete key expansion projects but defer significant amount of intensification and back up capability projects during 2020 -2024.

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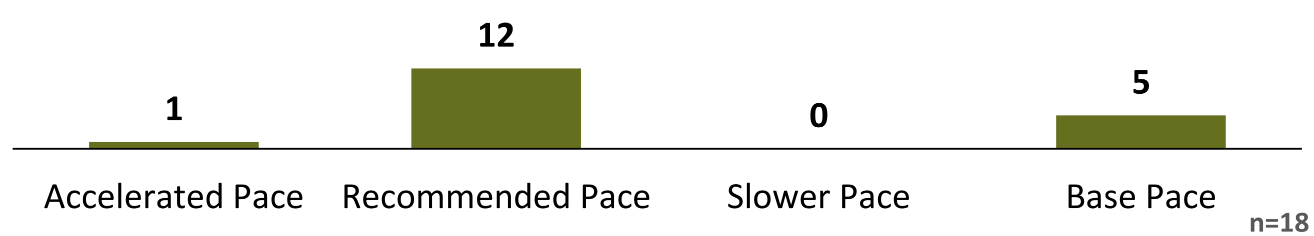

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	-	-	-	1	-
Recommended Pace	5	3	4	-	-
Slower Pace	-	-	-	-	-
Base Pace	-	2	3	-	-

* Small sample size, interpret with caution. **n-size shown.**

Voltage Conversion

About 8.5% of Alectra Utilities' customers are serviced by low voltage distribution systems. These lines were built in the 1950's and represent some of Alectra Utilities' oldest distribution assets. These lines have much less capacity than modern lines. During an outage, the modern lines cannot be used to restore power to the low voltage lines, because they don't operate at the same voltage levels.

This equipment has become functionally obsolete, and the risk of equipment failure is increasing. Since there is no urgent threat to reliability, there are no low voltage conversion investments included within existing rates.

However, investing in voltage conversion projects would:

- improve reliability through the new lines and transformers;
- provide access to increased supply from higher voltage substations; and
- improve outage restoration from the enhanced back-up and availability of tie points at this higher voltage level.

Online Workbook

Voltage Conversion

Large Use

Q Which of the following timing options would you prefer?

Option	Voltage Conversion	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **11** low voltage substations	Enable Alectra Utilities to convert 10,533 customers to present day supply voltage
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **9** low voltage substations	Enable Alectra Utilities to convert 9,984 customers to present day supply voltage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **5** low voltage substations	Enable Alectra Utilities to convert 6,566 customers to present day supply voltage
Base Pace *Within current rates*	Alectra Utilities will not decommission any stations	Current rates support the investment to enable Alectra Utilities to convert 3,600 customer to present day supply voltage

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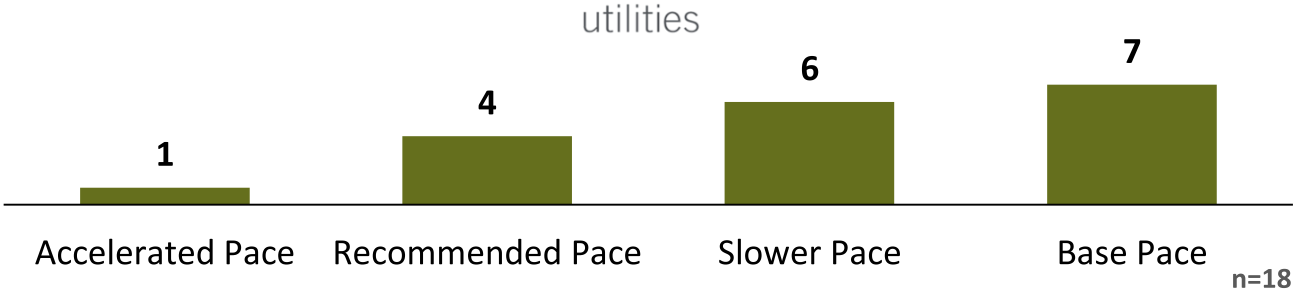

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ
Accelerated Pace	-	1	-	-
Recommended Pace	1	-	2	1
Slower Pace	4	2	-	-
Base Pace	-	2	5	-

* Small sample size, interpret with caution. **n-size shown.**

Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity in order to provide electricity for existing and new developments; provide more resilience to deal with extreme weather event and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline in Alectra Utilities' quality of service to current customers.

Here in Mississauga, Alectra Utilities has two stations that need investment.

- The proposed new Duke station is located immediately north of Square One and will help serve the growing demands of that area.
- A station in the East Credit area of Mississauga is currently located on leased land that Alectra Utilities would like to purchase for long term security.

The lead time to build a station is 2 to 3 years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures.

Online Workbook

Distribution Stations Capacity (ERZ)

Large Use

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station and increase capacity at one station	Enable Alectra Utilities to build Duke station as well as buy leased land at the East Credit area station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station	Enable Alectra Utilities to build Duke station, while assuming the risk that it will cost more to purchase leased land at a station in East Credit in the future.
Base Pace *Within current rates*	Delay any station capacity investments	Risk that it will cost more to purchase leased land in future. Existing stations likely to experience overloading and increased risk of reliability issues.

enersource | alectra utilities

Investment only in Enersource RZ. Small sample size, interpret with caution. **n-size shown**. **n=5**

Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity to provide electricity for existing and new developments; provide more resilience to deal with extreme weather events and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities’ is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities’ substations are approaching capacity limits. Delaying planned investments could result in a decline Alectra Utilities‘ quality of service to current customers.

Here in the former PowerStream area, Alectra Utilities has four stations that need investment:

- The existing Melbourne station in Bradford is located on leased land that Alectra Utilities would like to purchase for long-term stability. Furthermore, this station requires an upgrade.
- Barrie and Alliston both have growing demand that will need Alectra Utilities to buy the land for and to build new stations.
- Growth in Markham and Richmond Hill requires building a new transformer station after 2024. However, prior to building this new station, an environmental assessment is needed.

The lead time to build a station is two to three years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures. Alectra Utilities has presented the following options that balance system needs and rate impacts.

Online Workbook

Distribution Stations Capacity (PRZ)

Large Use

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually (\$Y.YY more per bill by 2024)*	Build two new stations and increase capacity at one station	• Upgrade Bradford station • Build new stations in both Alliston and Barrie • Complete environmental assessment for Markham station.
Recommended Pace ***Additional*** *$X.XX per month annually (\$Y.YY more per bill by 2024)*	Build one new stations and increase capacity at one Station	• Upgrade Bradford station • Build station in Alliston • Complete environmental assessment for Markham station. Risk that existing Barrie stations will experience overloading and increased risk of reliability issues.
Base Pace *Within current rates*	Upgrade one station and secure land for future station build.	• Upgrade Bradford station • Complete environmental assessment for Markham station. Risk that existing Alliston and Barrie stations will experience overloading and increased risk of reliability issues.

PowerStream | alectra utilities

Investment only in PowerStream RZ. Small sample size, interpret with caution. **n-size shown.** **n=1**

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Additional Station Investments

Beyond the transformers and other equipment that directly operate the grid, other investments are required for security, communications and control systems. Distribution stations play an important role in Alectra Utilities' electricity grid, transforming high voltage electricity to a lower voltage that is suitable for distribution. A failure in a distribution station can result in an outage for thousands of customers.

- **Communications and control systems** allow Alectra Utilities staff in central control rooms to remotely monitor and control the equipment in distribution stations in order to avoid equipment failures and manage failures when they do occur. Monitoring equipment is also used for security purposes.

While new investments to keep these systems up to date would help to maintain reliability and security, delaying these investment is less likely to cause problems compared to delaying other projects discussed earlier.

To manage within existing rates, Alectra Utilities is proposing to postpone any investments in distribution station, communications and control systems. Managers know that as these systems age, there will likely be more outages, but it is not possible to estimate the exact risks involved.

Online Workbook

Additional Station Investments

Large Use

Q Which of the following timing options would you prefer?

Option	Level of Investment	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew communication, replace end-of-life station equipment, obsolete protection equipment and upgrade station facilities.	• Maintain reliability • Ensure reliable communication performance of the system • Increases security at the station.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication, replace end of life station equipment and obsolete protection equipment.	• Maintain reliability • Ensure reliable communication performance of the system • Does not increase security at the station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication and replace end of life station equipment.	• Maintain reliability • Ensure reliable communication infrastructure. • Does not increase security at the station.
Base Pace *Within current rates*	Monitor station equipment and reactively replace when necessary. Defer other investments beyond 2024	This option would require allocating funds from the reactive budget as necessary.

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	1	1	1	-	-
Recommended Pace	3	1	4	1	-
Slower Pace	-	-	1	-	-
Base Pace	1	3	1	-	-

Preparing for More Consumer Choice

New technologies are changing the way that consumers are able to interact with the electricity system. Emerging technologies like solar power, battery storage and electric vehicles are constantly evolving; they are becoming more affordable, more widely available, and better performing.

Properly planned and managed, the integration of these technologies with Alectra Utilities' traditional "poles and wires" equipment is expected to provide benefits to customers by way of:

- reducing the amount of infrastructure costs related to meeting the increased demand for electricity; and
- generating electricity more locally, reducing the amount of generation that is needed elsewhere in the province.

Regardless of whether you are considering new energy choices like an electric vehicle for yourself today, the market is changing quickly, and Alectra Utilities must be prepared as adoption becomes more widespread over the next five years. For instance, charging each electric vehicle draws as much energy as two average homes. If a dozen or so people come home and start changing their vehicles at a period of peak demand, it could overload the grid in that neighbourhood. Not being prepared could result in increased equipment failure due to overloaded lines, as well as costly infrastructure upgrades to meet the demand posed by this technology.

Alectra Utilities has identified three pilot projects to ensure the system is ready when more consumers adopt this technology. These pilots are intended to answer questions like;

- *How will the grid respond if a neighbourhood rapidly adopts new technology, such as electric vehicles?*
- *How can Alectra Utilities reduce the strain on the system by using smart technology to dispatch electricity?*

These pilots are not required to meet immediate reliability issues, however, they will help to ensure that Alectra Utilities is able to meet the challenged as more consumers embrace this technology in the next few years.

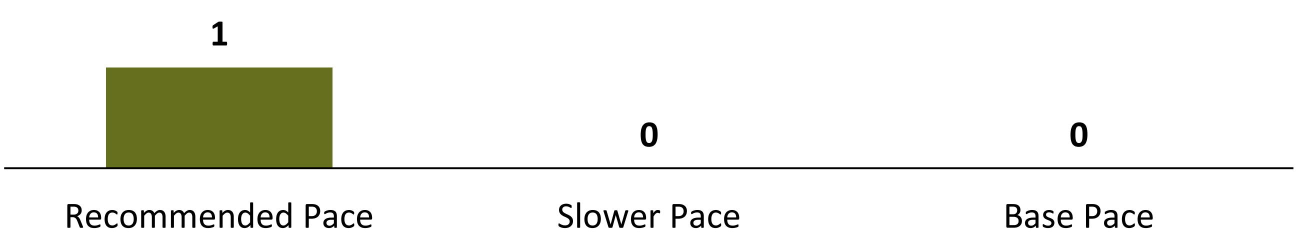
Online Workbook

Preparing for More Consumer Choice

Large Use

Q Which of the following timing options would you prefer?

Option	Approach
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Conduct three pilot projects to prepare to integrate new technology like electric vehicles, solar power and battery storage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Wait until new technology like electric vehicles, solar power and battery storage becomes more widely adopted
Base Pace *Within current rates*	Reactively respond to technology uptake by investing in traditional 'poles and wires' infrastructure as reliability and capacity issues become apparent



Investment only in PowerStream RZ. Small sample size, interpret with caution. **n-size shown.** n=1

Online Workbook
Investment Alternative Summary

Large Use

Investment Alternative Summary

Throughout this workbook, you have been asked about some key choices that could impact your rates. Below is a summary of your answers to the questions that could impact your rates.

At the bottom of this page you will find the total bill impact of all the answers you gave that would result in a bill increase.

Having seen the total bill impact, please review your answers and change your responses if you desire; your potential rate impact will be re-calculated. You will have the opportunity to adjust your answers again until you feel you've reached the best balance for you.

Q Large Use Customer Bill Impact Change and Magnitude of Bill Impact

Bill Impact Analysis	ERZ**	BRZ**	HRZ**	PRZ**	GRZ
Average $ Initial	$152.74	$243.31	$141.76	$229.12	n/a
Average $ Final	$146.28	$246.93	$128.33	$229.12	n/a
Difference: Initial VS. Final	-($6.42)	-($3.62)	-($13.43)	0.00	n/a

Differences that are statistically significant at 95% are noted by an asterisk (*).

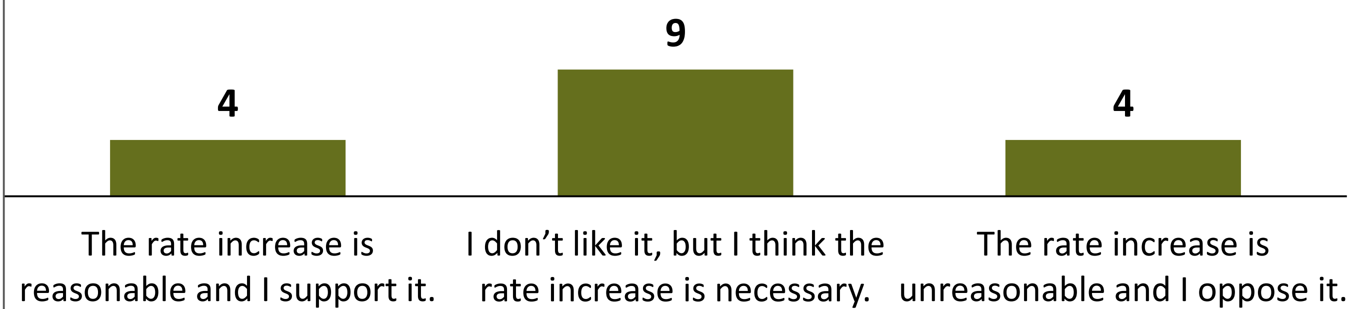
** Small sample size, interpret with caution.

Online Workbook

Impact of Choices on Rates

Large Use

Q Which of the following statements best represents your view?



Note: "Don't know" (n=2) not shown.

n=18

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
The rate increase is reasonable and I support it	1	2	-	1	-
I don't like it, but I think the rate increase is necessary	2	1	6	-	-
The rate increase is unreasonable and I oppose it	1	2	1	-	-
Don't know	1	-	-	-	-
Reasonable and support it + don't like it, but think it's necessary	**3/5**	**3/5**	**6/7**	**1/1**	**-**

* Small sample size, interpret with caution. **n-size shown.**

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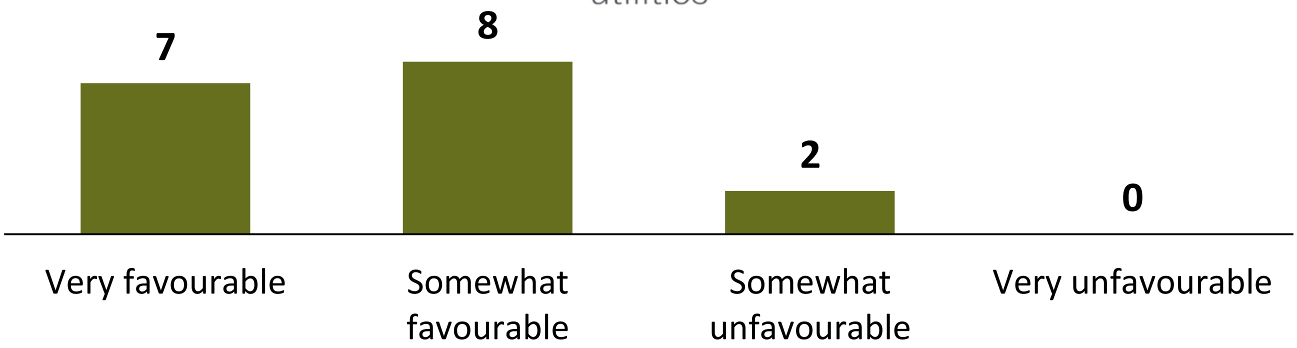
Online Workbook

Workbook Diagnostics | Overall Impression

Large Use

Q Did you have a favourable or unfavourable impression of the workbook you just completed?



Note: "Don't know" (n=1) not shown.

n=18

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very favourable	3	2	1	1	-
Somewhat favourable	1	2	5	-	-
Somewhat unfavourable	-	1	1	-	-
Very unfavourable	-	-	-	-	-
Don't know	1	-	-	-	-

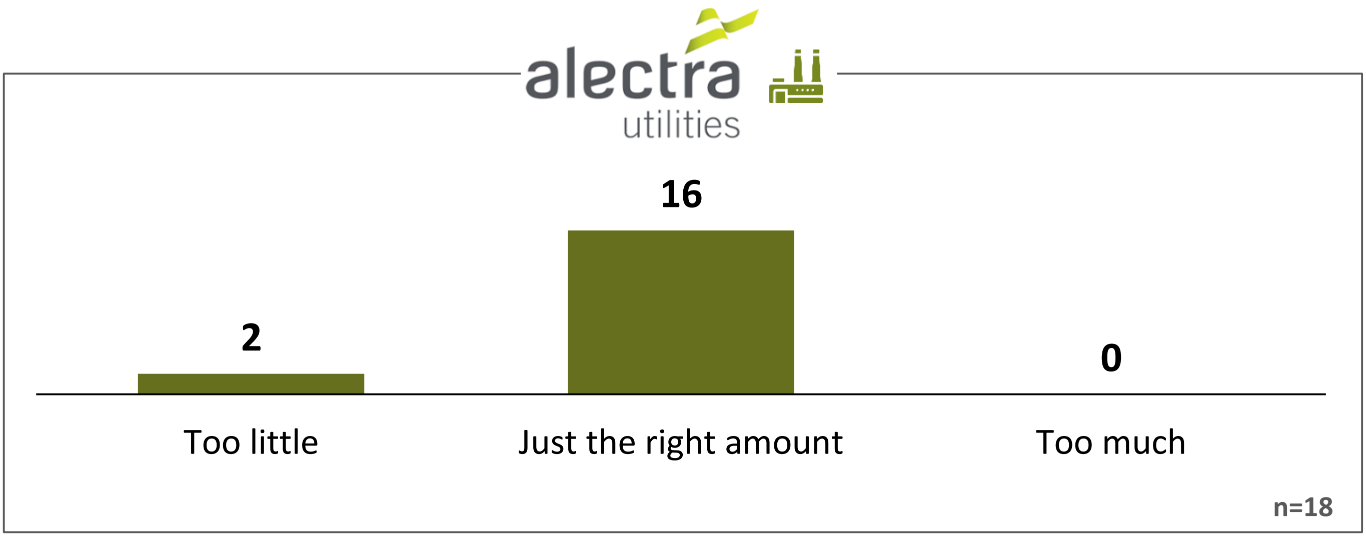
* Small sample size, interpret with caution. **n-size shown.**

Online Workbook

Workbook Diagnostics | Volume of Information

Large Use

Q Did Alectra Utilities provide too much information, not enough, or just the right amount?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Too little	1	-	1	-	-
Just the right amount	4	5	6	1	-
Too much	-	-	-	-	-

* Small sample size, interpret with caution. **n-size shown.**

INNOVATIVE RESEARCH GROUP

INNOVATIVE RESEARCH GROUP

Appendix 1

Bill Impacts By Investment

Residential Bill Impacts

Investment Decisions by rate zone

Investment Category	ERZ	BRZ	HRZ	PRZ	GRZ
Eliminating Meter Data Security Risks				1	
Keeping the Business Running	1	1	1	2	1
Pacing Investments in the Underground System	2		2	3	
Keeping Pace with Overhead System Renewal	3	2	3	4	
Alectra Utilities' Transformer Replacement Program	4	3	4	5	2
Monitoring and Control Equipment	5	4	5	6	3
Converting Rear Lot Service			6	7	4
Timing of a Rear Lot Conversion Program			7	8	5
Planning for Expansion, Intensification and Back-up	6	5	8	9	6
Voltage Conversion	7	6	9	10	
Distribution Stations Capacity	8			11	
Additional Station Investments	9	7	10	12	7
Preparing for More Consumer Choice				13	

Residential Bill Impacts

Residential

Summary of bill impacts by investment option and rate zone

Eliminating meter safety risks	ERZ		BRZ		HRZ		PRZ		GRZ	
							2020	2024		
Recommended Pace							$0.06	$0.28		
Base Pace							-	-		

Keeping the business running	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Approach	$0.07	$0.34	$0.08	$0.39	$0.07	$0.35	$0.07	$0.35	$0.06	$0.29
Base Approach	-	-	-	-	-	-	-	-	-	-

Pacing Investments in the Underground System	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024			2020	2024	2020	2024		
Accelerated Pace	$0.04	$0.18			$0.02	$0.09	$0.05	$0.26		
Recommended Pace	$0.02	$0.09			$0.01	$0.04	$0.02	$0.12		
Base Pace	-	-			-	-	-	-		
Slower Pace	($0.05)	($0.23)			($0.02)	($0.11)	($0.06)	($0.31)		

Keeping Pace with Overhead System Renewal	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024		
Accelerated Pace	$0.04	$0.18	$0.04	$0.22	$0.03	$0.16	$0.07	$0.34		
Recommended Pace	-	-	-	-	-	-	-	-		
Slower Pace	($0.02)	($0.09)	($0.02)	($0.11)	($0.02)	($0.08)	($0.03)	($0.17)		

Alectra Utilities' transformer replacement program	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.02	$0.10	$0.02	$0.10	$0.01	$0.04	$0.02	$0.11	$0.02	$0.10
Recommended Pace	-	-	-	-	-	-	-	-	-	-
Slower Pace	($0.01)	($0.05)	($0.01)	($0.05)	($0.00)	($0.02)	($0.01)	($0.06)	($0.01)	($0.05)

INNOVATIVE RESEARCH GROUP

Residential Bill Impacts

Residential

Summary of bill impacts by investment option and rate zone

Monitoring and Control Equipment	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.01	$0.04	$0.01	$0.05	$0.01	$0.03	$0.02	$0.11	$0.03	$0.13
Recommended Pace	-	-	-	-	-	-	-	-	-	-
Slower Pace	($0.01)	($0.03)	($0.01)	($0.03)	($0.00)	($0.02)	($0.01)	($0.07)	($0.02)	($0.08)

Converting Rear Lot Service Not included in overall rate impact calculations	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Reactive Approach					$0.01	$0.05	$0.01	$0.06	$0.00	$0.02
New poles in backyard					$0.01	$0.04	$0.01	$0.05	$0.00	$0.02
Partial Underground					$0.01	$0.06	$0.02	$0.08	$0.01	$0.03
Full Underground					$0.02	$0.11	$0.03	$0.14	$0.01	$0.05

Timing of a Rear Lot Conversion Program	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace					$0.05	$0.23	$0.06	$0.31	$0.02	$0.10
Moderate Pace					$0.03	$0.17	$0.05	$0.23	$0.01	$0.07
Recommended Pace					$0.02	$0.11	$0.03	$0.14	$0.01	$0.05
Base Pace					-	-	-	-	-	-

Planning for Expansion, Intensification and Back-up	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.10	$0.50	$0.06	$0.29	$0.05	$0.25	$0.13	$0.64	$0.08	$0.42
Recommended Pace	$0.09	$0.44	$0.05	$0.25	$0.04	$0.22	$0.11	$0.56	$0.07	$0.36
Slower Pace	$0.06	$0.32	$0.04	$0.19	$0.03	$0.16	$0.08	$0.41	$0.05	$0.27
Base Pace	-	-	-	-	-	-	-	-	-	-

INNOVATIVE RESEARCH GROUP

Residential Bill Impacts

Residential

Summary of bill impacts by investment option and rate zone

Voltage Conversion	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.02	$0.12	$0.06	$0.30	$0.11	$0.53	$0.00	$0.02		
Recommended Pace	$0.02	$0.12	$0.06	$0.28	$0.10	$0.49	$0.00	$0.02		
Slower Pace	$0.01	$0.05	$0.02	$0.12	$0.04	$0.21	$0.00	$0.01		
Base Pace	-	-	-	-	-	-	-	-		

Distribution Stations Capacity (ERZ)	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace	$0.02	$0.12								
Slower Pace	$0.02	$0.09								
Base Pace	-	-								

Distribution Stations Capacity (PRZ)	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace							$0.03	$0.14		
Recommended Pace							$0.02	$0.09		
Base Pace							-	-		

Additional Station Investments	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.01	$0.06	$0.01	$0.03	$0.00	$0.02	$0.02	$0.08	$0.00	$0.02
Recommended Pace	$0.01	$0.05	$0.00	$0.02	$0.00	$0.01	$0.01	$0.07	$0.00	$0.01
Slower Pace	$0.01	$0.05	$0.00	$0.02	$0.00	$0.01	$0.00	$0.02	-	-
Base Pace	-	-	-	-	-	-	-	-	-	-

INNOVATIVE RESEARCH GROUP

Residential Bill Impacts

Residential

Summary of bill impacts by investment option and rate zone

Preparing for more consumer choice	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace							$0.05	$0.23		
Slower Pace							$0.02	$0.08		
Base Pace							-	-		

INNOVATIVE RESEARCH GROUP

Small Business Bill Impacts

Small Business

Summary of bill impacts by investment option and rate zone

Eliminating meter safety risks	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace							$0.12	$0.60		
Base Pace							-	-		

Keeping the business running	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Approach	$0.20	$0.99	$0.19	$0.97	$0.17	$0.84	$0.15	$0.75	$0.09	$0.45
Base Approach	-	-	-	-	-	-	-	-	-	-

Pacing Investments in the Underground System	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024			2020	2024	2020	2024		
Accelerated Pace	$0.11	$0.54			$0.04	$0.21	$0.11	$0.55		
Recommended Pace	$0.05	$0.25			$0.02	$0.10	$0.05	$0.25		
Base Pace	-	-			-	-	-	-		
Slower Pace	($0.13)	($0.66)			($0.05)	($0.26)	($0.13)	($0.67)		

Keeping Pace with Overhead System Renewal	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024		
Accelerated Pace	$0.11	$0.53	$0.11	$0.55	$0.08	$0.39	$0.15	$0.73		
Recommended Pace	-	-	-	-	-	-	-	-		
Slower Pace	($0.05)	($0.26)	($0.06)	($0.28)	($0.04)	$0.19	($0.07)	($0.36)		

Alectra Utilities' transformer replacement program	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.06	$0.30	$0.05	$0.26	$0.02	$0.10	$0.05	$0.24	$0.03	$0.16
Recommended Pace	-	-	-	-	-	-	-	-	-	-
Slower Pace	($0.03)	($0.15)	($0.03)	($0.13)	($0.01)	($0.05)	($0.02)	($0.12)	($0.02)	($0.08)

Small Business Bill Impacts

Small Business

Summary of bill impacts by investment option and rate zone

Monitoring and Control Equipment	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.03	$0.13	$0.03	$0.13	$0.01	$0.07	$0.05	$0.23	$0.04	$0.20
Recommended Pace	-	-	-	-	-	-	-	-	-	-
Slower Pace	($0.02)	($0.08)	($0.02)	($0.08)	($0.01)	($0.05)	($0.03)	($0.14)	($0.02)	($0.12)

Converting Rear Lot Service Not included in overall rate impact calculations	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Reactive Approach					$0.02	$0.11	$0.03	$0.13	$0.01	$0.03
New poles in backyard					$0.02	$0.09	$0.02	$0.10	$0.00	$0.02
Partial Underground					$0.03	$0.16	$0.04	$0.18	$0.01	$0.04
Full Underground					$0.05	$0.26	$0.06	$0.30	$0.01	$0.07

Timing of a Rear Lot Conversion Program	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace					$0.11	$0.56	$0.13	$0.66	$0.03	$0.15
Moderate Pace					$0.08	$0.42	$0.10	$0.49	$0.02	$0.12
Recommended Pace					$0.05	$0.26	$0.06	$0.30	$0.01	$0.07
Base Pace					-	-	-	-	-	-

Planning for Expansion, Intensification and Back-up	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.29	$1.46	$0.14	$0.72	$0.12	$0.61	$0.27	$1.36	$0.13	$0.65
Recommended Pace	$0.25	$1.27	$0.13	$0.63	$0.11	$0.53	$0.24	$1.19	$0.11	$0.56
Slower Pace	$0.19	$0.94	$0.09	$0.46	$0.08	$0.39	$0.18	$0.88	$0.08	$0.42
Base Pace	-	-	-	-	-	-	-	-	-	-

Small Business Bill Impacts

Small Business

Summary of bill impacts by investment option and rate zone

Voltage Conversion	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.07	$0.36	$0.15	$0.75	$0.25	$1.27	$0.01	$0.05		
Recommended Pace	$0.07	$0.33	$0.14	$0.69	$0.23	$1.17	$0.01	$0.05		
Slower Pace	$0.03	$0.14	$0.06	$0.29	$0.10	$0.49	$0.00	$0.02		
Base Pace	-	-	-	-	-	-	-	-		

Distribution Stations Capacity (ERZ)	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace	$0.07	$0.36								
Slower Pace	$0.05	$0.27								
Base Pace	-	-								

Distribution Stations Capacity (PRZ)	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace							$0.06	$0.31		
Recommended Pace							$0.04	$0.19		
Base Pace							-	-		

Additional Station Investments	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.03	$0.16	$0.01	$0.07	$0.01	$0.05	$0.03	$0.16	$0.00	$0.02
Recommended Pace	$0.03	$0.14	$0.01	$0.04	$0.01	$0.04	$0.03	$0.14	$0.00	$0.02
Slower Pace	$0.03	$0.14	$0.01	$0.04	$0.01	$0.04	$0.01	$0.05	-	-
Base Pace	-	-	-	-	-	-	-	-	-	-

Small Business Bill Impacts

Small Business

Summary of bill impacts by investment option and rate zone

Preparing for more consumer choice	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace							$0.10	$0.48		
Slower Pace							$0.03	$0.16		
Base Pace							-	-		

Appendix 2

Assessing the Views of LEAP Eligible Customers

Please refer to page 14 for total breakdown of residential customers who are considered LEAP eligible based on household size and income.

LEAP Eligible Customers

Assessing the views of LEAP eligible customers

Residential

Enersource Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified
Keeping the Business Running			
Recommended Approach	50%	57%	66%
Base Approach	50%	43%	34%
Pacing Investments in the Underground System			
Accelerated Pace	16%	17%	25%
Recommended Pace	52%	55%	54%
Base Pace	23%	21%	17%
Slower Pace	8%	7%	4%
Keeping Pace with Overhead System Renewal			
Accelerated Pace	16%	19%	22%
Recommended Pace	72%	71%	71%
Slower Pace	12%	10%	7%
Alectra Utilities Transformer Replacement Program			
Accelerated Pace	21%	20%	27%
Recommended Pace	68%	70%	67%
Slower Pace	11%	10%	6%
Monitoring and Control Equipment			
Accelerated Pace	21%	22%	29%
Recommended Pace	65%	67%	64%
Slower Pace	14%	10%	7%
Planning for Expansion, Intensification and Back-up			
Accelerated Pace	12%	12%	16%
Recommended Pace	52%	51%	54%
Slower Pace	11%	14%	12%
Base Pace	25%	23%	19%
Voltage Conversion			
Accelerated Pace	16%	18%	22%
Recommended Pace	50%	50%	48%
Slower Pace	10%	13%	14%
Base Pace	24%	19%	16%
Distribution Stations Capacity			
Recommended Pace	61%	62%	69%
Slower Pace	16%	18%	15%
Base Pace	24%	20%	15%
Additional Station Investments			
Accelerated Pace	15%	18%	23%
Recommended Pace	53%	52%	53%
Slower Pace	9%	11%	9%
Base Pace	22%	19%	15%

LEAP Eligible Customers

Assessing the views of LEAP eligible customers

Residential

Brampton Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified
Keeping the Business Running			
Recommended Approach	44%	48%	60%
Base Approach	56%	52%	40%
Keeping Pace with Overhead System Renewal			
Accelerated Pace	23%	22%	28%
Recommended Pace	59%	68%	60%
Slower Pace	18%	10%	12%
Alectra Utilities Transformer Replacement Program			
Accelerated Pace	24%	20%	28%
Recommended Pace	57%	67%	61%
Slower Pace	19%	13%	11%
Monitoring and Control Equipment			
Accelerated Pace	25%	23%	30%
Recommended Pace	57%	65%	59%
Slower Pace	18%	12%	12%
Planning for Expansion, Intensification and Back-up			
Accelerated Pace	18%	12%	19%
Recommended Pace	45%	54%	52%
Slower Pace	11%	10%	9%
Base Pace	26%	24%	20%
Voltage Conversion			
Accelerated Pace	17%	13%	20%
Recommended Pace	40%	47%	42%
Slower Pace	15%	18%	15%
Base Pace	28%	22%	23%
Additional Station Investments			
Accelerated Pace	19%	18%	23%
Recommended Pace	47%	57%	52%
Slower Pace	10%	8%	9%
Base Pace	24%	17%	16%

LEAP Eligible Customers

Assessing the views of LEAP eligible customers

Residential

Horizon Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified
Keeping the Business Running			
Recommended Approach	56%	61%	67%
Base Approach	44%	39%	33%
Pacing Investments in the Underground System			
Accelerated Pace	24%	25%	31%
Recommended Pace	52%	53%	51%
Base Pace	17%	16%	14%
Slower Pace	8%	5%	4%
Keeping Pace with Overhead System Renewal			
Accelerated Pace	22%	20%	24%
Recommended Pace	68%	71%	70%
Slower Pace	11%	9%	6%
Alectra Utilities Transformer Replacement Program			
Accelerated Pace	26%	27%	33%
Recommended Pace	64%	65%	62%
Slower Pace	10%	8%	5%
Monitoring and Control Equipment			
Accelerated Pace	24%	23%	29%
Recommended Pace	65%	68%	65%
Slower Pace	11%	9%	6%
Converting Rear Lot Service			
Reactive Approach	11%	11%	11%
New Poles in Backyard	12%	10%	10%
Partial Underground	54%	56%	53%
Full Underground	23%	23%	26%
Timing of a Rear Lot Conversion Program			
Accelerated Pace	12%	9%	11%
Moderate Pace	12%	12%	12%
Recommended Pace	52%	54%	52%
Base Pace	24%	25%	25%
Planning for Expansion, Intensification and Back-up			
Accelerated Pace	11%	10%	12%
Recommended Pace	56%	55%	55%
Slower Pace	10%	12%	12%
Base Pace	24%	23%	21%
Voltage Conversion			
Accelerated Pace	12%	10%	13%
Recommended Pace	49%	47%	45%
Slower Pace	16%	19%	19%
Base Pace	23%	23%	23%
Additional Station Investments			
Accelerated Pace	19%	20%	24%
Recommended Pace	59%	60%	58%
Slower Pace	7%	8%	7%
Base Pace	15%	11%	11%

LEAP Eligible Customers

Assessing the views of LEAP eligible customers

Residential

PowerStream Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified
Eliminating Meter Data Security Risks			
Recommended Approach	48%	54%	55%
Base Approach	52%	46%	45%
Keeping the Business Running			
Recommended Approach	42%	47%	51%
Base Approach	58%	53%	49%
Pacing Investments in the Underground System			
Accelerated Pace	13%	15%	20%
Recommended Pace	47%	55%	53%
Base Pace	29%	21%	21%
Slower Pace	10%	8%	5%
Keeping Pace with Overhead System Renewal			
Accelerated Pace	12%	13%	17%
Recommended Pace	70%	75%	73%
Slower Pace	17%	12%	10%
Alectra Utilities Transformer Replacement Program			
Accelerated Pace	14%	19%	24%
Recommended Pace	70%	69%	68%
Slower Pace	15%	11%	8%
Monitoring and Control Equipment			
Accelerated Pace	13%	16%	20%
Recommended Pace	71%	72%	71%
Slower Pace	16%	12%	9%
Converting Rear Lot Service			
Reactive Approach	13%	14%	14%
New Poles in Backyard	14%	11%	12%
Partial Underground	47%	52%	46%
Full Underground	27%	23%	28%
Timing of a Rear Lot Conversion Program			
Accelerated Pace	9%	8%	10%
Moderate Pace	9%	9%	7%
Recommended Pace	49%	52%	49%
Base Pace	34%	31%	34%
Planning for Expansion, Intensification and Back-up			
Accelerated Pace	7%	7%	9%
Recommended Pace	45%	48%	49%
Slower Pace	12%	13%	12%
Base Pace	36%	33%	30%
Voltage Conversion			
Accelerated Pace	15%	15%	21%
Recommended Pace	49%	56%	53%
Slower Pace	10%	10%	9%
Base Pace	26%	19%	17%

LEAP Eligible Customers

Assessing the views of LEAP eligible customers

Residential

PowerStream Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified
Distribution Stations Capacity			
Accelerated Pace	13%	15%	17%
Recommended Pace	47%	52%	49%
Base Pace	40%	33%	34%
Additional Station Investments			
Accelerated Pace	9%	11%	14%
Recommended Pace	46%	52%	52%
Slower Pace	15%	17%	15%
Base Pace	29%	20%	19%
Preparing for More Consumer Choice			
Recommended Pace	41%	42%	46%
Slower Pace	21%	27%	25%
Base Pace	38%	32%	29%

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LEAP Eligible Customers

Assessing the views of LEAP eligible customers

Residential

Guelph Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified
Keeping the Business Running			
Recommended Approach	54%	61%	68%
Base Approach	46%	39%	32%
Alectra Utilities Transformer Replacement Program			
Accelerated Pace	26%	24%	32%
Recommended Pace	62%	64%	63%
Slower Pace	11%	12%	5%
Monitoring and Control Equipment			
Accelerated Pace	20%	18%	25%
Recommended Pace	64%	69%	66%
Slower Pace	16%	13%	9%
Converting Rear Lot Service			
Reactive Approach	14%	12%	13%
New Poles in Backyard	12%	7%	8%
Partial Underground	44%	47%	45%
Full Underground	30%	35%	34%
Timing of a Rear Lot Conversion Program			
Accelerated Pace	16%	12%	13%
Moderate Pace	14%	16%	15%
Recommended Pace	49%	48%	50%
Base Pace	21%	24%	22%
Planning for Expansion, Intensification and Back-up			
Accelerated Pace	9%	7%	9%
Recommended Pace	49%	50%	51%
Slower Pace	16%	15%	16%
Base Pace	26%	29%	24%
Additional Station Investments			
Accelerated Pace	17%	16%	21%
Recommended Pace	62%	63%	64%
Base Pace	21%	21%	15%

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For more information, please contact:

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Senior Consultant
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(e) jgaras@innovativeresearch.ca

APPENDIX 2.0

INNOVATIVE
RESEARCH GROUP

2020-2024 DSP Customer Engagement

Voluntary Report

alectra
utilities

This report and all of the information and data contained within it may not be released, shared or otherwise disclosed to any other party, without the prior, written consent of Alectra Utilities Inc.

May 2019

STRICTLY PRIVILEGED AND CONFIDENTIAL

INNOVATIVE
RESEARCH GROUP

Residential Customers (Voluntary)

Online Workbook Results

Methodology

Residential Voluntary Online Workbook

INNOVATIVE was engaged by Alectra Utilities Corporation (Alectra Utilities) in this study to gather input on preferences on program timing and balancing outcomes. **Pages 6 to 68** show the actual pages of the workbook that was sent and completed by customers. The only additions are the actual results.

Field Dates & Workbook Delivery

The **Residential Voluntary Online Workbook** was accessible to all Alectra Utilities residential customers from April 8th and May 1st, 2019.

Publishing the Portal Online

INNOVATIVE hosted the online portal at the following URL: *AlectraCustomerFeedback.com*

The website prevented customers from completing questions repeatedly and saved their progress as they answered each question. Upon completion, the site was no longer accessible at the web address given.

Each customer was able to select their rate zone and rate class, and ultimately a workbook customised to their rate zone and class.

Sample Distribution

The voluntary residential online workbook sample not been weighted, therefore, is not representative of the broader Alectra Utilities customer base.

The table below summarizes the sample breakdown by rate zone of the voluntary residential workbook.

Sample Distribution	Total	Distribution
Enersource	854	21%
Brampton	535	13%
Horizon	1,095	27%
PowerStream	1,204	29%
Guelph	407	10%
Total	**4,095**	**100%**

Note: *Graphs and tables may not always total 100% due to rounding values rather than any error in data. Sums are added before rounding numbers. Caution interpreting results with small n-sizes.*

Voluntary Online Workbook

Welcome to Alectra Utilities' planning consultation!

Residential

We need your input on choices that will affect the service you receive and the price you pay.

1. Alectra Utilities is developing its investment plan for 2020 to 2024. This plan will determine the investments Alectra Utilities makes in equipment and infrastructure, the services it provides, and the rates you pay.
2. **Alectra will be accountable to the public regulator, both in terms of sharing what customers say and demonstrating how they considered those views.**
3. You don't need to be an electricity expert to participate in this consultation. This workbook is focused on basic choices and provides the background information you need to answer the questions.
4. All you need to do is provide your feedback on between **7 and 13 choices.** If you can give half an hour now, Alectra Utilities can finalize its plan to serve customers like you for the next five years.

Those who complete the questions that follow will be invited to enter a draw to win one of ten (10) $500 prepaid credit cards.

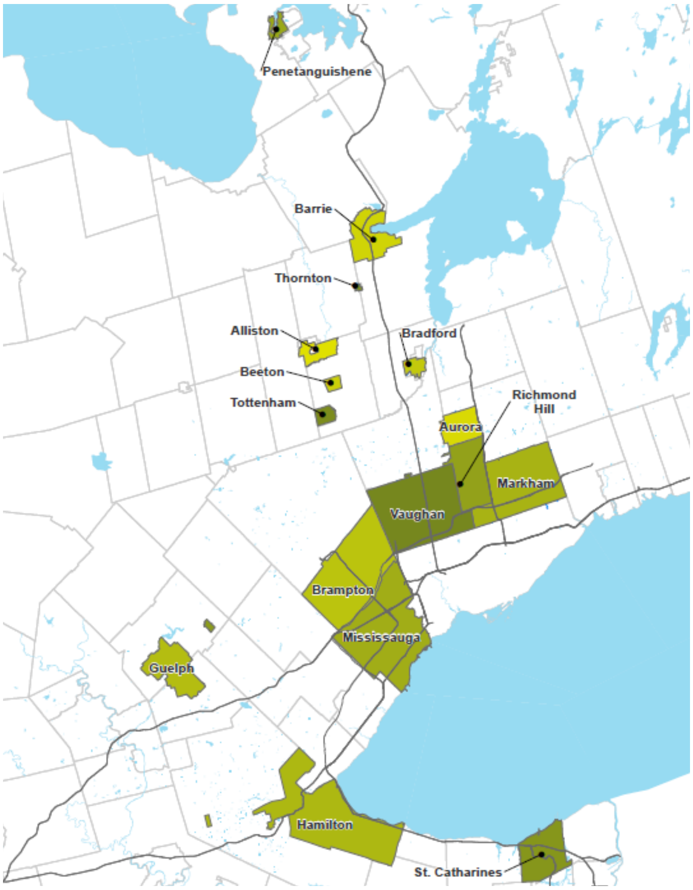
All of your individual responses will be kept confidential. Innovative Research Group (INNOVATIVE), an independent research company, has been hired to gather your feedback.

If you are reading this on a smaller mobile device, you may want to consider accessing the survey from a tablet, desktop or laptop instead so that it is easier for you to read.

INNOVATIVE RESEARCH GROUP

Who is Alectra Utilities?

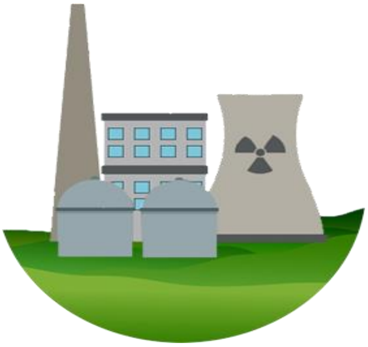
Alectra Utilities is preparing its first consolidated Distribution System Plan. Alectra Utilities is the union of five leading Ontario utilities – Enersource, Horizon Utilities, Brampton Hydro, PowerStream and Guelph Hydro. Alectra Utilities now serves over one million customers.



Alectra Utilities provides services to customers in all of these areas. However, customer rates are based on the cost of serving only the area that you live in.

Understanding Alectra Utilities' role in Ontario's electricity system

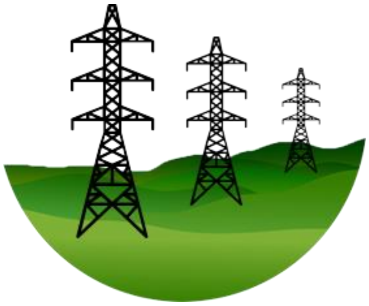
Ontario's electricity system is owned and operated by public, private and municipal corporations across the province. It is made up of three components: generation, transmission and distribution.



1 Generation

Where electricity comes from.

Ontario's electricity is generated by nuclear, natural gas, hydroelectric and renewable technologies, such as wind and solar. In Ontario, about 50% of electricity is generated by Ontario Power Generation, which has generation stations across the province.



2 Transmission

Electricity travels across Ontario.

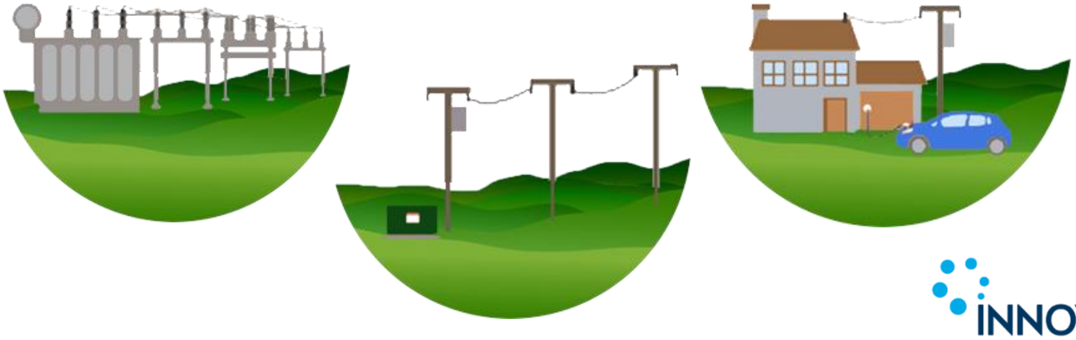
Once electricity is generated, it must be transported to urban and rural areas across the province. This happens by way of high voltage transmission lines that serve as highways for electricity. The province has more than 30,000 kilometres of transmission lines.

3 Local Distribution

Delivering power to homes and businesses in your community.

Alectra Utilities is responsible for the last step of the journey: distributing electricity to customers through its distribution network. This local grid includes transformer stations of various sizes and designs that decrease the voltage of the electricity so it can be used in your home or business.

Across Alectra Utilities' service territory, there are 16,400 km of overhead powerlines and 22,140 km of underground cable.

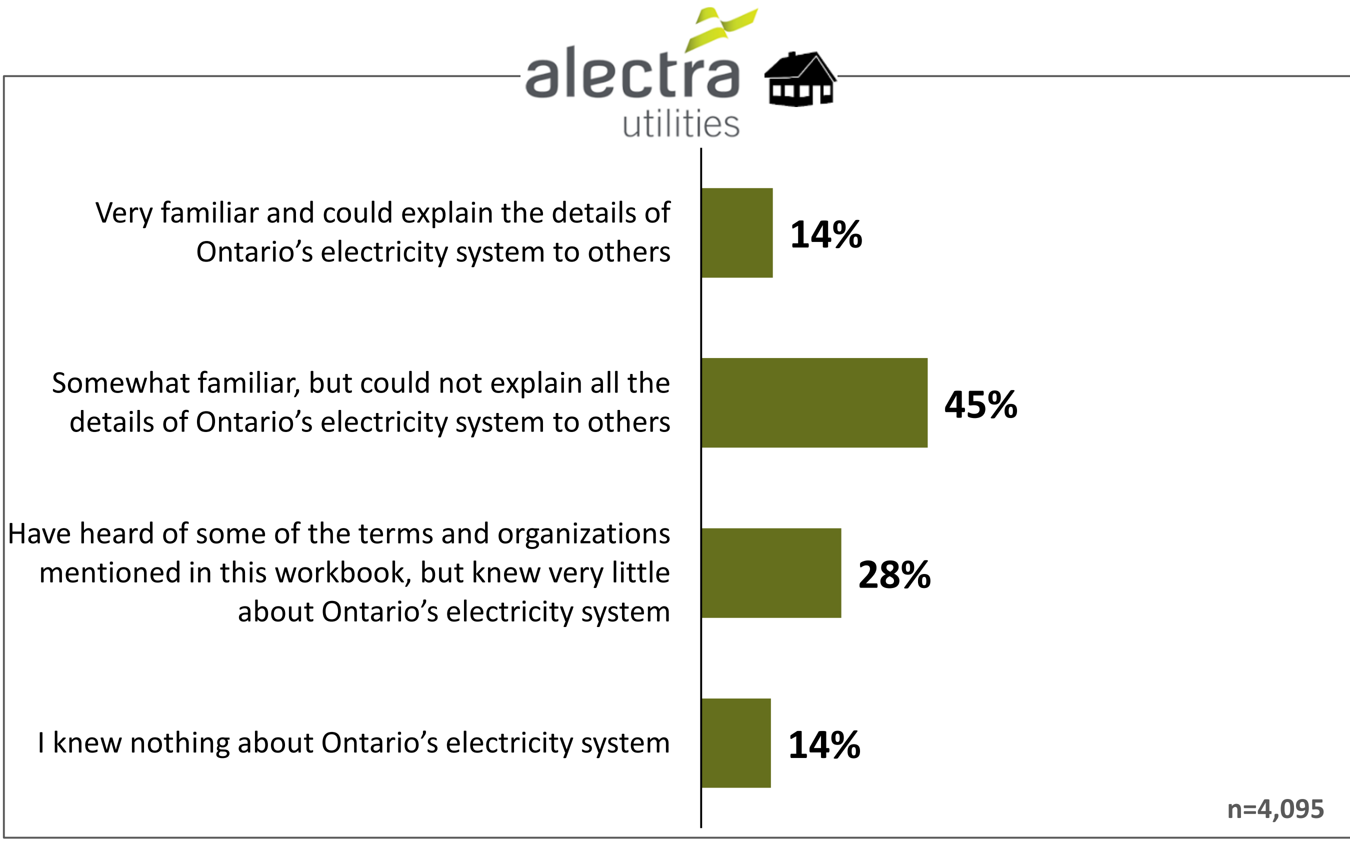


Voluntary Online Workbook

Residential

Understanding Alectra Utilities' role in Ontario's electricity system

Q Before this consultation, how familiar were you with the various parts of the electricity system and how they work together?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very familiar	16%	12%	13%	14%	15%
Somewhat familiar	44%	41%	46%	44%	49%
Heard of some of the terms and organizations	27%	30%	27%	28%	26%
Knew nothing about the electricity system	13%	17%	13%	14%	11%

How much of you bill goes to Alectra Utilities?

- Every item and charge on your bill is mandated by the provincial government or regulated by the **Ontario Energy Board (OEB)**, the provincial energy regulator.
- While Alectra Utilities is responsible for collecting payment for the entire electricity bill, it retains only the distribution portion of the delivery charge.
- **Distribution makes up about [PIPE-PER] of the typical residential customer's bill.**
- The rest of your bill is passed onto provincial transmission companies, power generation companies, the government and regulatory agencies.

Residential Bill (Horizon Utilities)

Sample Alectra Utilities Monthly Bill
(Based on consumption of 750 kWh)

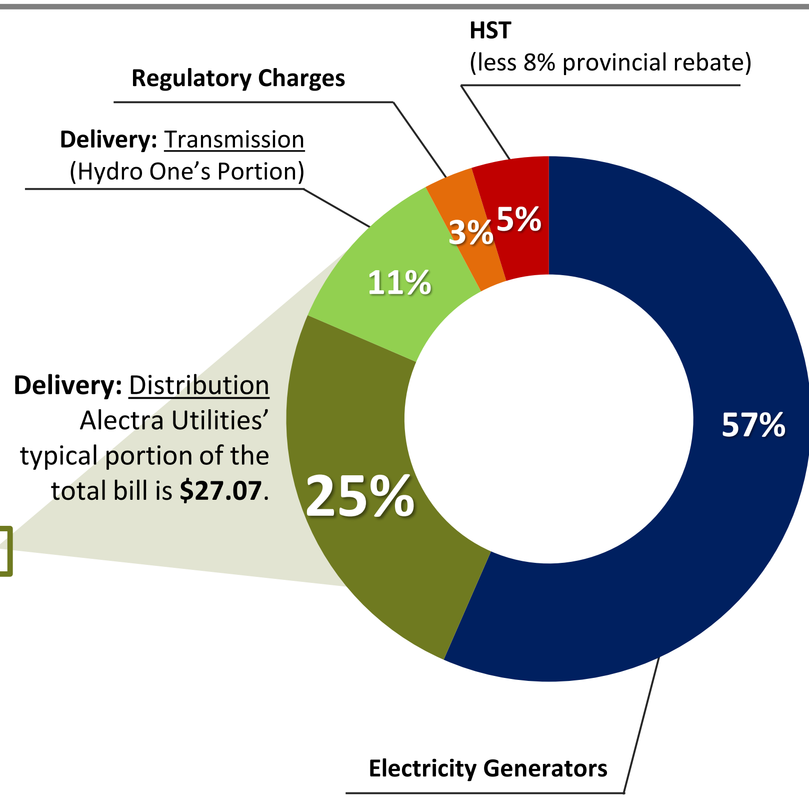
Account Number:
000 000 000 000 0000

Meter Number:
00000000

Alectra Utilities' portion: **$27.07**

Your Electricity Charges	
Electricity	
Off-Peak @ 6.5 ¢/kWh	31.69
Mid-Peak @ 9.4 ¢/kWh	11.99
On-Peak @ 13.2 ¢/kWh	17.82
Delivery	38.76
Regulatory Charges	3.29
Total Electricity Charges	**$103.54**
HST	13.46
8% Provincial Rebate*	**(-$8.28)**
Total Amount	**$108.72**

*The Ontario government is providing a rebate on your electricity costs equal to the provincial portion of the HST



Note: Graphs may not always total 100% due to rounding.

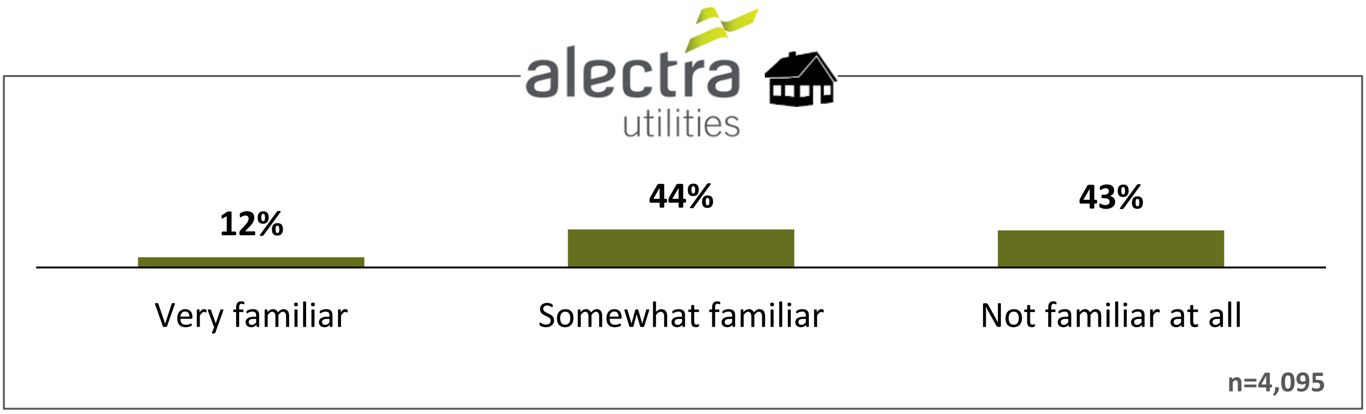
Note: Sample bills were customized for each rate zone and rate class. The above represents a sample residential bill in the Horizon rate zone.

Voluntary Online Workbook

Percentage of bill that goes to Alectra Utilities

Residential

Q Before this consultation, how familiar were you with the percentage of your electricity bill that goes to Alectra Utilities?



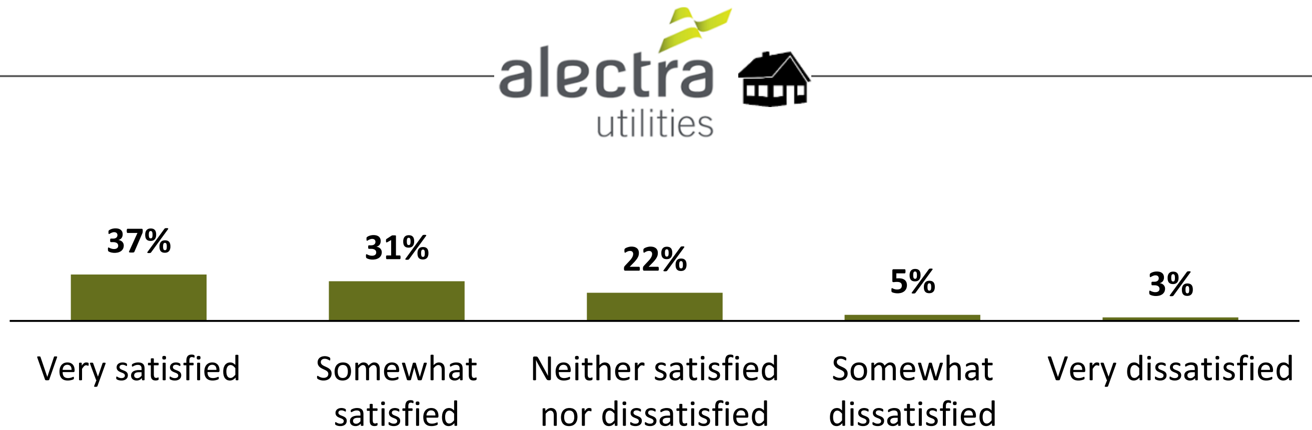
Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very familiar	13%	12%	13%	11%	10%
Somewhat familiar	46%	42%	43%	47%	42%
Not familiar at all	41%	46%	44%	42%	48%

Voluntary Online Workbook

Residential

Overall satisfaction with Alectra Utilities

Q Generally, how satisfied or dissatisfied are you with the services you receive from Alectra Utilities?



Note: "Don't know" (3%) not shown.

n=4,095

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very satisfied	37%	41%	38%	36%	29%
Somewhat satisfied	32%	30%	30%	35%	26%
Neutral	21%	19%	23%	21%	28%
Somewhat dissatisfied	5%	6%	4%	4%	5%
Very dissatisfied	3%	1%	3%	3%	2%
Don't know	3%	2%	2%	1%	9%
Overall satisfied	**69%**	**72%**	**67%**	**70%**	**55%**
Overall dissatisfied	**8%**	**7%**	**7%**	**7%**	**7%**

Voluntary Online Workbook

Reliability Experience | Preamble

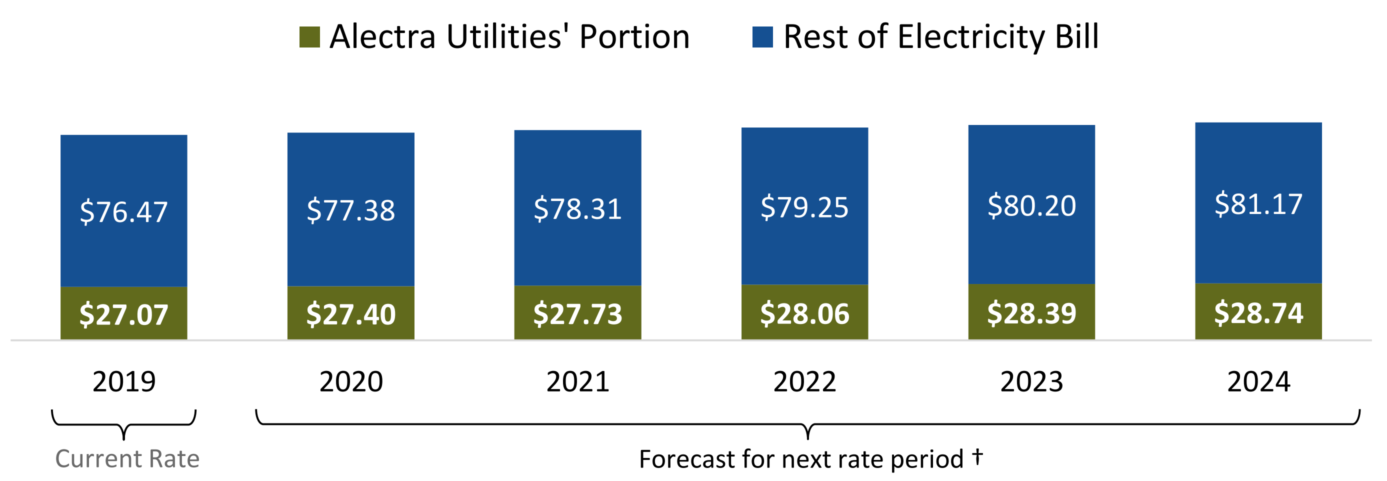
Residential

How much can you expect to pay over the next few years?

Prior to the Alectra Utilities' merger, each predecessor utility had their rates set by the OEB. Until rates are rebased in 2027, your future rate increases will be limited by an OEB-set Price Cap Formula. Each year Alectra Utilities is permitted to increase rates to reflect inflation minus savings targets established by the OEB. **This requires Alectra Utilities to keep cost increases below inflation.**

For customers in your area and rate class, the distribution charge for **the typical bill is estimated to increase by 1.2%** on average for the next five years.

Estimated Typical Residential Annual Increase in Monthly Bill (Before Tax) ††



Note: Sample bills were customized for each rate zone and rate class. The above represents a sample residential bill in the Horizon rate zone.

Where does your money go?

Alectra Utilities has two budgets; **operating and capital.** The operating budget covers recurring expenses, such as salaries, taxes, fuel costs and rent. Under the Price Cap Formula, Alectra Utilities cannot ask for any additional money for operating expenses.

This consultation is about the capital budget. This budget covers things like poles, wires, cables, transformers, computers and programs, vehicles, and buildings.

†† On November 23, 2018, the OEB calculated the value of the inflation factor for incentive rate setting under the Price Cap IR plan of 1.5% for rate changes effective 2019. With a stretch factor of 0.3%, the Price Cap Adjustment for Alectra Utilities was 1.2%. This rate has been used to forecast the rates for 2020-2024. The 2020-2024 rates assumes no changes to electricity rates or the Group 1 riders over the 2020 to 2024 period. The OEB approved bill impact for 2019 was used as the basis for the calculation of forecasted rates for 2020-2024.

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Voluntary Online Workbook

What is this consultation about? | Preamble

Residential

What is this consultation about?

This consultation is about finding the right balance between reliability and the price you pay.

The point of this workbook is to allow customers, like yourself, to provide feedback on whether the planners have found the right balance or whether they should consider different options that better reflect your views.

Alectra Utilities is now creating its first overall investment plan as a merged utility. The process started with Alectra Utilities asking customers whether they had any unmet needs and which outcomes Alectra Utilities' plan should focus on. Click here to see more.

Using that input, Alectra Utilities' managers reviewed each part of the utility's business. All the projects identified in this workbook have been found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Now Alectra Utilities is coming back to customers with a final set of choices.

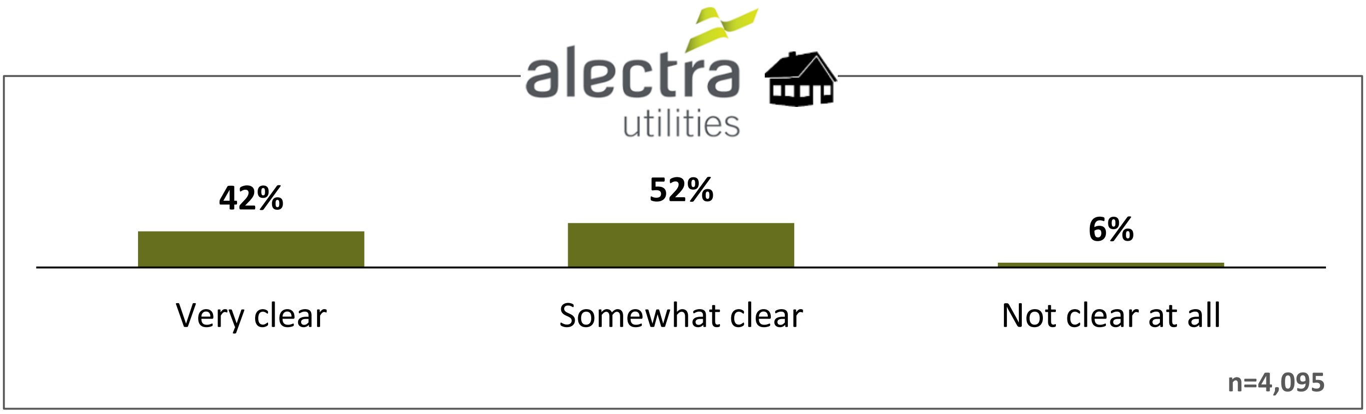
- For each choice, Alectra Utilities has identified an option to stay within existing rates under the price cap formula. It has also identified options to increase investments and, in some areas, where practical, options to reduce investments to make room for increased investments in more pressing areas.
- Planners have indicated the option that in their view provides the best balance between any potential rate increase with the intention to maintain reliability and to fix or avoid pockets of customers that are having significantly below average experiences.
- At the end of the these questions, you will have an opportunity to review your responses and total rate impact of those choices. You will be able to change your responses until you feel you have found the right mix of investments and rate impact, in your view.
- If your preferences result in higher levels of investment than current rates support, Alectra Utilities may apply for a rate increase under the rules established by the OEB. While the exact amount of any rate increase would consider the views collected in this consultation, the workbook will ask you for your views on a rate increase that will be sufficient to pay for the planners' recommended options.

Voluntary Online Workbook

What is this consultation about?

Residential

Q Do you feel that the purpose of Alectra Utilities' customer consultation is clear?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very clear	42%	42%	41%	43%	45%
Somewhat clear	52%	52%	54%	51%	50%
Not clear at all	5%	6%	6%	6%	5%

Reliability Experience

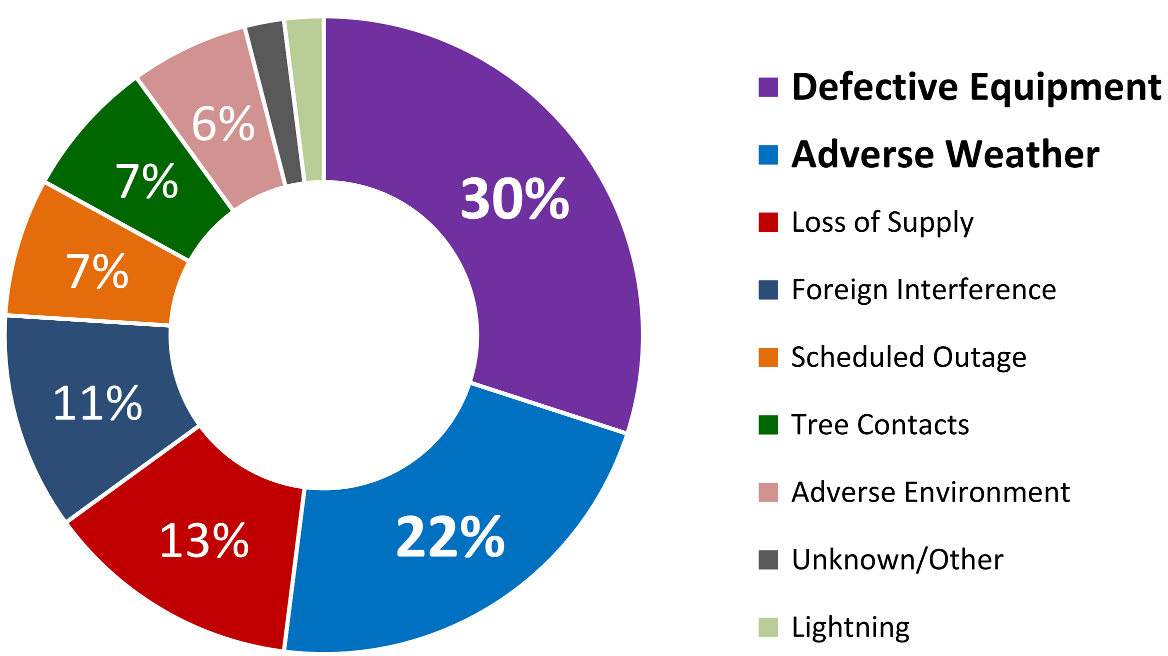
Reliability is a key priority for Alectra Utilities. Since 2014, both the average **number** and **duration** of outages has increased for the typical Alectra Utilities customer.

- The average number of outages (excluding major event days) has increased by an average of 6% per year from 2014-2018, rising from **1.27 to 1.53** over this period.
- The average duration of outages (excluding major event days) has increased by an average of 8% per year from 2014-2018, rising from **0.88 hours to 1.14** hours over this period.

The two primary contributors to outages account for more than 50% of all outages.

1. **Defective equipment** accounted for 30% of customer hours of interruption between 2014-2018, the single largest outage cause.
2. **Adverse weather** is the second leading cause of outages. It accounted for 22% of customer hours of interruption over the same period.

Customer Outage Duration (Hours) by Cause 2014-2018



Depending on what rate zone you are in, the subsequent pages will ask you to review between 7 and 13 choices, many of which address the issues identified in the chart above.

Voluntary Online Workbook

Reliability Experience

Residential

Q In the past 12 months, how many power outages do you recall experiencing at home/your organization?

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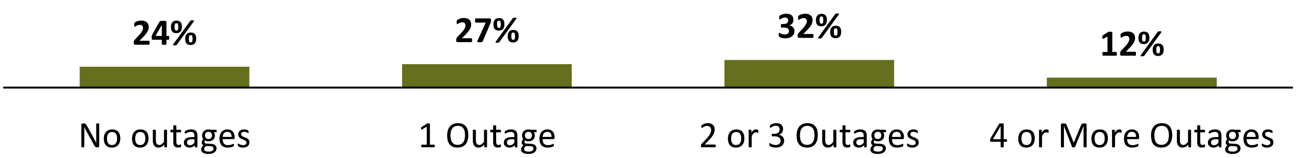

Note: “Don’t know” (4%) not shown.

n=4,095

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
No outages	30%	33%	19%	20%	30%
1 outage	29%	26%	30%	24%	28%
2 or 3 outages	27%	29%	36%	37%	25%
4 or more outages	11%	7%	11%	15%	11%
Don’t know	4%	5%	4%	4%	6%

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Voluntary Online Workbook

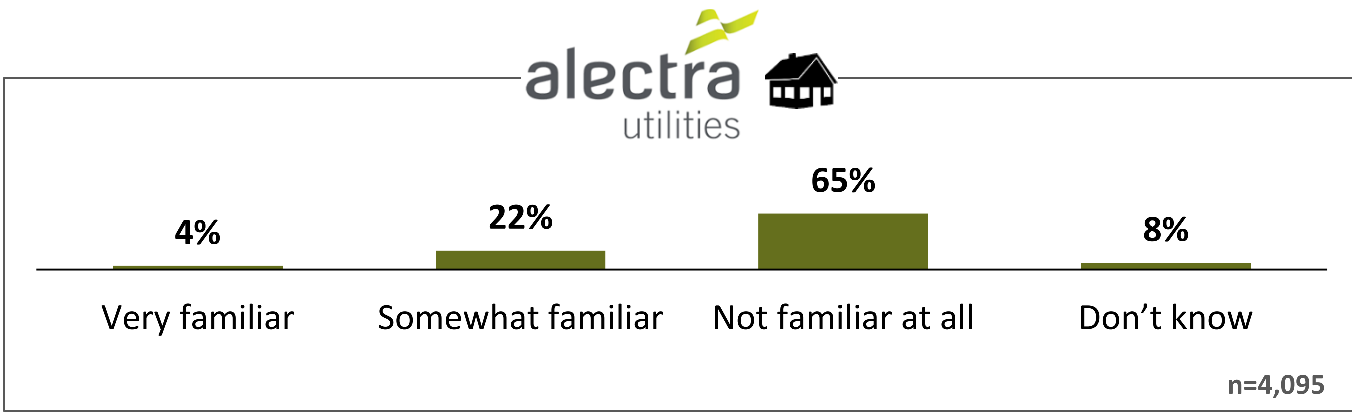
Mandatory Investments

Federal, provincial and municipal governments as well as regulators set requirements and standards that Alectra Utilities must satisfy. Mandatory investments can be broken down into three categories:

1. **Connecting customers:** This includes connecting customers to the grid when a new home or building is constructed or modified.
2. **Moving equipment:** This includes moving equipment like poles and cables for road widening.
3. **Mandated obligations:** This includes installing and maintaining customer meters and transferring electricity from the provincial transmission system.

These investments mean that about one-in-five dollars (20%) of your current rates are already committed and not available for other investments

Q Before this consultation, were you familiar that one-in-five dollars (20%) of your current rates are already committed to mandatory investments and not available for other projects?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very familiar	4%	6%	5%	4%	3%
Somewhat familiar	25%	22%	22%	21%	19%
Not familiar at all	63%	61%	67%	66%	71%
Don't know	8%	10%	6%	9%	7%

Voluntary Online Workbook

Unplanned Repairs and Replacements

On average, each year, Alectra Utilities spends approximately 19 million dollars or 6% of it's core budget to repair or replace equipment that has either failed, will fail imminently, or poses an imminent safety risk. This may include sudden equipment failure, or severe weather taking down a pole in front of your home or business.

There are two possible approaches for how to fund these types of repairs:

1. By delaying other projects that had been planned but not started
2. By establishing an annual allocation for these unplanned repairs and replacements

If Alectra Utilities delays other projects, this can result in needs not being met and can create inefficiencies in project procurement and management.

If Alectra Utilities establishes an allocation for these unplanned repairs and replacements, that money is not available to fund other projects.

Q Which option do you prefer?

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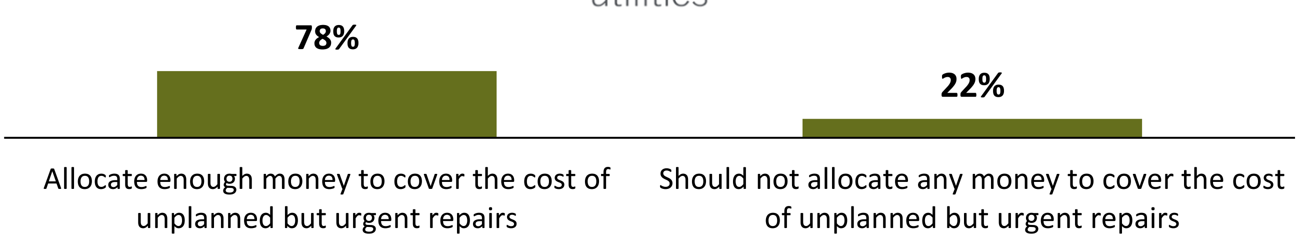

n=4,095

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Alectra Utilities should allocate enough money (approximately 19 million or 6%) in its core budget to reactive capital to cover the cost of unplanned but urgent repairs	80%	76%	79%	77%	76%
Alectra Utilities should not allocate any money in its core budget to reactive capital and simply delay planned projects to cover the cost of unplanned but urgent repairs	20%	24%	21%	23%	24%

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Eliminating Meter Data Security Risks

Residential

Within the former PowerStream area, Alectra Utilities has identified an older type of meter that could be hacked. These meters collect and transmit information to Alectra Utilities about how much electricity you use, and when you use it, but do not have access to any other personal information.

While these meters are at increased risk of hacking, there has not been a known data breach, and it's possible that they won't be hacked in the future.

Between 2015 and 2019, Alectra Utilities will have replaced 41,000 of these at-risk meters, however, an additional 91,000 will still be in service at the end of 2019.

Alectra Utilities has a decision to make about how quickly or slowly they replace these meters. It's your data and it's your money, so Alectra Utilities would like to know what your preference is.

Q Which of the following options would you prefer?

Option	Expected Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities will be able to address all the metering needs identified for the distribution system during 2020-2024 including the replacement of first generation smart meters that do not support modern levels of data encryption
Base Pace *Within current rates*	Alectra Utilities will be able to address some of the metering needs identified for the distribution system during 2020-2024. Replacement of first generation smart meters that do not support modern levels of data encryption would be deferred beyond 2024

Investment only in PowerStream RZ

n=1,204

Keeping the Business Running

Alectra Utilities is more than just poles and wires – it's a business that needs to invest in equipment such as tools, trucks, buildings, computers and software.

When deciding whether to continue to maintain existing equipment or replace them, Alectra Utilities considers whether the risks and costs of continuing to use them outweigh the benefits of waiting longer to replace them. Alectra Utilities business planning process has identified more needs for equipment investments than current rates will allow.

To stay within existing rates, Alectra Utilities has identified the most urgent priorities, things like: keeping large "bucket" trucks on the road; replacing computer equipment that is no longer functional; and repairing leaking roofs. This would mean that less urgent investments, like vans and other equipment would be delayed.

Alectra Utilities recognizes that delaying the less pressing investments will make it harder for staff to do their jobs safely and maintain reliability and security standards.

Bucket trucks (left) have been identified as the most urgent priority, while investments in vans (right) would be delayed in the *base approach.*

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Keeping the Business Running

Residential

Q Which of the following options would you prefer?

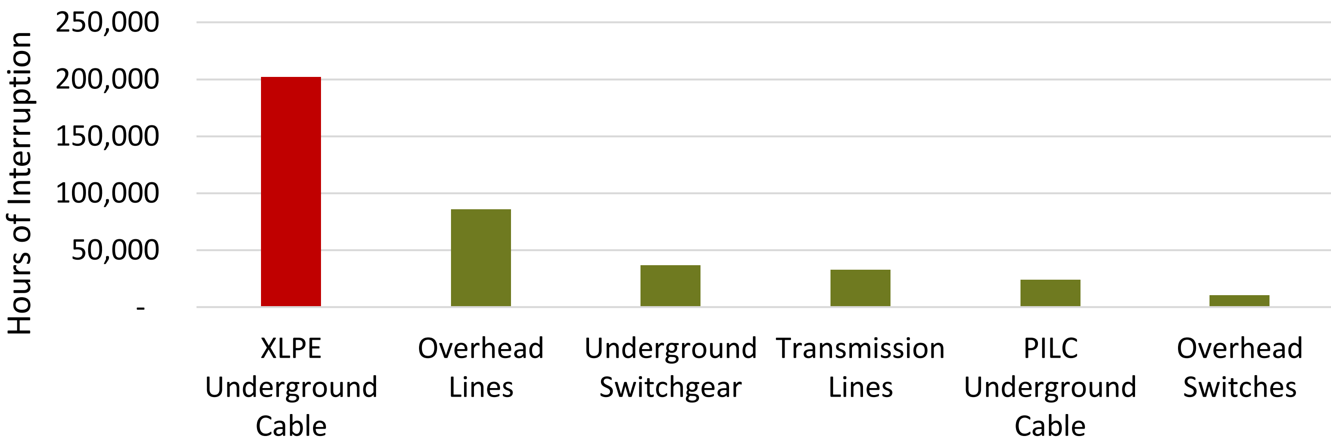
Option	Outcome
Recommended Approach ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities staff will have access to equipment of the same standard as similar sized businesses
Base Approach *Within current rates*	Stay within its existing rates and only replace the equipment with the most urgent needs

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Recommended Approach	51%	45%	52%	42%	55%
Base Approach	49%	55%	48%	58%	45%

Underground Asset Renewal

Equipment failure is the single largest cause of outages in Alectra Utilities' system. As the chart below illustrates, a particular type of equipment known as cross-linked polyethylene (XLPE) cable is the leading cause of outages across Alectra Utilities' system.

What type of equipment is causing the most outages? (5-year average)



Case Study

The deterioration of these cables is directly impacting customers. For example, the York/Hilda neighbourhood in Vaughan was originally scheduled to have its cables replaced in 2019. But in 2018, customers began to experience a cascading series of prolonged outages, due to cable failures. Cables repaired one week would fail again the next. In the summer, 250 customers experienced eight cable faults (one outage a week). As a result, the cable had to be replaced on an emergency basis at both a higher cost to Alectra Utilities and major inconvenience to the affected customers.

As Alectra Utilities reviewed all of its equipment across all of its operating areas, it became clear that replacing XLPE underground cable requires an accelerated investment plan. To provide the best value to customers, Alectra Utilities will be using two approaches:

- **Cable Rejuvenation**: Cable rejuvenation is a lower-cost solution that can extend the life of these cables without the need to excavate and replace the entire cable. While it is the better value for customers for cables in fair condition, it is not effective for cables that are already declining.

- **Cable Replacement**: In some cases, Alectra Utilities has no prudent choice but to replace the cable. Replacing this equipment now rather than trying to extend its life will cost more now, but will deliver superior reliability over time, relative to older standards of cable.

Alectra Utilities has a decision to make regarding the pace in which they invest in replacing or extending the life of at-risk underground equipment.

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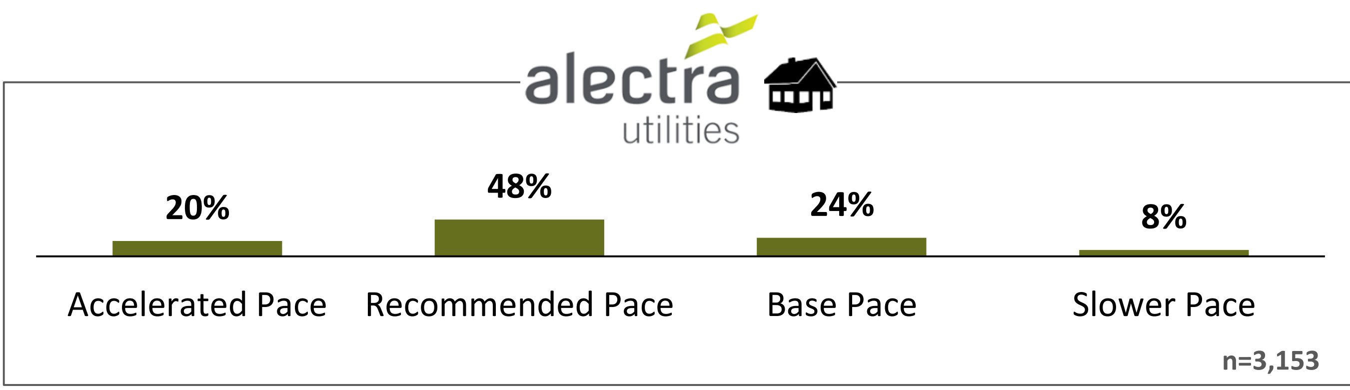
Pacing Investments in the Underground System

Residential

Within current rates, the reliability of underground cable is expected to further worsen by approximately 4% from current 2018 levels. As such, Alectra Utilities is recommending a pace of cable replacement and rehabilitation that will maintain current levels of reliability.

Q Which of the following cable replacement strategies would you prefer?

Option	Cable replaced or rehabilitated	Expected Reliability Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**2,184 km** by 2024	Improve the reliability of cables by 8% from the current (2018) level
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**1,978 km** by 2024	Maintain the reliability of cables at the current (2018) level
Base Pace *Within current rates*	**1,861 km** by 2024	Reliability of cables to further worsen by 4% from the current (2018) level
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**1,624 km** by 2024	Reliability of cables expected to further worsen by 10% from the current (2018) level



Rate Zone Breakdown	ERZ	HRZ	PRZ
Accelerated Pace	18%	23%	19%
Recommended Pace	48%	48%	46%
Base Pace	24%	21%	27%
Slower Pace	10%	8%	8%

Keeping Pace with Overhead System Renewal

Compared to previous years, Alectra Utilities is considering slowing down its overall spending on poles and wires, known as the overhead system. There are two primary reasons for this proposed reduction in spending:

1. **Additional focus on the underground system:** As noted earlier, customers served by the underground system are having more reliability issues than customers served by overhead lines.

2. **New technology increasing the lifespan of poles:** Advancements in testing and inspections are enabling Alectra Utilities to keep overhead poles and wires in service for longer and have enabled the utility to be smarter about replacing aging equipment.

Based on a recent condition study, most poles in Alectra Utilities' overhead system are in good or excellent condition. However, the study identified that 8,110 or 7.5% of the poles in Alectra Utilities' system are currently in poor or very poor condition. Alectra Utilities also projects that a portion of the 15% of poles currently in fair condition will deteriorate into poor or very poor condition over the next five years and will need to be replaced.

Generally, Alectra Utilities tries to replace groups of poles in similar condition which allows for a lower average cost of replacement than replacing poles one at a time. While the slower option reduces the total amount of spending, the cost per pole is higher because it would involve doing more single-pole replacements and more replacements that require overtime labour.

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Keeping Pace with Overhead System Renewal

Residential

Q Which of the following options would you prefer?

Option	Poles replaced	Expected Outcome
Accelerated Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**8,110** by 2024	Address **all of the poor and very poor poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Recommended Pace *Within current rates*	**4,830** by 2024	Address **most of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Slower Pace ***<u>Decrease</u>*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**3,190** by 2024	Address **half of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions

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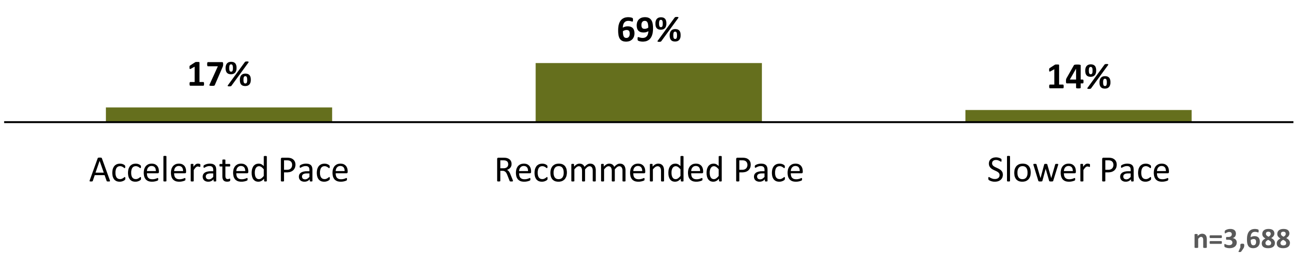

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ
Accelerated Pace	16%	21%	18%	15%
Recommended Pace	70%	63%	68%	72%
Slower Pace	14%	16%	14%	13%

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Residential

Overhead and Underground Renewal by Service Type

The questions below are broken down by the type of electricity service customers believe they receive.

- "Wires" refers to homes that are serviced by the overhead system
- "Cables" refers to homes that are serviced by the underground system

Q Underground System Renewal **by** Service Type

Rate Zone Breakdown	ERZ		HRZ		PRZ	
Service Type	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**
Accelerated Pace	16%	20%	24%	24%	18%	20%
Recommended Pace	48%	48%	45%	53%	43%	47%
Base Pace	29%	24%	23%	18%	32%	26%
Slower Pace	7%	9%	8%	5%	7%	7%

Q Overheard System Renewal **by** Service Type

Rate Zone Breakdown	ERZ		BRZ		HRZ		PRZ	
Service Type	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**
Accelerated Pace	17%	16%	26%	21%	21%	15%	17%	15%
Recommended Pace	67%	71%	57%	63%	65%	73%	73%	71%
Slower Pace	16%	13%	18%	16%	14%	12%	10%	13%

INNOVATIVE RESEARCH GROUP

Alectra Utilities' Transformer Replacement Program

Transformers are a critical piece of distribution equipment that reduce voltage from the higher levels that are more efficient to move electricity long distances to lower levels that are safer to connect to homes and offices. They can either be located on the ground, in underground vaults or attached to distribution poles

- Through the annual Asset Condition Assessment, Alectra Utilities has identified that 2,998 transformers are now in a *poor* or *very poor* condition. Alectra Utilities already has funded plans to replace 1,148 of these transformers. However, there will still be a need to replace 1,850 transformers based on present day condition assessments.
- Over the next five years, Alectra Utilities projects that another 2,000 transformers will deteriorate and will need to be replaced as well.
- In addition to the *poor* and *very poor* condition transformers, Alectra Utilities has identified another 900 transformers that need to be replaced due to unsafe legacy configurations or that are consistently overloaded in current conditions.

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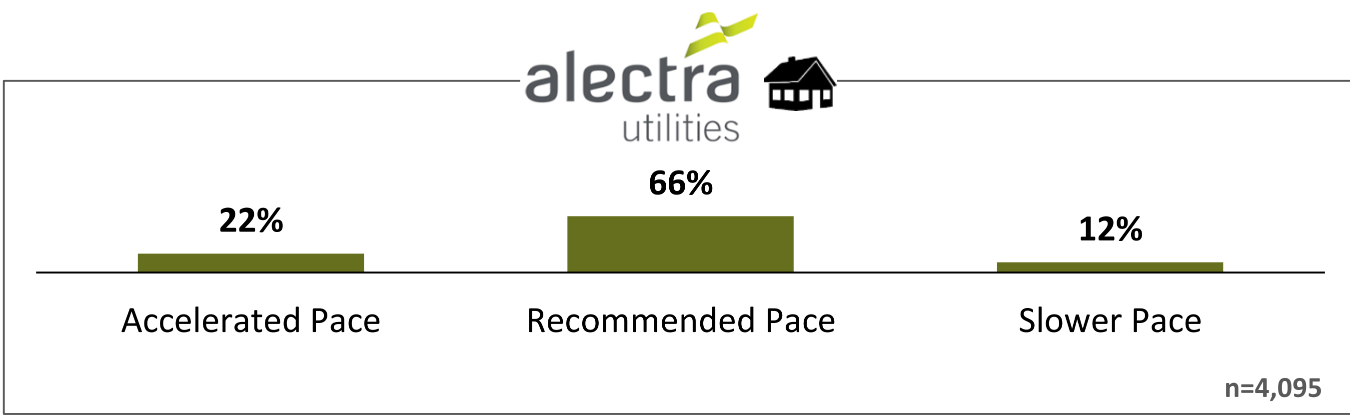
Alectra Utilities' Transformer Replacement Program

Residential

Q Which of the following options would you prefer?

Option	Transformers replaced	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**4,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations or are consistently overloaded. • Replace all transformers that will decline to poor and very poor condition over the next five years
Recommended Pace *Within current rates*	**2,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations that are consistently overloaded
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**1,850** by 2024	• Replace only transformers currently assessed to be in poor or very poor condition



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	20%	20%	24%	21%	26%
Recommended Pace	68%	65%	65%	68%	58%
Slower Pace	12%	15%	11%	11%	16%

Monitoring and Control Equipment

Using proven technology like pole top monitors and automated switches allows Alectra Utilities to automatically reroute power during outages and planned maintenance, reducing the length of time customers are without power and reducing reliance on crews who need to travel to the site to physically reroute power.

When Alectra Utilities is rebuilding existing lines, it typically replaces equipment that is like-for-like. That means, rebuilt older lines would not have monitoring and control equipment installed.

Alectra Utilities is proposing a different approach for its main feeder lines. Feeder lines are high capacity lines that bring electricity from substations to the lines that connect to homes or businesses. An outage on a feeder line can impact a 1,000 or more customers. Alectra Utilities is planning to phase in monitoring and control equipment to each feeder in the system, so that when power does go out, it can be quickly restored for large numbers of customers.

Each of the three options will continue to phase in this equipment during typical renewal. The difference is in how quickly they modify the remaining feeder lines.

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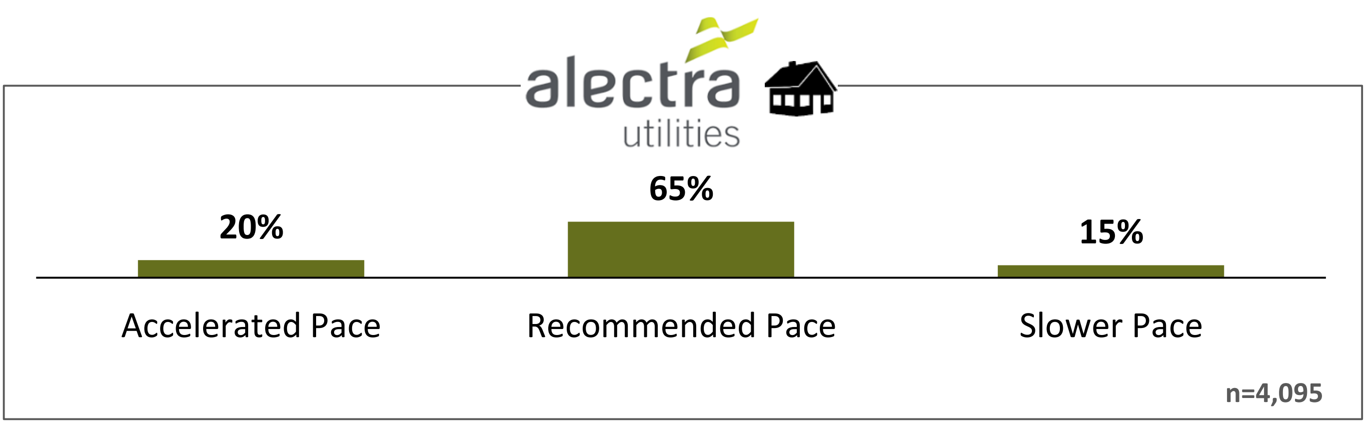
Monitoring and Control Equipment

Q Which of the following options would you prefer?

Option	Devices installed over next 5 years	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**284** 95 additional targeted reliability improvements	Projected to improve reliability by 17% for approximately 142,000 customers. All feeders would be automated in 10 years
Recommended Pace *Within current rates*	**189** 47 additional worst performing feeders	Projected to improve reliability by 17% for approximately 95,000 customers. All feeders would be automated in 15 years
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**142**	Projected to improve reliability by 17% for approximately 71,000 customer. All feeders would be automated in 20 years



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	20%	20%	22%	19%	21%
Recommended Pace	66%	60%	65%	68%	61%
Slower Pace	14%	19%	13%	13%	18%

Converting Rear Lot Service

Alectra Utilities' service area contains multiple older suburban and urban neighbourhoods with rear lot or "backyard" infrastructure. In general, rear lot electricity lines are 40 years of age or older. This type of equipment presents three primary problems:

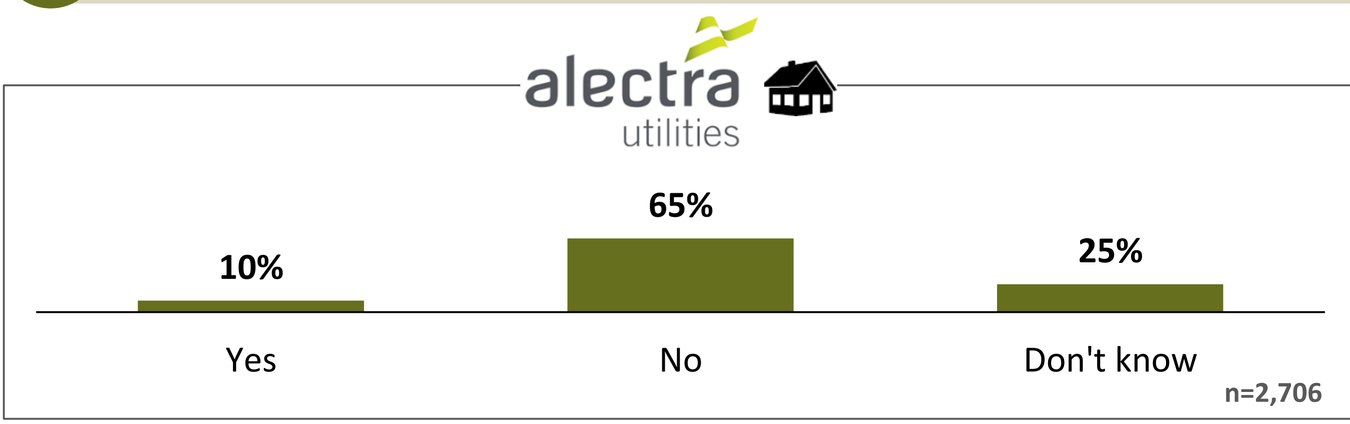
1. Repairs and maintenance are complicated because these lines are in the backyard of homes, rather than the front. Often regular equipment cannot access the backyards and repair crews need to work around trees, pools, sheds and other obstacles.

2. Rear lot equipment is subject to greater tree contact, especially during severe weather

3. The equipment presents elevated safety risks to the general public should the assets fail.

An Alectra Utilities study showed that rear lot restoration times are approximately 4.55 hours. This is three times higher than a comparable front lot restoration time of 1 to 1.4 hours.

Q To the best of your knowledge, does your power come from a line in a backyard behind your home?



Rate Zone Breakdown	HRZ	PRZ	GRZ
Yes	15%	7%	6%
No	61%	66%	73%
Don't know	24%	27%	21%

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Converting Rear Lot Service

Residential

Alectra Utilities has two choices to make in dealing with rear lot service, a design choice and a timing choice. The first question relates to what design approach the utility chooses. The options below assume that all rear lot equipment is converted within the next 70 years.

Q Which of the following design approaches would you prefer?

Option	Rear lot or "backyard" equipment design choices
Reactive Approach ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Reactively** replace rear lot assets when they have reached their physical end-of-life criteria, knowing that there could be prolonged reliability impacts. This option leaves customers vulnerable to longer than average storm outages and resulting safety risks.
New poles in backyard ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** replace old poles and equipment, with new poles and equipment in backyards. This would improve day-to-day reliability but leaves customers vulnerable to longer than average storm outages, and resulting safety risks.
Partial Underground ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** re-locate some rear lot infrastructure to front lot underground. This would address some of the vulnerability to longer than average storm outages and resulting safety risks.
Full Underground ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**Proactively** re-locate all rear lot infrastructure to front lot underground. This would completely resolve the vulnerability to longer than average storm outages and resulting safety risks.

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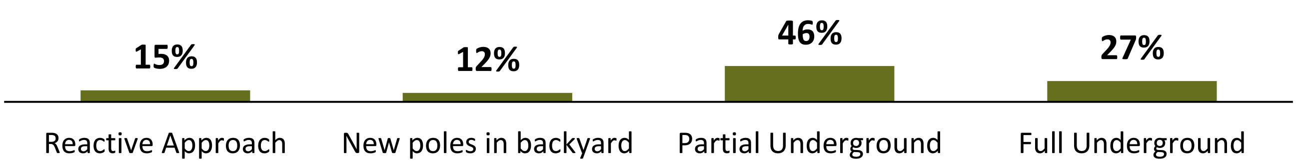

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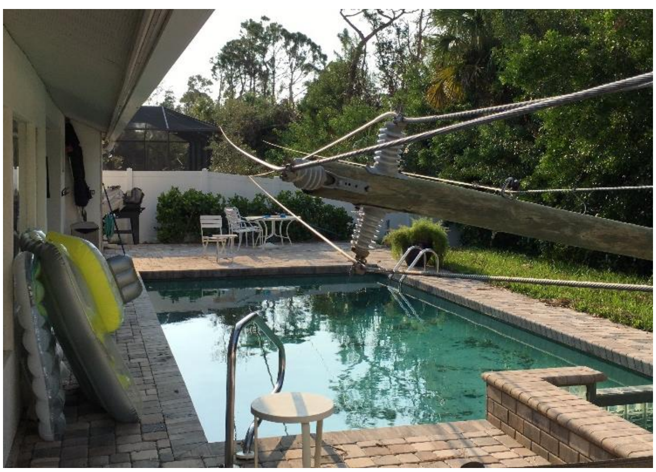
Rate Zone Breakdown	HRZ	PRZ	GRZ
Reactive Approach	12%	17%	18%
New poles in backyard	14%	11%	11%
Partial Underground	51%	45%	36%
Full Underground	24%	27%	35%

Timing of a Rear Lot Conversion Program

Approximately 11,000 customers throughout the former Horizon, PowerStream and Guelph Hydro rate zones are supplied by rear lot lines.

Because rear lot lines have reasonable reliability in normal weather, Alectra Utilities has given other projects priority within its current approved rates. However because rear lot conversions will reduce customer exposure to prolonged outages, and safety risks, Alectra Utilities has identified three timing options to replace rear lot lines proactively.

The exact cost will depend on the design, but for your feedback the options assume the full replacement with front lot underground service.



Examples of rear lot equipment

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Timing of a Rear Lot Conversion Program

Residential

Q Which of the following timing options would you prefer?

Option	Pacing of renewal and conversion	Service renewed and converted over 5-year period
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **30 year period**	Approximately **1,810 customers** (16% of customer with rear lot)
Moderate Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **40 year period**	Approximately **1,360 customers** (12% of customer with rear lot)
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **70 year period**	Approximately **851 customers** (8% of customer with rear lot)
Base Pace *Within current rates*	Renew and convert existing rear lot overhead locations on a reactive emergency basis	Expose customers serviced by these lines to prolonged outage and safety risks

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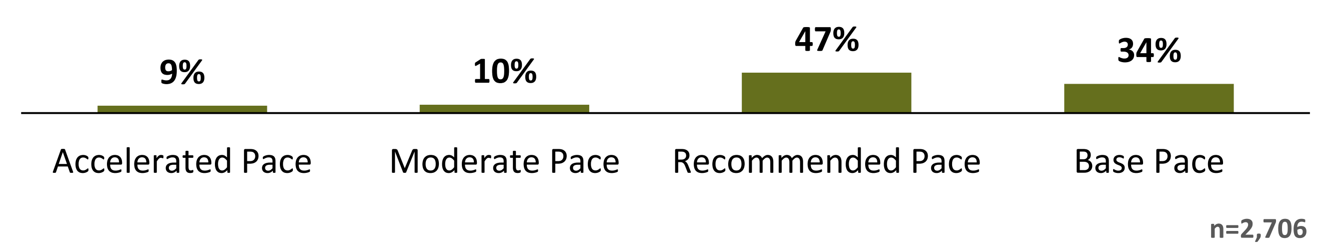

Rate Zone Breakdown	HRZ	PRZ	GRZ
Accelerated Pace	9%	8%	11%
Moderate Pace	11%	7%	14%
Recommended Pace	48%	46%	46%
Base Pace	32%	38%	28%

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Rear Lot Questions by Service Type

Q Converting Rear Lot Service (Design) **by** Service Type

Rate Zone Breakdown	HRZ		PRZ		GRZ	
Service Type	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot
Reactive Approach	10%	12%	18%	17%	8%	19%
New poles in backyard	14%	14%	7%	11%	8%	9%
Partial Underground	47%	51%	45%	44%	32%	39%
Full Underground	29%	23%	30%	28%	52%	34%

Q Timing of a Rear Lot Conversion Program (Timing) **by** Service Type

Rate Zone Breakdown	HRZ		PRZ		GRZ	
Service Type	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot	Rear Lot	Not Rear Lot
Accelerated Pace	18%	7%	17%	7%	32%	11%
Moderate Pace	14%	11%	8%	7%	16%	14%
Recommended Pace	45%	48%	54%	46%	36%	48%
Base Pace	23%	34%	20%	40%	16%	27%

Planning for Expansion, Intensification and Back-up

Expansion, increased intensification and increased back-up projects all involved adding high capacity feeder lines to the grid.

- **Expansion:** Where there is no line or a line might have been initially built to service a farm, it is now serving a subdivision and can no longer meet the needs of those customers.
- **Intensification and redevelopment:** Multiple downtown areas are becoming more densely populated, which has resulted in insufficient supply to meet the increased demand.
- **Back-up capacity:** Because of the way the grid has grown, there are certain areas within Alectra Utilities' service territory that no longer have access to adequate back-up capacity in the case of an outage.

While most expansion related projects cannot be deferred due to the obligation to connect new customers, some intensification and back-up capacity projects could be delayed.

Intensification:

- Since these projects are often completed with other infrastructure projects such as road widening and sewer work, deferral could lead to increased costs and service disruptions.
- Building expansion projects now allows the projects to be built at lower cost with less disruptions than waiting until development is underway and the need is pressing.

Back-up capacity:

- Deferral of back-up projects could lead to increased outage times during contingency condition and may cause reliability issues on some heavily loaded lines.
- Adding back-up capacity now allows for quicker restoration of power when caused by transmission system failures or severe weather events.

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Residential

Planning for Expansion, Intensification and Back-up

Q Which of the following timing options would you prefer?

Option	2020 – 2024 Expansion & Intensification Projects
Accelerated Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	Address all the expansion, intensification and contingency needs identified for the distribution system during 2020-2024.
Recommended Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	Address all the expansion needs and many of the intensification and required back-up projects. Some projects related to intensification or back-up capability will be deferred.
Slower Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	Address all expansion projects but defer majority of intensification and all required back-up capability projects. Reliability and power quality may be affected on heavily loaded feeders.
Base Pace *Within current rates*	Complete key expansion projects but defer significant amount of intensification and back up capability projects during 2020 -2024.

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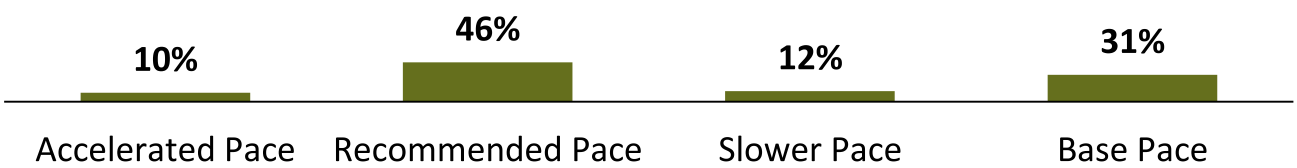

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Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	14%	12%	9%	8%	10%
Recommended Pace	46%	46%	50%	44%	41%
Slower Pace	13%	11%	11%	12%	14%
Base Pace	27%	30%	30%	35%	35%

Voltage Conversion

About 8.5% of Alectra Utilities' customers are serviced by low voltage distribution systems. These lines were built in the 1950's and represent some of Alectra Utilities' oldest distribution assets. These lines have much less capacity than modern lines. During an outage, the modern lines cannot be used to restore power to the low voltage lines, because they don't operate at the same voltage levels.

This equipment has become functionally obsolete, and the risk of equipment failure is increasing. Since there is no urgent threat to reliability, there are no low voltage conversion investments included within existing rates.

However, investing in voltage conversion projects would:

- improve reliability through the new lines and transformers;
- provide access to increased supply from higher voltage substations; and
- improve outage restoration from the enhanced back-up and availability of tie points at this higher voltage level.

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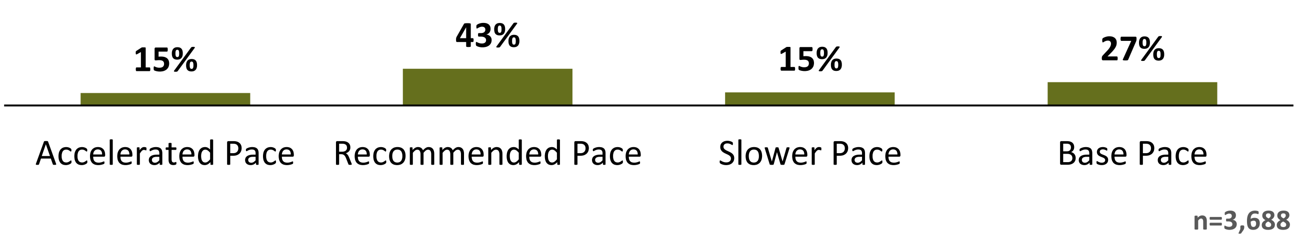
Voltage Conversion

Residential

Q Which of the following timing options would you prefer?

Option	Voltage Conversion	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **11** low voltage substations	Enable Alectra Utilities to convert 10,533 customers to present day supply voltage
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **9** low voltage substations	Enable Alectra Utilities to convert 9,984 customers to present day supply voltage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **5** low voltage substations	Enable Alectra Utilities to convert 6,566 customers to present day supply voltage
Base Pace *Within current rates*	Alectra Utilities will not decommission any stations	Current rates support the investment to enable Alectra Utilities to convert 3,600 customer to present day supply voltage



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ
Accelerated Pace	16%	12%	10%	19%
Recommended Pace	44%	40%	41%	45%
Slower Pace	14%	17%	19%	11%
Base Pace	26%	31%	30%	24%

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Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity in order to provide electricity for existing and new developments; provide more resilience to deal with extreme weather event and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline in Alectra Utilities' quality of service to current customers.

Here in Mississauga, Alectra Utilities has two stations that need investment.

- The proposed new Duke station is located immediately north of Square One and will help serve the growing demands of that area.
- A station in the East Credit area of Mississauga is currently located on leased land that Alectra Utilities would like to purchase for long term security.

The lead time to build a station is 2 to 3 years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures.

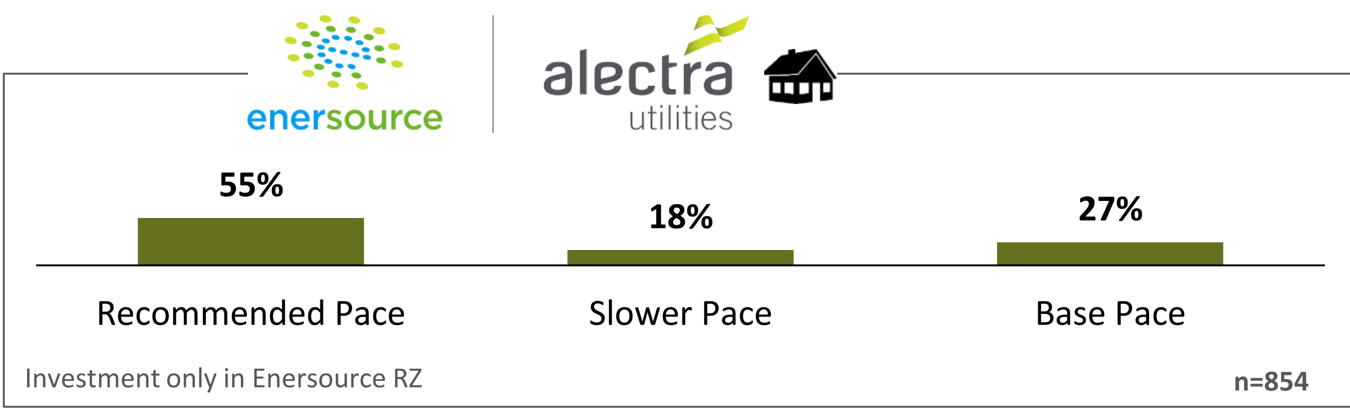
Voluntary Online Workbook

Distribution Stations Capacity (ERZ)

Residential

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station and increase capacity at one station	Enable Alectra Utilities to build Duke station as well as buy leased land at the East Credit area station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station	Enable Alectra Utilities to build Duke station, while assuming the risk that it will cost more to purchase leased land at a station in East Credit in the future.
Base Pace *Within current rates*	Delay any station capacity investments	Risk that it will cost more to purchase leased land in future. Existing stations likely to experience overloading and increased risk of reliability issues.



Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity to provide electricity for existing and new developments; provide more resilience to deal with extreme weather events and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline Alectra Utilities' quality of service to current customers.

Here in the former PowerStream area, Alectra Utilities has four stations that need investment:

- The existing Melbourne station in Bradford is located on leased land that Alectra Utilities would like to purchase for long-term stability. Furthermore, this station requires an upgrade.
- Barrie and Alliston both have growing demand that will need Alectra Utilities to buy the land for and to build new stations.
- Growth in Markham and Richmond Hill requires building a new transformer station after 2024. However, prior to building this new station, an environmental assessment is needed.

The lead time to build a station is two to three years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures. Alectra Utilities has presented the following options that balance system needs and rate impacts.

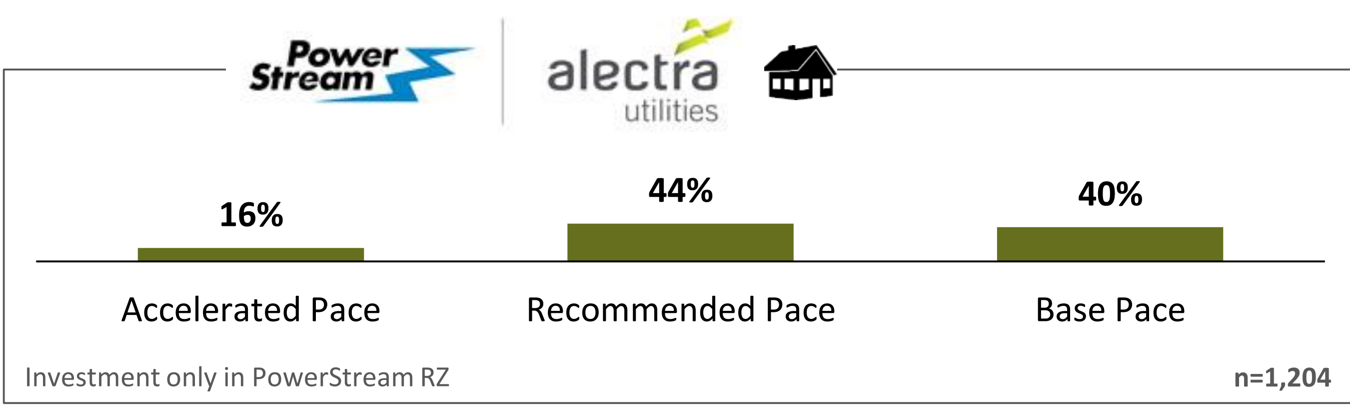
Voluntary Online Workbook

Distribution Stations Capacity (PRZ)

Residential

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually (\$Y.YY more per bill by 2024)*	Build two new stations and increase capacity at one station	• Upgrade Bradford station • Build new stations in both Alliston and Barrie • Complete environmental assessment for Markham station.
Recommended Pace ***Additional*** *$X.XX per month annually (\$Y.YY more per bill by 2024)*	Build one new stations and increase capacity at one Station	• Upgrade Bradford station • Build station in Alliston • Complete environmental assessment for Markham station. Risk that existing Barrie stations will experience overloading and increased risk of reliability issues.
Base Pace *Within current rates*	Upgrade one station and secure land for future station build.	• Upgrade Bradford station • Complete environmental assessment for Markham station. Risk that existing Alliston and Barrie stations will experience overloading and increased risk of reliability issues.



Additional Station Investments

Beyond the transformers and other equipment that directly operate the grid, other investments are required for security, communications and control systems. Distribution stations play an important role in Alectra Utilities' electricity grid, transforming high voltage electricity to a lower voltage that is suitable for distribution. A failure in a distribution station can result in an outage for thousands of customers.

- **Communications and control systems** allow Alectra Utilities staff in central control rooms to remotely monitor and control the equipment in distribution stations in order to avoid equipment failures and manage failures when they do occur. Monitoring equipment is also used for security purposes.

While new investments to keep these systems up to date would help to maintain reliability and security, delaying these investment is less likely to cause problems compared to delaying other projects discussed earlier.

To manage within existing rates, Alectra Utilities is proposing to postpone any investments in distribution station, communications and control systems. Managers know that as these systems age, there will likely be more outages, but it is not possible to estimate the exact risks involved.

Voluntary Online Workbook

Additional Station Investments

Residential

Q Which of the following timing options would you prefer?

Option	Level of Investment	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew communication, replace end-of-life station equipment, obsolete protection equipment and upgrade station facilities.	• Maintain reliability • Ensure reliable communication performance of the system • Increases security at the station.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication, replace end of life station equipment and obsolete protection equipment.	• Maintain reliability • Ensure reliable communication performance of the system • Does not increase security at the station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication and replace end of life station equipment.	• Maintain reliability • Ensure reliable communication infrastructure. • Does not increase security at the station.
Base Pace *Within current rates*	Monitor station equipment and reactively replace when necessary. Defer other investments beyond 2024	This option would require allocating funds from the reactive budget as necessary.

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Accelerated Pace	16%	14%	17%	13%	17%
Recommended Pace	48%	52%	54%	45%	56%
Slower Pace	10%	12%	9%	17%	-
Base Pace	26%	22%	20%	25%	27%

Combined Alectra Utilities results not shown because “slower pace” option was not presented in the Guelph rate zone. **n=4,095**

Preparing for More Consumer Choice

New technologies are changing the way that consumers are able to interact with the electricity system. Emerging technologies like solar power, battery storage and electric vehicles are constantly evolving; they are becoming more affordable, more widely available, and better performing.

Properly planned and managed, the integration of these technologies with Alectra Utilities' traditional "poles and wires" equipment is expected to provide benefits to customers by way of:

- reducing the amount of infrastructure costs related to meeting the increased demand for electricity; and
- generating electricity more locally, reducing the amount of generation that is needed elsewhere in the province.

Regardless of whether you are considering new energy choices like an electric vehicle for yourself today, the market is changing quickly, and Alectra Utilities must be prepared as adoption becomes more widespread over the next five years. For instance, charging each electric vehicle draws as much energy as two average homes. If a dozen or so people come home and start changing their vehicles at a period of peak demand, it could overload the grid in that neighbourhood. Not being prepared could result in increased equipment failure due to overloaded lines, as well as costly infrastructure upgrades to meet the demand posed by this technology.

Alectra Utilities has identified three pilot projects to ensure the system is ready when more consumers adopt this technology. These pilots are intended to answer questions like;

- *How will the grid respond if a neighbourhood rapidly adopts new technology, such as electric vehicles?*
- *How can Alectra Utilities reduce the strain on the system by using smart technology to dispatch electricity?*

These pilots are not required to meet immediate reliability issues, however, they will help to ensure that Alectra Utilities is able to meet the challenged as more consumers embrace this technology in the next few years.

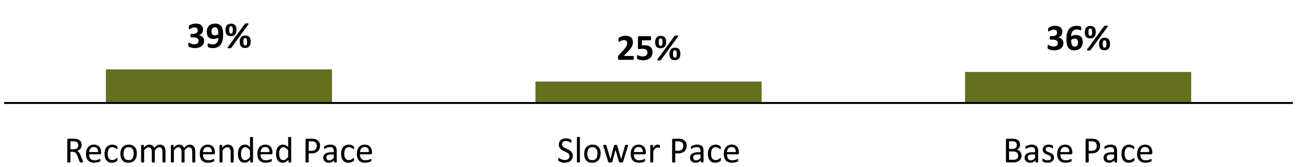
Voluntary Online Workbook

Preparing for More Consumer Choice

Residential

Q Which of the following timing options would you prefer?

Option	Approach
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Conduct three pilot projects to prepare to integrate new technology like electric vehicles, solar power and battery storage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Wait until new technology like electric vehicles, solar power and battery storage becomes more widely adopted
Base Pace *Within current rates*	Reactively respond to technology uptake by investing in traditional 'poles and wires' infrastructure as reliability and capacity issues become apparent



Investment only in PowerStream RZ

n=1,204

Investment Alternative Summary

Throughout this workbook, you have been asked about some key choices that could impact your rates. Below is a summary of your answers to the questions that could impact your rates.

At the bottom of this page you will find the total bill impact of all the answers you gave that would result in a bill increase.

Having seen the total bill impact, please review your answers and change your responses if you desire; your potential rate impact will be re-calculated. You will have the opportunity to adjust your answers again until you feel you've reached the best balance for you.

Q Residential Customer Bill Impact Change and Magnitude of Bill Impact

Bill Impact Analysis	ERZ	BRZ	HRZ	PRZ	GRZ
Average $ Initial	$0.15	$0.12	$0.16	$0.22	$0.09
Average $ Final	$0.15	$0.11	$0.15	$0.22	$0.09
Difference: Initial VS. Final	$0.00*	$0.00*	$0.00*	($0.01)*	$0.00

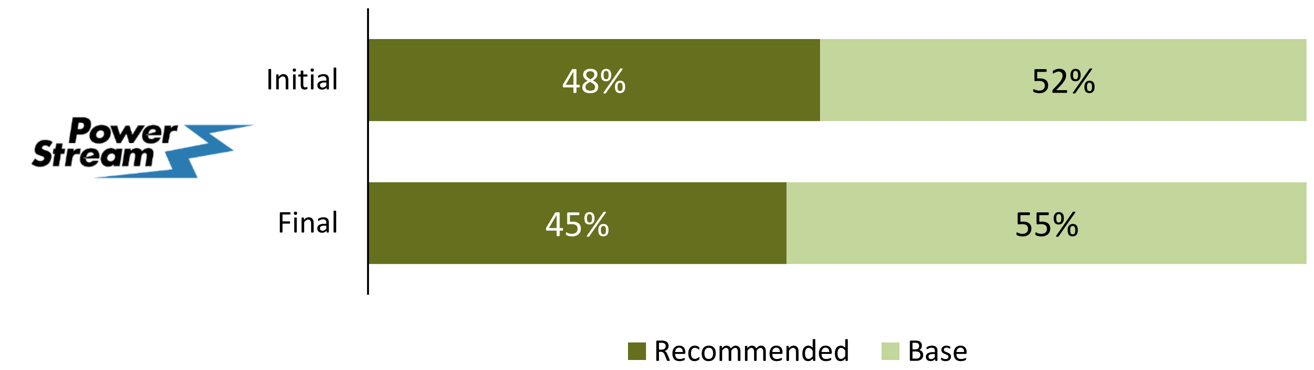
Differences that are statistically significant at 95% are noted by an asterisk (*).

Voluntary Online Workbook

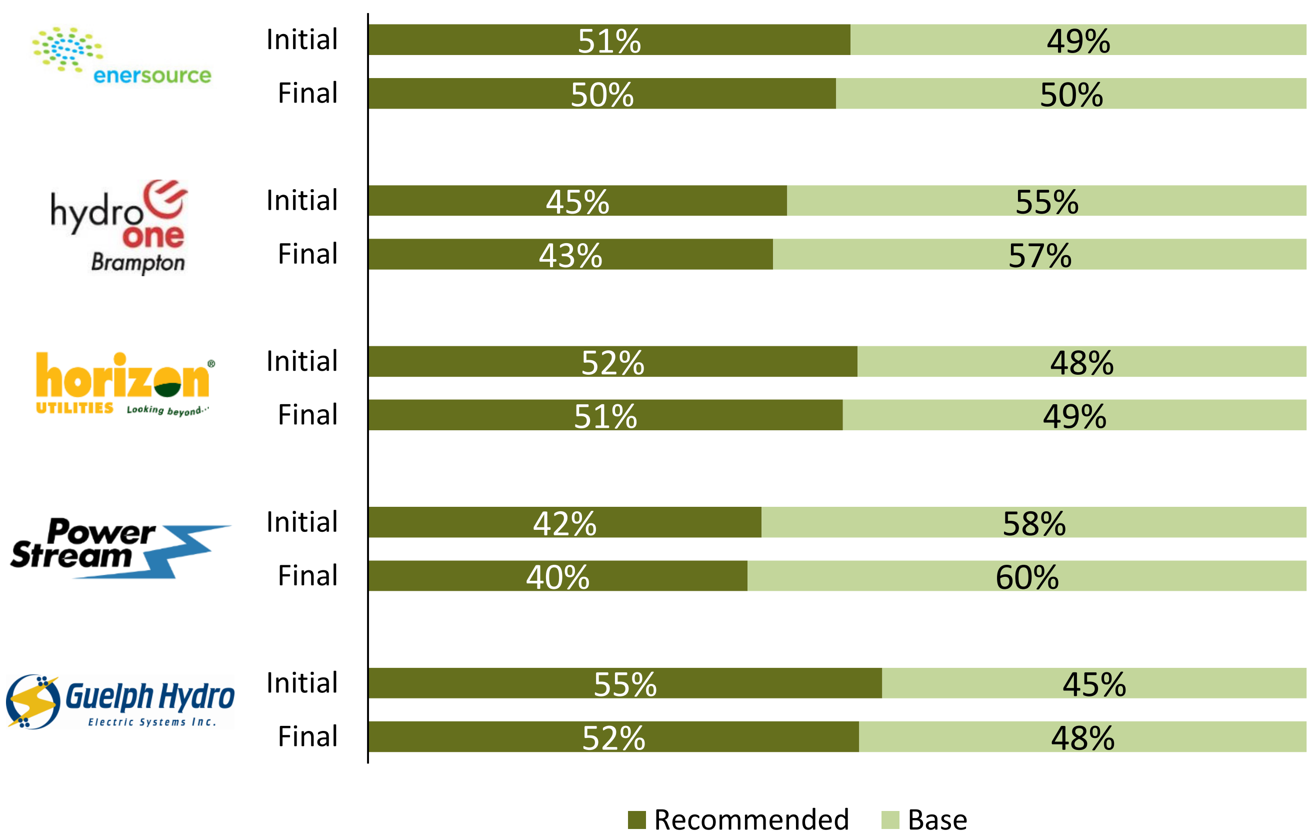
Change in Initial vs. Final Response by Project

Residential

Q Eliminating Meter Data Security Risks



Q Keeping the Business Running

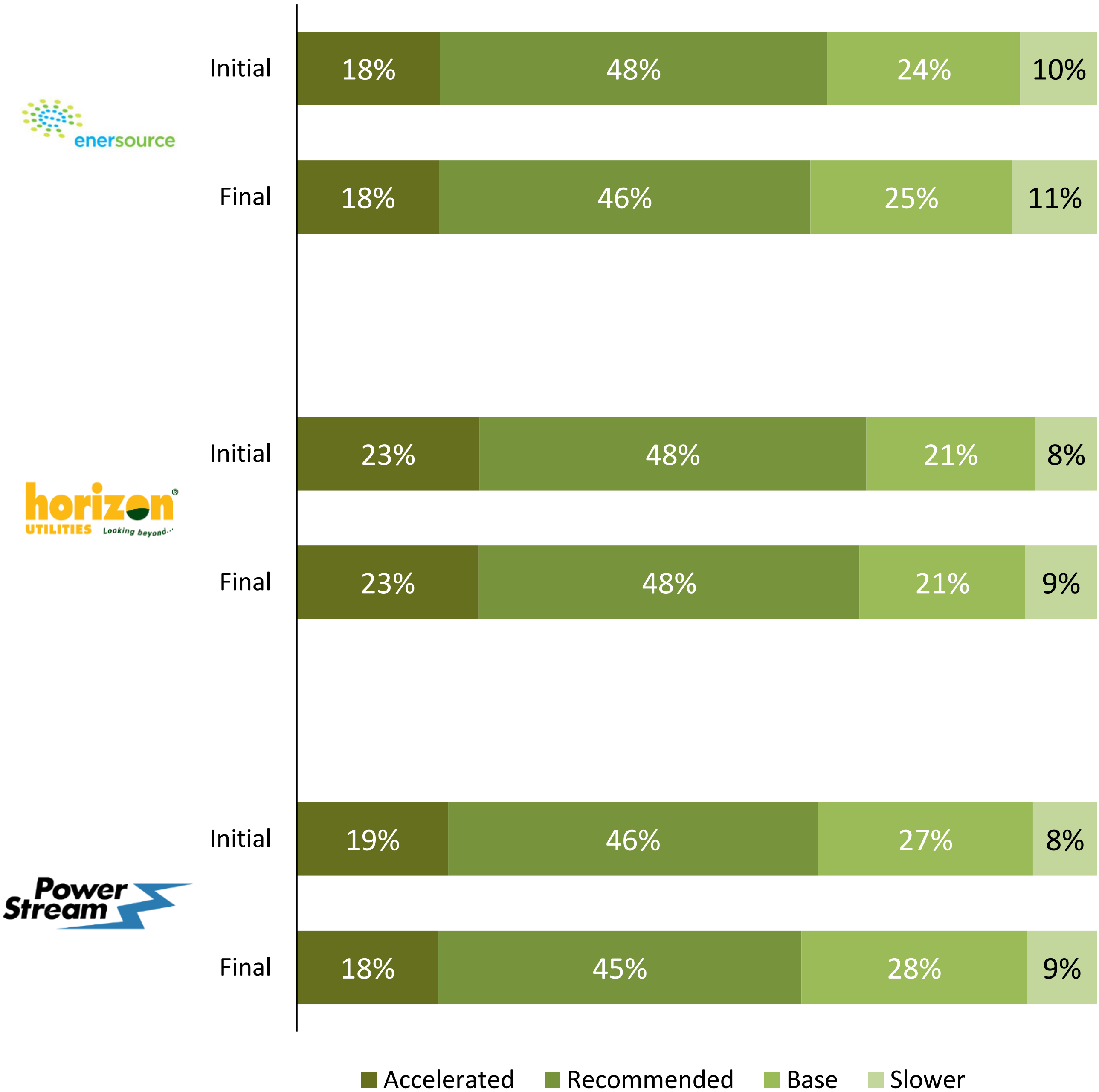


Voluntary Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Pacing Investments in the Underground System



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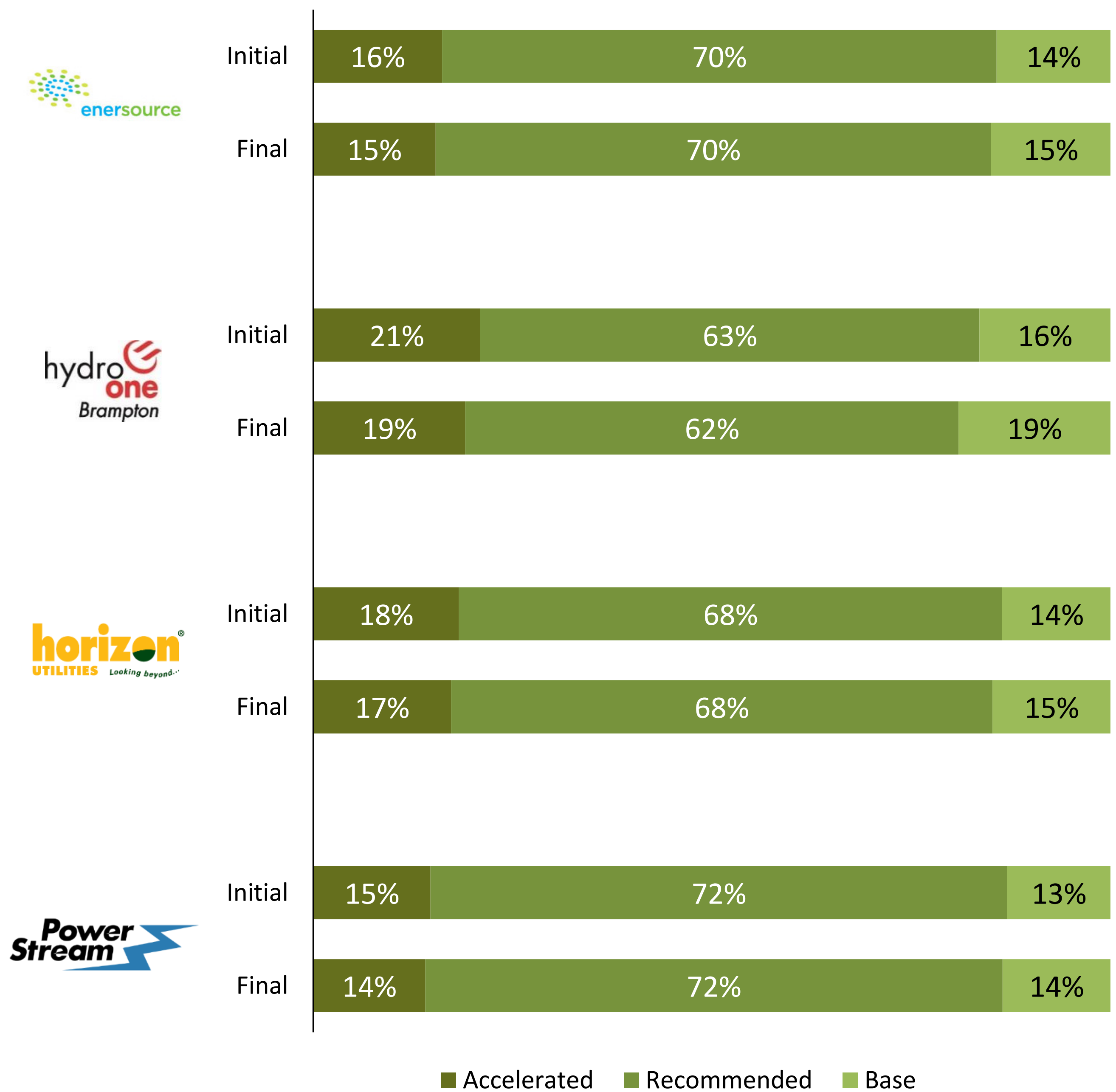
Voluntary Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Keeping Pace with Overhead System Renewal



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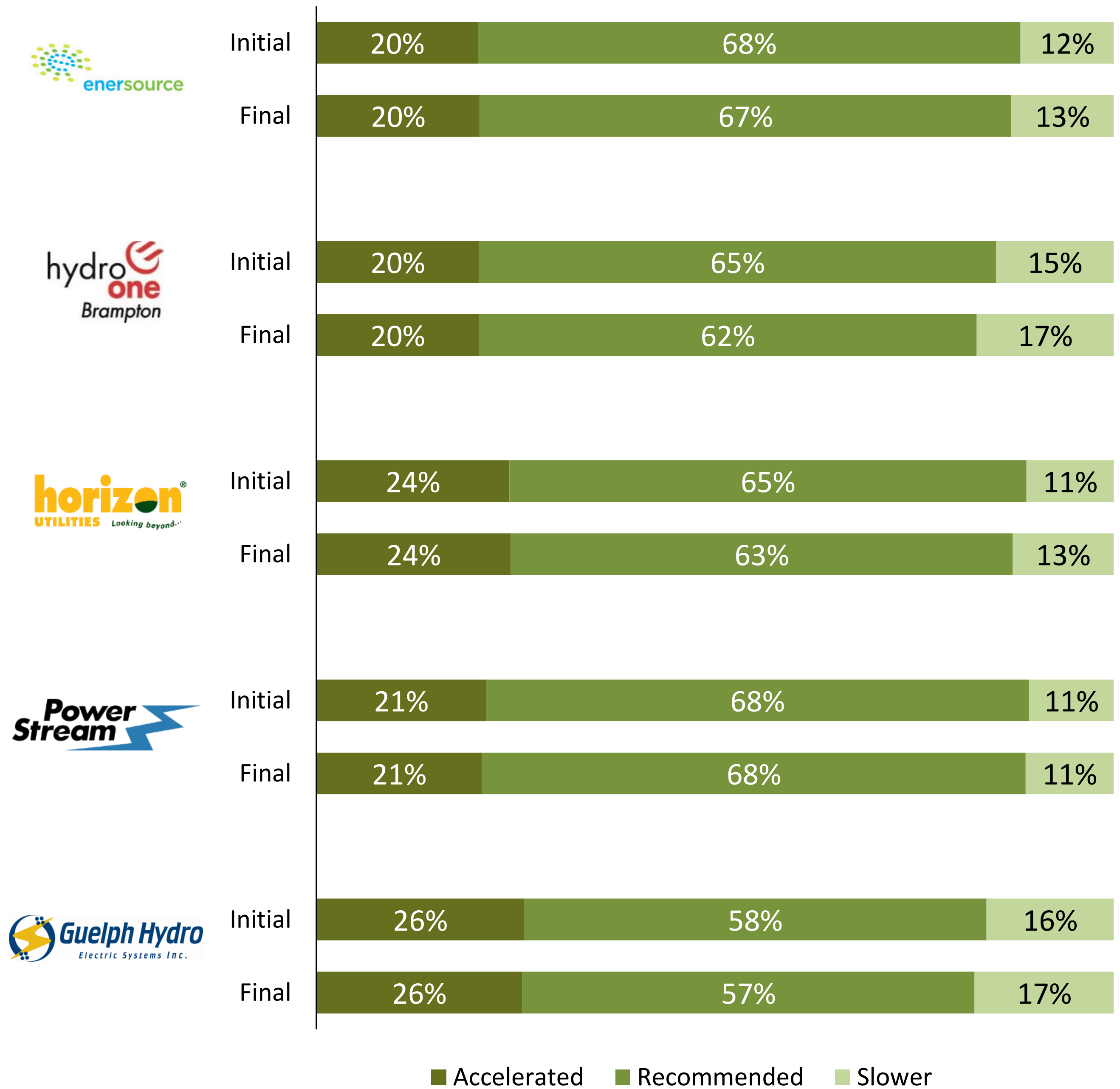
Change in Initial vs. Final Response by Project

Residential

Q Alectra Utilities' Transformer Replacement Program

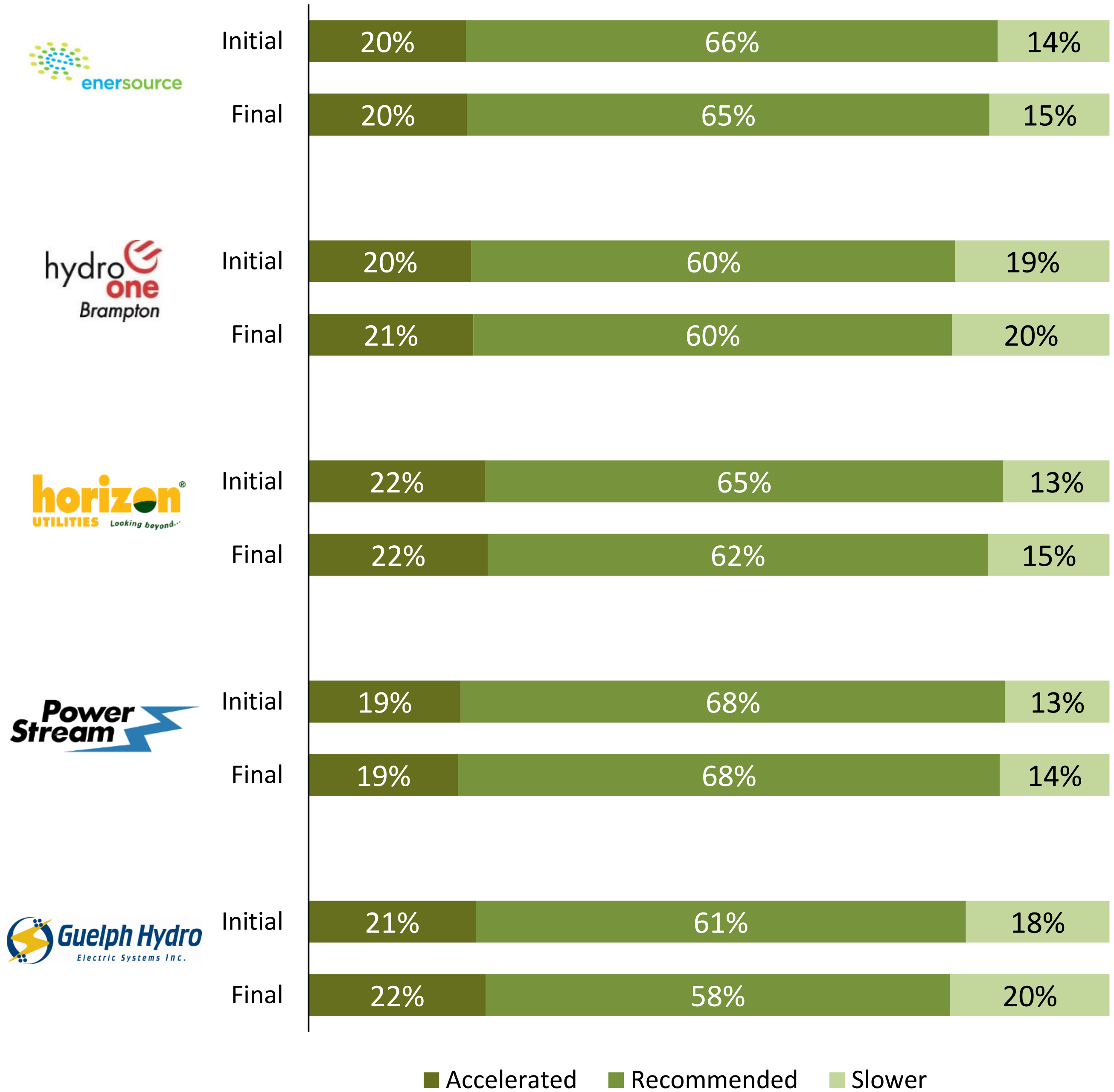


Voluntary Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Monitoring and Control Equipment



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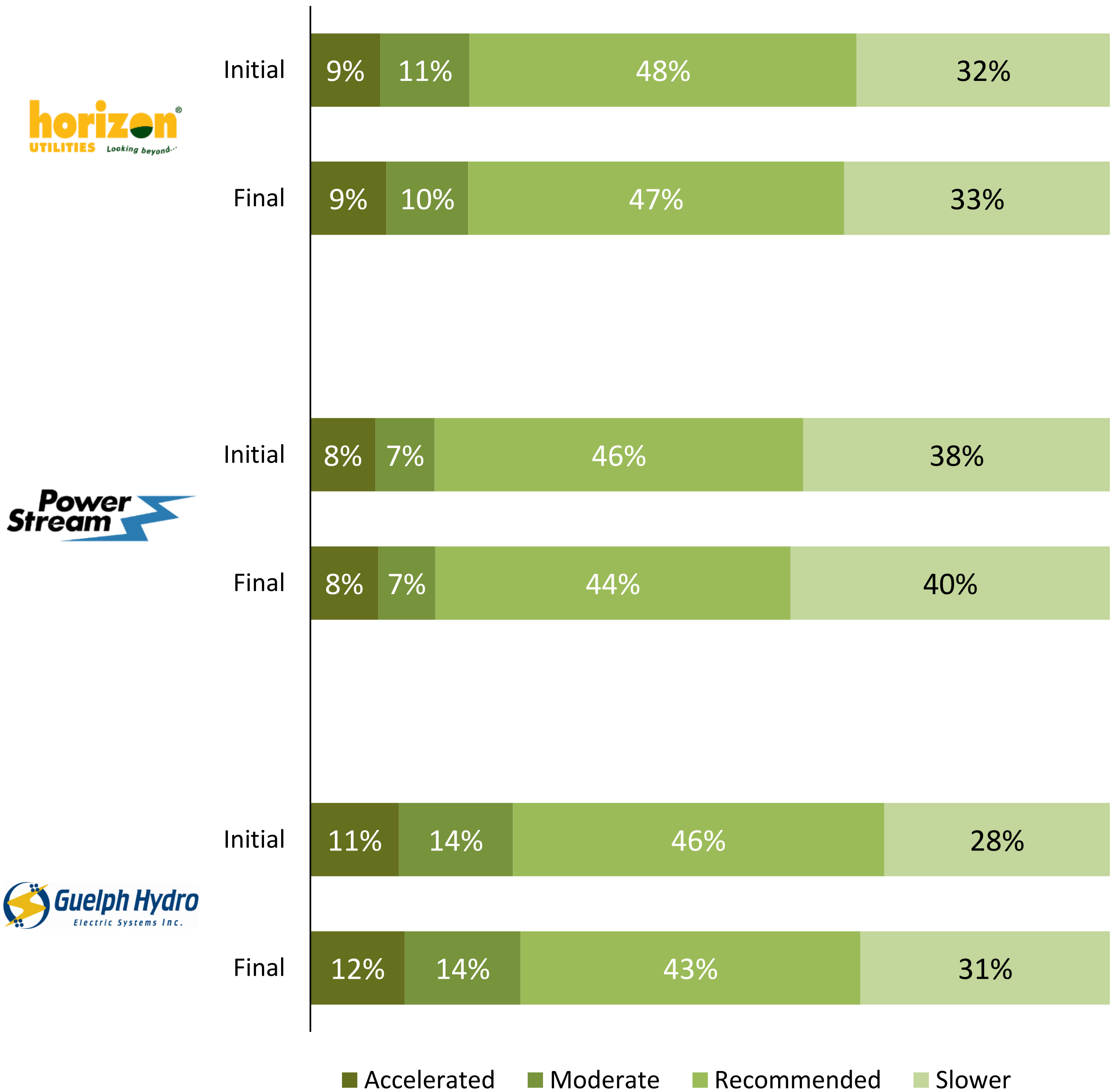
Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Timing of a Rear Lot Conversion Program

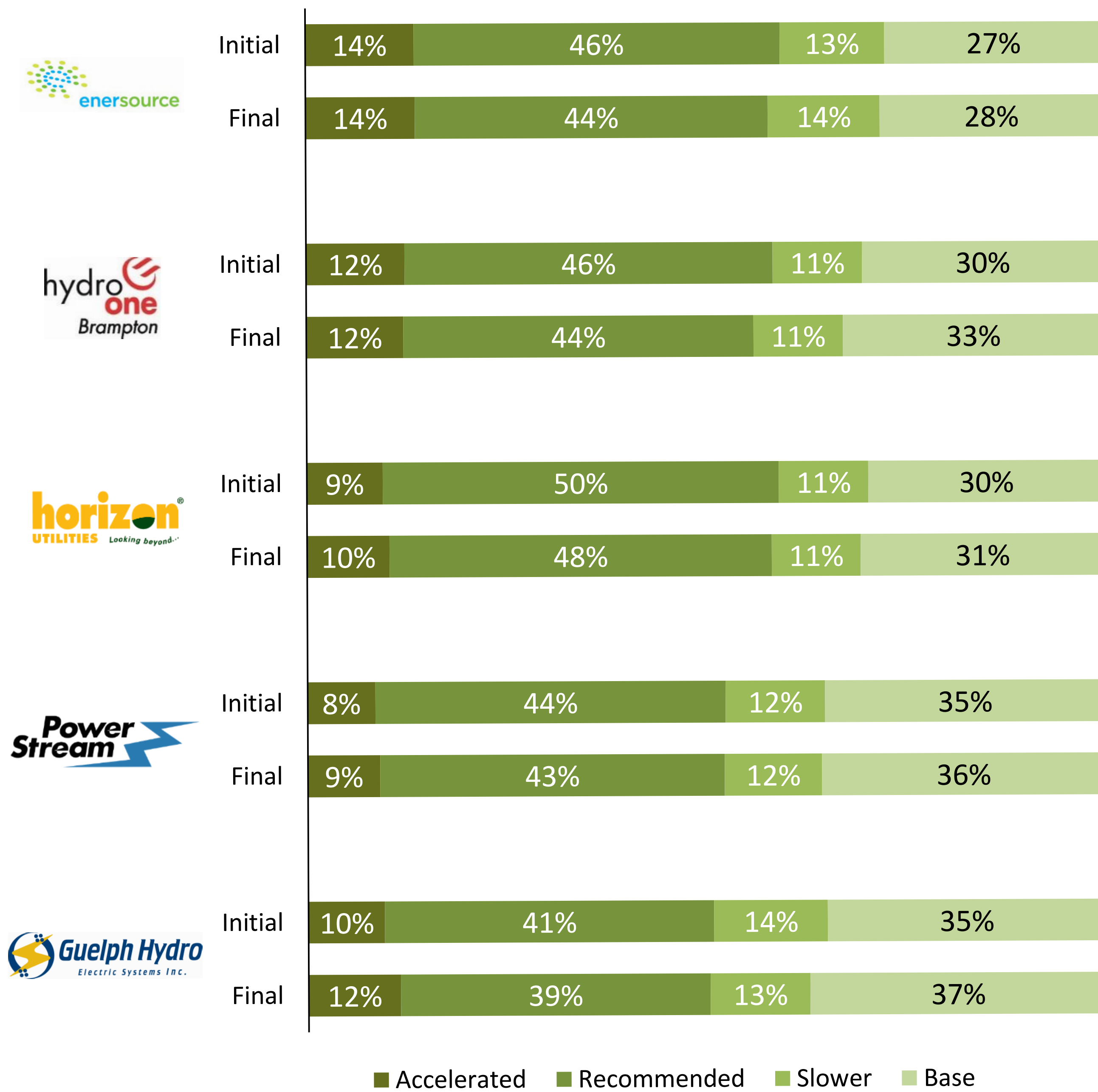


Voluntary Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Planning for Expansion, Intensification and Back-up

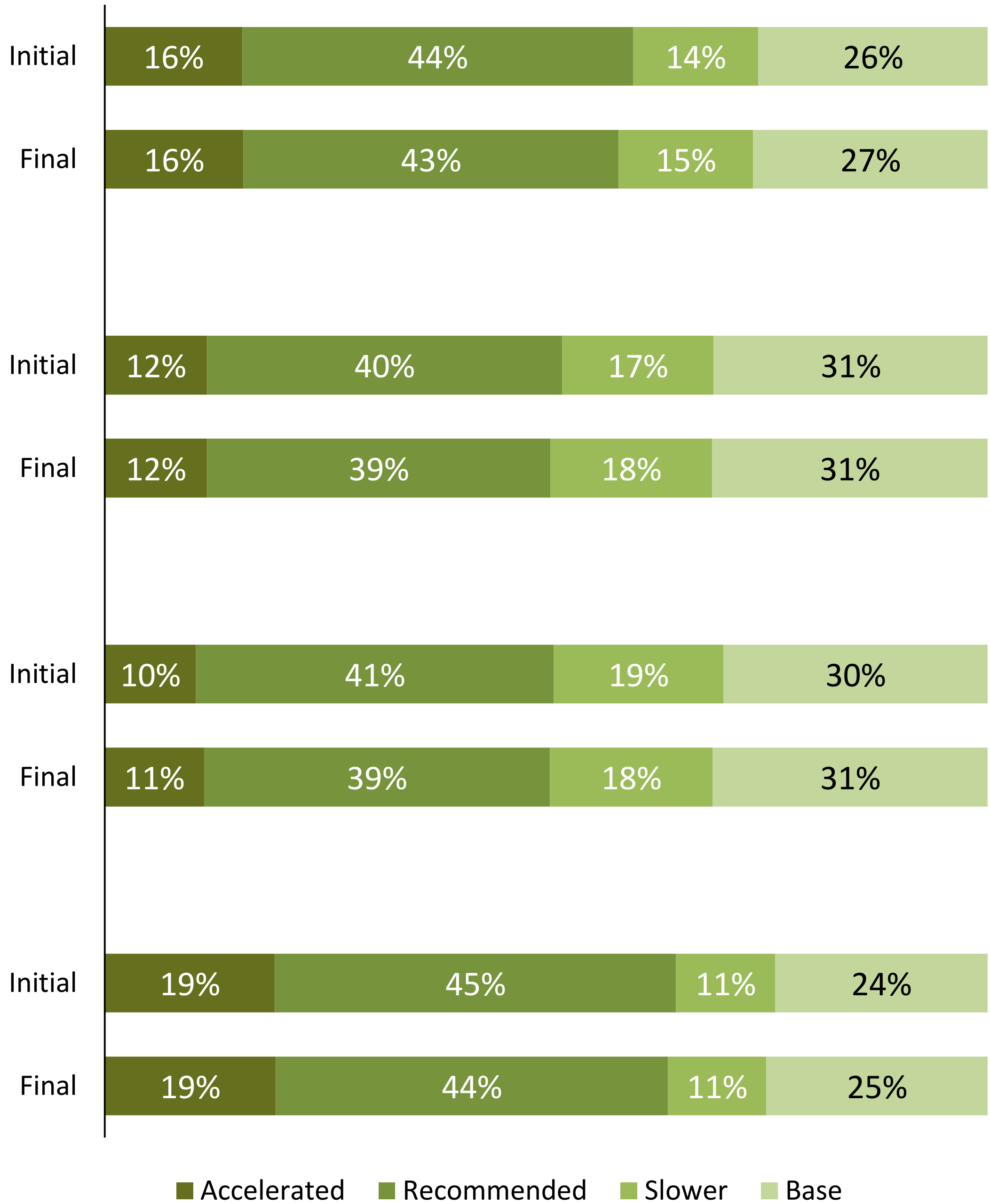


Voluntary Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Voltage Conversion



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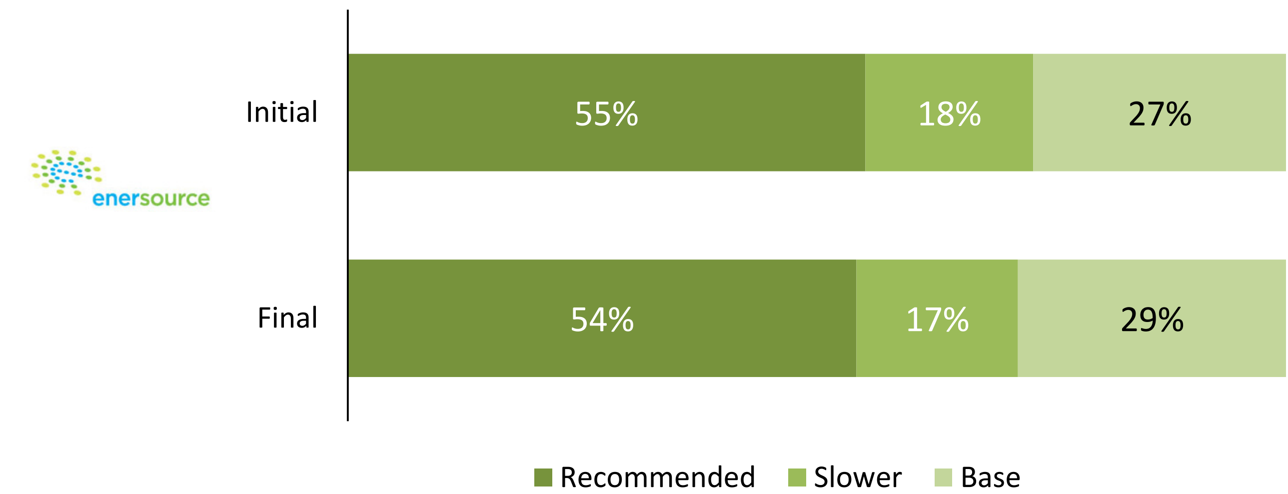
Voluntary Online Workbook

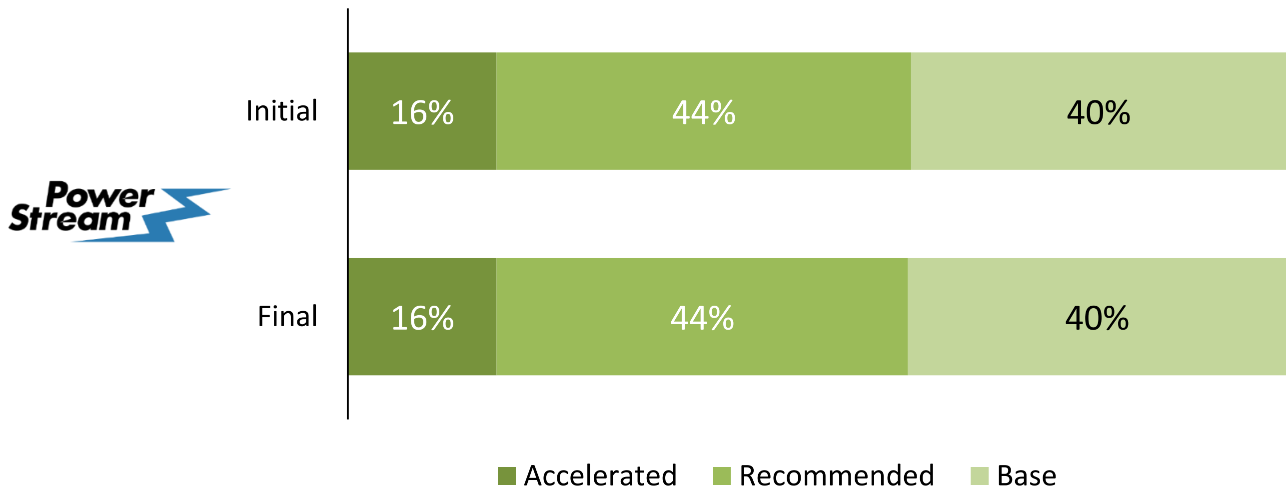
Change in Initial vs. Final Response by Project

Residential

Q Distribution Stations Capacity (ERZ)



Q Distribution Stations Capacity (PRZ)



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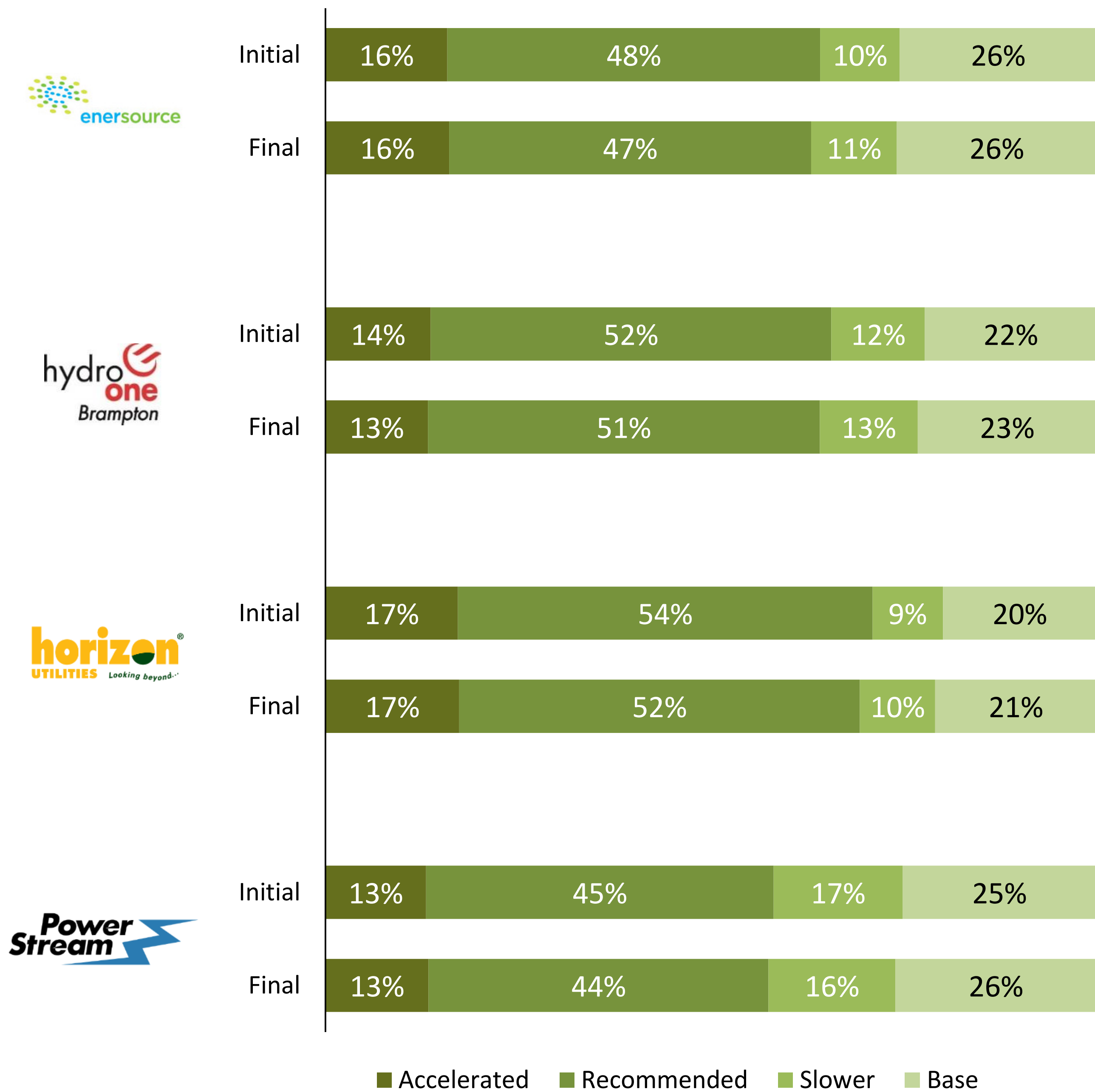
Voluntary Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Additional Station Investments



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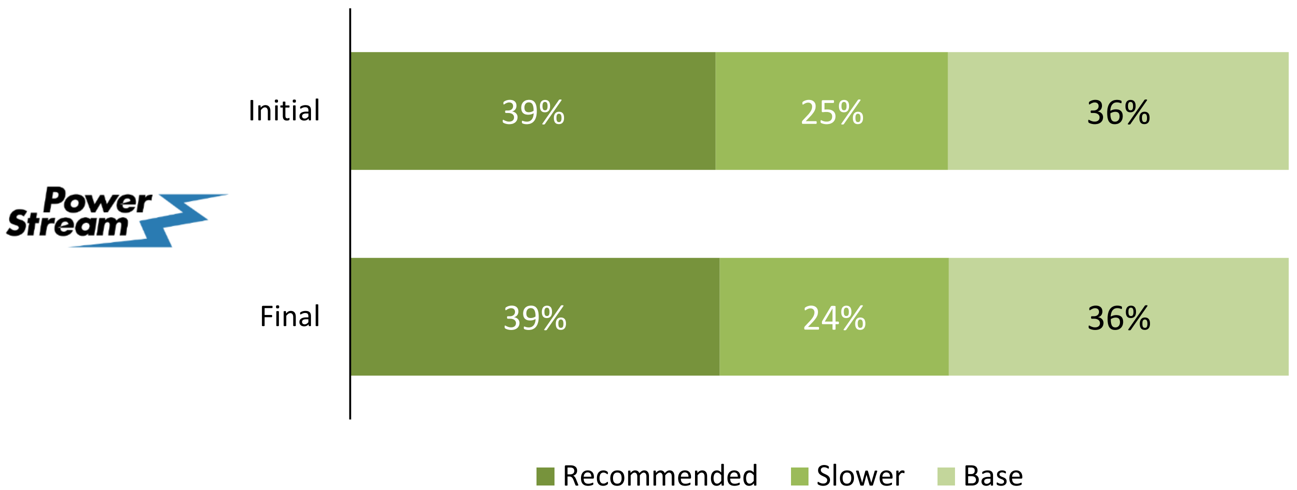
Voluntary Online Workbook

Change in Initial vs. Final Response by Project

Residential

Q Preparing for More Consumer Choice



Voluntary Online Workbook

Impact of Choices on Rates | Preamble

Impact of Choices on Rates

As noted earlier, all the projects identified in this workbook have been evaluated and found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Under the OEB rules, Alectra Utilities can apply for additional rates, beyond the scheduled 1.2% increase, to pay for these improvements.

Alectra Utilities has calculated the rate impact of implementing the options recommended by their planners.

These priorities may change based on your input but give you a sense of the cost for an investment program that aims to:

- maintain reliability for the average customer;
- fix or avoid equipment issues that cause below average reliability for some customers; and
- help the system do a better job of responding to major outages caused by severe weather or transmission grid failures.

Following Alectra Utilities planners' recommended approach would result in an average additional [PIPE-RID1] cents per month annually for the typical customer in your rate class.

At the end of the 5-year plan, the typical customer in your rate class would see the distribution portion of their electricity bill increase by [PIPE-RID2] above the current projected rate of [PIPE-TOT] in 2024.

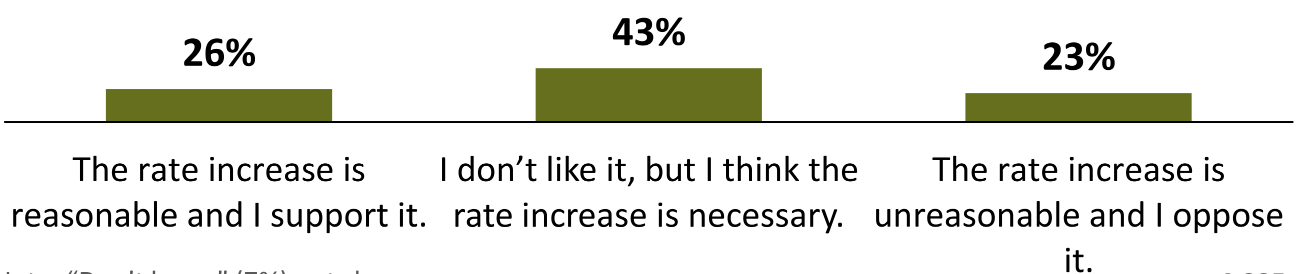
Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
[PIPE-RID1]	$0.23	$0.23	$0.25	$0.39	$0.14
[PIPE-RID2]	$1.16	$1.13	$1.27	$1.95	$0.72
[PIPE-TOT]	$26.71	$26.33	$28.74	$30.67	$31.14

Voluntary Online Workbook

Impact of Choices on Rates

Residential

Q Which of the following statements best represents your view?



Note: "Don't know" (7%) not shown. n=4,095

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
The rate increase is reasonable and I support it	27%	23%	26%	27%	30%
I don't like it, but I think the rate increase is necessary	45%	40%	43%	42%	45%
The rate increase is unreasonable and I oppose it	22%	29%	22%	24%	21%
Don't know	6%	8%	9%	7%	4%
Reasonable and support it + don't like it, but think it's necessary	**72%**	**64%**	**69%**	**69%**	**75%**

INNOVATIVE RESEARCH GROUP

Voluntary Online Workbook

Residential

Overall Rate Impact by LEAP Qualification and Rate Zone

Q Which of the following statements best represents your view?

Enersource Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	**Total ERZ**
The rate increase is reasonable and I support it	23%	25%	36%	27%
I don't like it, but I think the rate increase is necessary	39%	40%	45%	45%
The rate increase is unreasonable and I oppose it	31%	27%	16%	22%
Don't know	7%	7%	4%	6%
Top 2 Boxes	**62%**	**65%**	**81%**	**72%**

Brampton Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	**Total ERZ**
The rate increase is reasonable and I support it	15%	27%	32%	23%
I don't like it, but I think the rate increase is necessary	33%	36%	48%	40%
The rate increase is unreasonable and I oppose it	38%	32%	17%	29%
Don't know	13%	6%	3%	8%
Top 2 Boxes	**48%**	**62%**	**80%**	**64%**

Note: Those who said "prefer not to say" to income question not shown.

Voluntary Online Workbook

Residential

Overall Rate Impact by LEAP Qualification and Rate Zone

Q Which of the following statements best represents your view?

Horizon Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	Total HRZ
The rate increase is reasonable and I support it	21%	26%	38%	26%
I don't like it, but I think the rate increase is necessary	45%	44%	41%	43%
The rate increase is unreasonable and I oppose it	23%	23%	15%	22%
Don't know	11%	8%	5%	9%
Top 2 Boxes	**66%**	**70%**	**80%**	**69%**

PowerStream Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	Total PRZ
The rate increase is reasonable and I support it	20%	25%	36%	27%
I don't like it, but I think the rate increase is necessary	39%	42%	45%	42%
The rate increase is unreasonable and I oppose it	30%	25%	15%	24%
Don't know	11%	8%	3%	7%
Top 2 Boxes	**59%**	**67%**	**82%**	**69%**

Note: Those who said "prefer not to say" to income question not shown.

INNOVATIVE RESEARCH GROUP

Voluntary Online Workbook

Residential

Overall Rate Impact by LEAP Qualification and Rate Zone

Q Which of the following statements best represents your view?

Guelph Rate Zone	LEAP Qualified	Income <$52k, not LEAP Qualified	Income>$52k, not LEAP Qualified	Total GRZ
The rate increase is reasonable and I support it	25%	23%	39%	30%
I don't like it, but I think the rate increase is necessary	44%	54%	44%	45%
The rate increase is unreasonable and I oppose it	25%	18%	15%	21%
Don't know	6%	6%	1%	4%
Top 2 Boxes	**69%**	**76%**	**84%**	**75%**

Note: Those who said "prefer not to say" to income question not shown.

Voluntary Online Workbook

Workbook Diagnostics | Overall Impression

Residential

Q Did you have a favourable or unfavourable impression of the workbook you just completed?

alectra utilities

Note: "Don't know" (9%) not shown.

n=4,095

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Very favourable	25%	25%	21%	23%	18%
Somewhat favourable	53%	51%	53%	52%	58%
Somewhat unfavourable	12%	12%	12%	12%	10%
Very unfavourable	3%	3%	5%	4%	5%
Don't know	7%	9%	9%	9%	9%
Favourable	**78%**	**76%**	**74%**	**75%**	**76%**
Unfavourable	**15%**	**15%**	**17%**	**16%**	**15%**

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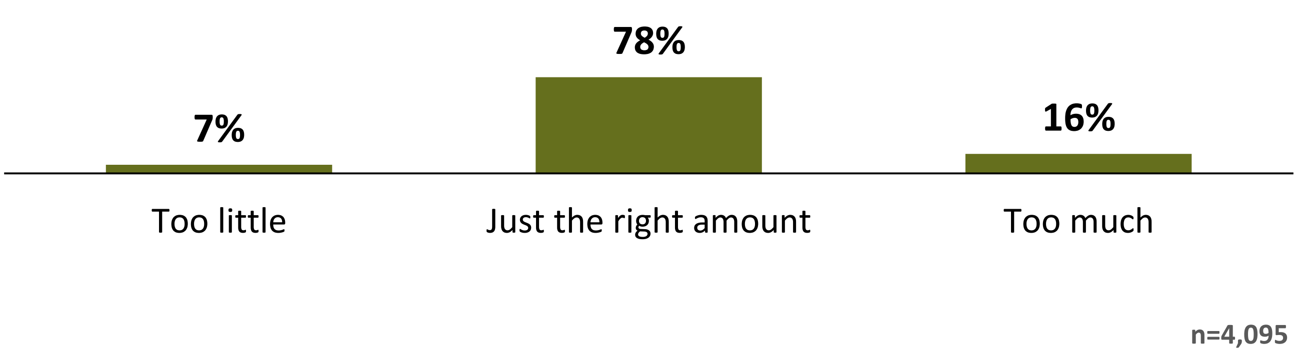
Voluntary Online Workbook

Workbook Diagnostics | Volume of Information

Q Did Alectra Utilities provide too much information, not enough, or just the right amount?



Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
Too little	6%	8%	6%	7%	8%
Just the right amount	79%	78%	78%	75%	82%
Too much	15%	15%	16%	18%	10%

INNOVATIVE RESEARCH GROUP

Small Business Customers

Online Workbook Results

Voluntary Online Workbook

Small Business Online Workbook

INNOVATIVE was engaged by Alectra Utilities Corporation (Alectra Utilities) in this study to gather input on preferences on program timing and balancing outcomes. **Pages 69 to 119** show the actual pages of the workbook that was sent and completed by customers. The only additions are the actual results.

Field Dates & Workbook Delivery

The **Small Business Voluntary Online Workbook** was accessible to all Alectra Utilities small business customers via the online portal. Customers had an opportunity to complete the workbook between April 8th and May 15th, 2019.

Publishing the Portal Online

INNOVATIVE hosted the online portal at the following URL: *AlectraCustomerFeedback.com*

The website prevented customers from completing questions repeatedly and saved their progress as they answered each question. Upon completion, the site was no longer accessible at the web address given.

Each customer was able to select their rate zone and rate class, and ultimately a workbook customised to their rate zone and class.

The voluntary small business online workbook sample not been weighted, therefore, is not representative of the broader Alectra Utilities customer base.

The table below summarizes the sample breakdown by rate zone of the voluntary small business

Sample Distribution	Total	Distribution
Enersource	30	16%
Brampton	12	6%
Horizon	60	32%
PowerStream	65	35%
Guelph	19	10%
Total	**186**	**100%**

Voluntary Online Workbook

Small Business

Welcome to Alectra Utilities' planning consultation!

We need your input on choices that will affect the service you receive and the price you pay.

1. Alectra Utilities is developing its investment plan for 2020 to 2024. This plan will determine the investments Alectra Utilities makes in equipment and infrastructure, the services it provides, and the rates you pay.
2. **Alectra will be accountable to the public regulator, both in terms of sharing what customers say and demonstrating how they considered those views.**
3. You don't need to be an electricity expert to participate in this consultation. This workbook is focused on basic choices and provides the background information you need to answer the questions.
4. All you need to do is provide your feedback on between **7 and 13 choices.** If you can give half an hour now, Alectra Utilities can finalize its plan to serve customers like you for the next five years.

Those who complete the questions that follow will be invited to enter a draw to win one of ten (10) $500 prepaid credit cards.

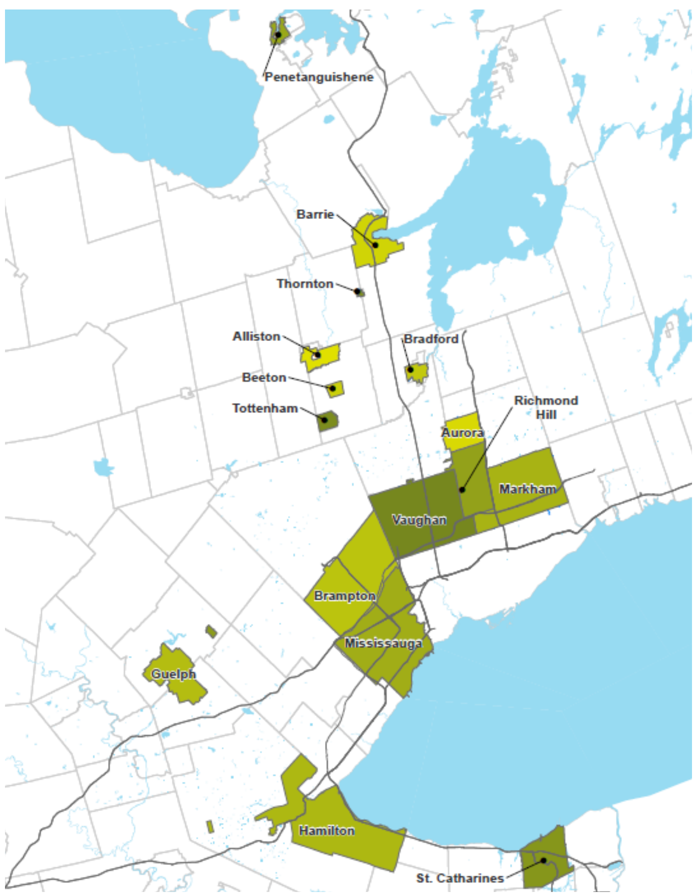
All of your individual responses will be kept confidential. Innovative Research Group (INNOVATIVE), an independent research company, has been hired to gather your feedback.

If you are reading this on a smaller mobile device, you may want to consider accessing the survey from a tablet, desktop or laptop instead so that it is easier for you to read.

INNOVATIVE RESEARCH GROUP

Who is Alectra Utilities?

Alectra Utilities is preparing its first consolidated Distribution System Plan. Alectra Utilities is the union of five leading Ontario utilities – Enersource, Horizon Utilities, Brampton Hydro, PowerStream and Guelph Hydro. Alectra Utilities now serves over one million customers.



Alectra Utilities provides services to customers in all of these areas. However, customer rates are based on the cost of serving only the area that you live in.

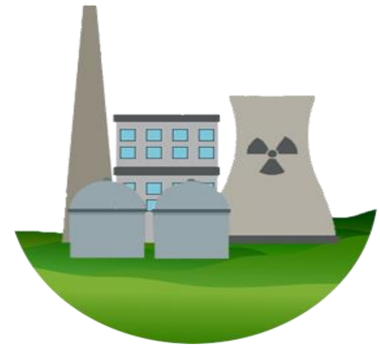
Understanding Alectra Utilities' role in Ontario's electricity system

Ontario's electricity system is owned and operated by public, private and municipal corporations across the province. It is made up of three components: generation, transmission and distribution.

1 Generation

Where electricity comes from.

Ontario's electricity is generated by nuclear, natural gas, hydroelectric and renewable technologies, such as wind and solar. In Ontario, about 50% of electricity is generated by Ontario Power Generation, which has generation stations across the province.



2 Transmission

Electricity travels across Ontario.

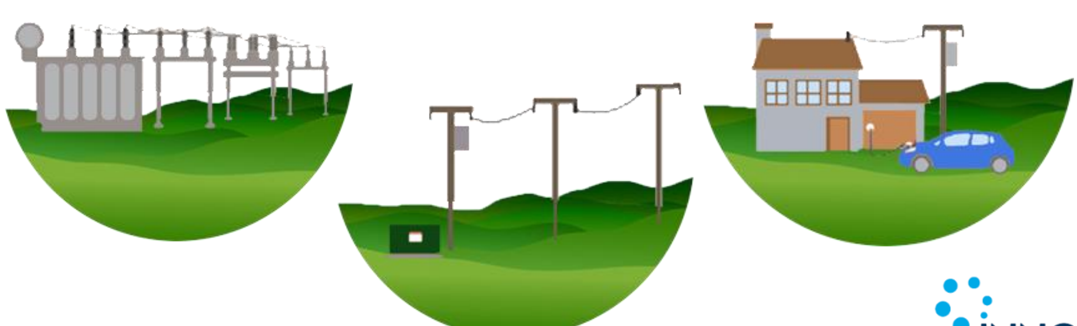
Once electricity is generated, it must be transported to urban and rural areas across the province. This happens by way of high voltage transmission lines that serve as highways for electricity. The province has more than 30,000 kilometres of transmission lines.

3 Local Distribution

Delivering power to homes and businesses in your community.

Alectra Utilities is responsible for the last step of the journey: distributing electricity to customers through its distribution network. This local grid includes transformer stations of various sizes and designs that decrease the voltage of the electricity so it can be used in your home or business.

Across Alectra Utilities' service territory, there are 16,400 km of overhead powerlines and 22,140 km of underground cable.

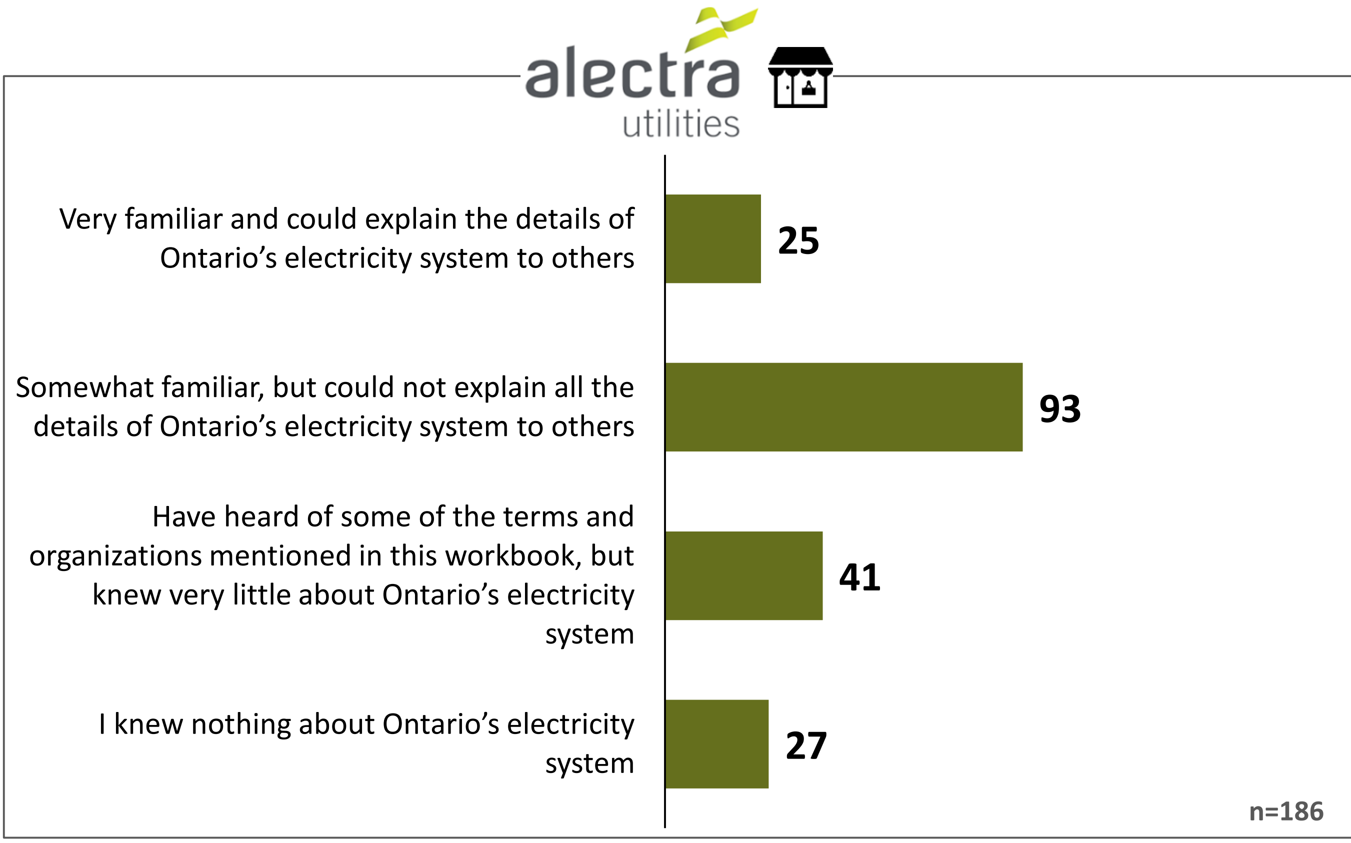


Voluntary Online Workbook

Small Business

Understanding Alectra Utilities' role in Ontario's electricity system

Q Before this consultation, how familiar were you with the various parts of the electricity system and how they work together?



Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Very familiar	3	4	5	8	5
Somewhat familiar	14	6	34	28	11
Heard of some of the terms and organizations	9	1	12	16	3
Knew nothing about the electricity system	4	1	9	13	0

* Small sample size, interpret with caution.

How much of you bill goes to Alectra Utilities?

- Every item and charge on your bill is mandated by the provincial government or regulated by the **Ontario Energy Board (OEB)**, the provincial energy regulator.
- While Alectra Utilities is responsible for collecting payment for the entire electricity bill, it retains only the distribution portion of the delivery charge.
- **Distribution makes up about [PIPE-PER] of the typical small business customer's bill.**
- The rest of your bill is passed onto provincial transmission companies, power generation companies, the government and regulatory agencies.

Typical Small Business Bill

Sample Alectra Utilities Monthly Bill
(Based on consumption of 2,000 kWh)

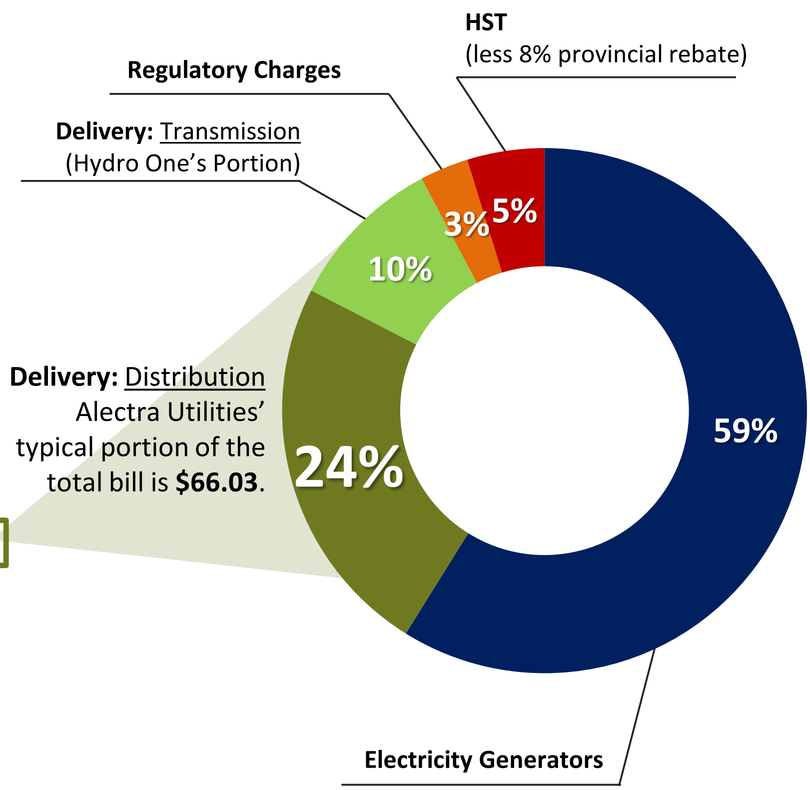
Account Number:
000 000 000 000 0000

Meter Number:
00000000

Alectra Utilities' portion: **$66.03**

Your Electricity Charges	
Electricity	
Off-Peak @ 6.5 ¢/kWh	84.50
Mid-Peak @ 9.4 ¢/kWh	31.96
On-Peak @ 13.2 ¢/kWh	47.52
Delivery	92.98
Regulatory Charges	8.35
Total Electricity Charges	**$265.31**
HST	34.49
8% Provincial Rebate*	**(-$21.22)**
Total Amount	**$278.57**

*The Ontario government is providing a rebate on your electricity costs equal to the provincial portion of the HST



Note: Graphs may not always total 100% due to rounding.

Note: Sample bills were customized for each rate zone and rate class. The above represents a sample small business bill in the Horizon rate zone.

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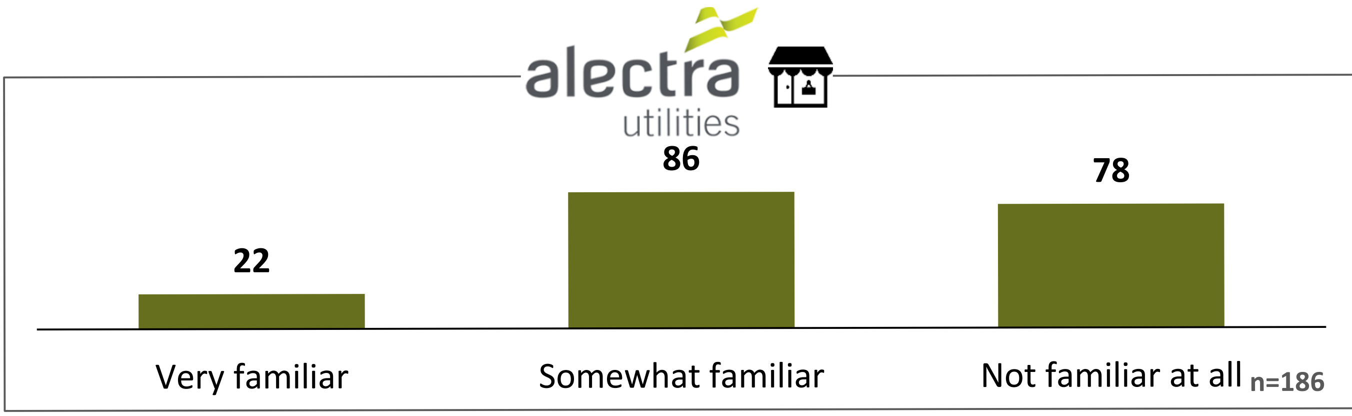
Percentage of bill that goes to Alectra Utilities

Small Business

Q Before this consultation, how familiar were you with the percentage of your electricity bill that goes to Alectra Utilities?



Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Very familiar	3	1	6	7	5
Somewhat familiar	12	9	29	30	6
Not familiar at all	15	2	25	28	8

* Small sample size, interpret with caution.

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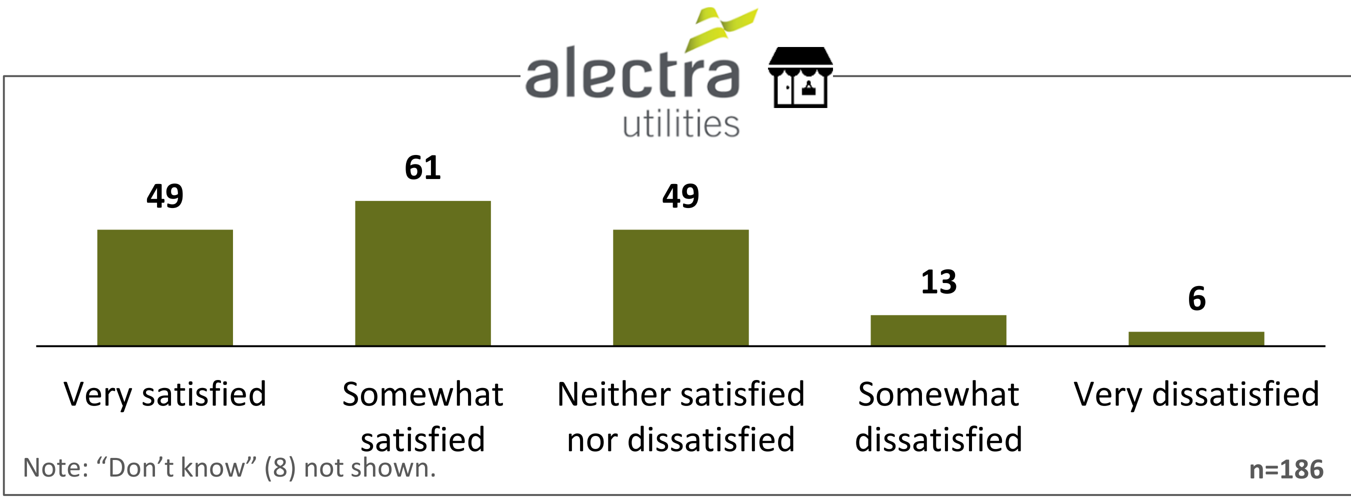
Overall satisfaction with Alectra Utilities

Small Business

Q Generally, how satisfied or dissatisfied are you with the services you receive from Alectra Utilities?



Rate Zone Breakdown	ERZ	BRZ*	HRZ	PRZ	GRZ*
Very satisfied	9	4	15	16	5
Somewhat satisfied	8	4	17	26	6
Neutral	6	3	20	13	7
Somewhat dissatisfied	3	1	2	7	0
Very dissatisfied	2	0	4	0	0
Don’t know	2	0	2	3	1
Overall satisfied	**17**	**8**	**32**	**42**	**11**
Overall dissatisfied	**5**	**1**	**6**	**7**	**0**

* Small sample size, interpret with caution.

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Voluntary Online Workbook

Reliability Experience | Preamble

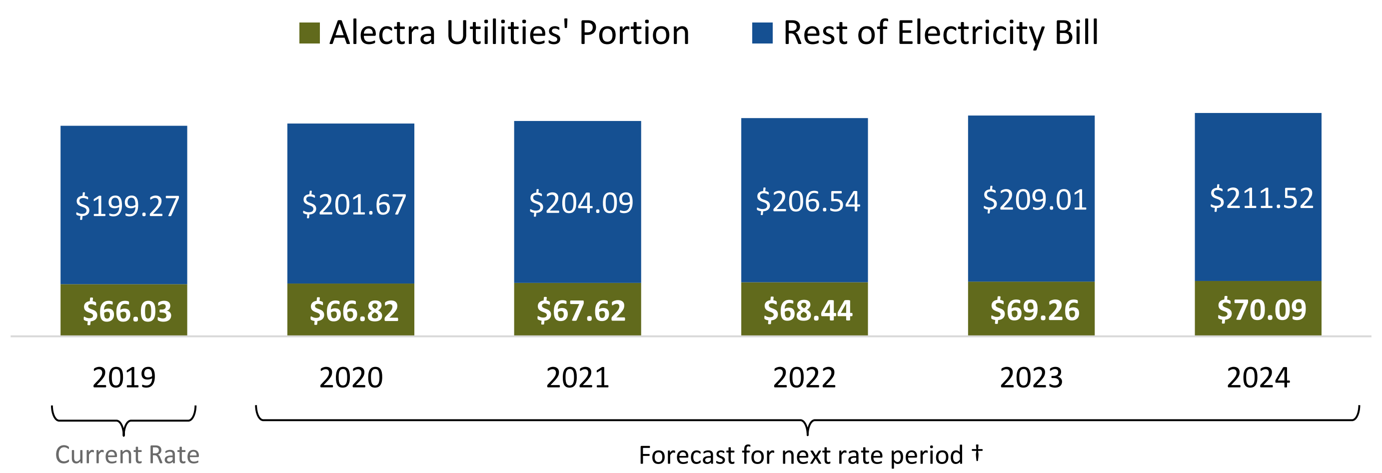
Small Business

How much can you expect to pay over the next few years?

Prior to the Alectra Utilities’ merger, each predecessor utility had their rates set by the OEB. Until rates are rebased in 2027, your future rate increases will be limited by an OEB-set Price Cap Formula. Each year Alectra Utilities is permitted to increase rates to reflect inflation minus savings targets established by the OEB. **This requires Alectra Utilities to keep cost increases below inflation.**

For customers in your area and rate class, the distribution charge for **the typical bill is estimated to increase by 1.2%** on average for the next five years.

Estimated Typical Small Business Annual Increase in Monthly Bill (Before Tax) ††



Note: Sample bills were customized for each rate zone and rate class. The above represents a sample small business bill in the Horizon rate zone.

Where does your money go?

Alectra Utilities has two budgets; **operating and capital.** The operating budget covers recurring expenses, such as salaries, taxes, fuel costs and rent. Under the Price Cap Formula, Alectra Utilities cannot ask for any additional money for operating expenses.

This consultation is about the capital budget. This budget covers things like poles, wires, cables, transformers, computers and programs, vehicles, and buildings.

†† On November 23, 2018, the OEB calculated the value of the inflation factor for incentive rate setting under the Price Cap IR plan of 1.5% for rate changes effective 2019. With a stretch factor of 0.3%, the Price Cap Adjustment for Alectra Utilities was 1.2%. This rate has been used to forecast the rates for 2020-2024. The 2020-2024 rates assumes no changes to electricity rates or the Group 1 riders over the 2020 to 2024 period. The OEB approved bill impact for 2019 was used as the basis for the calculation of forecasted rates for 2020-2024.

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What is this consultation about?

This consultation is about finding the right balance between reliability and the price you pay.

The point of this workbook is to allow customers, like yourself, to provide feedback on whether the planners have found the right balance or whether they should consider different options that better reflect your views.

Alectra Utilities is now creating its first overall investment plan as a merged utility. The process started with Alectra Utilities asking customers whether they had any unmet needs and which outcomes Alectra Utilities' plan should focus on. Click here to see more.

Using that input, Alectra Utilities' managers reviewed each part of the utility's business. All the projects identified in this workbook have been found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Now Alectra Utilities is coming back to customers with a final set of choices.

- For each choice, Alectra Utilities has identified an option to stay within existing rates under the price cap formula. It has also identified options to increase investments and, in some areas, where practical, options to reduce investments to make room for increased investments in more pressing areas.
- Planners have indicated the option that in their view provides the best balance between any potential rate increase with the intention to maintain reliability and to fix or avoid pockets of customers that are having significantly below average experiences.
- At the end of the these questions, you will have an opportunity to review your responses and total rate impact of those choices. You will be able to change your responses until you feel you have found the right mix of investments and rate impact, in your view.
- If your preferences result in higher levels of investment than current rates support, Alectra Utilities may apply for a rate increase under the rules established by the OEB. While the exact amount of any rate increase would consider the views collected in this consultation, the workbook will ask you for your views on a rate increase that will be sufficient to pay for the planners' recommended options.

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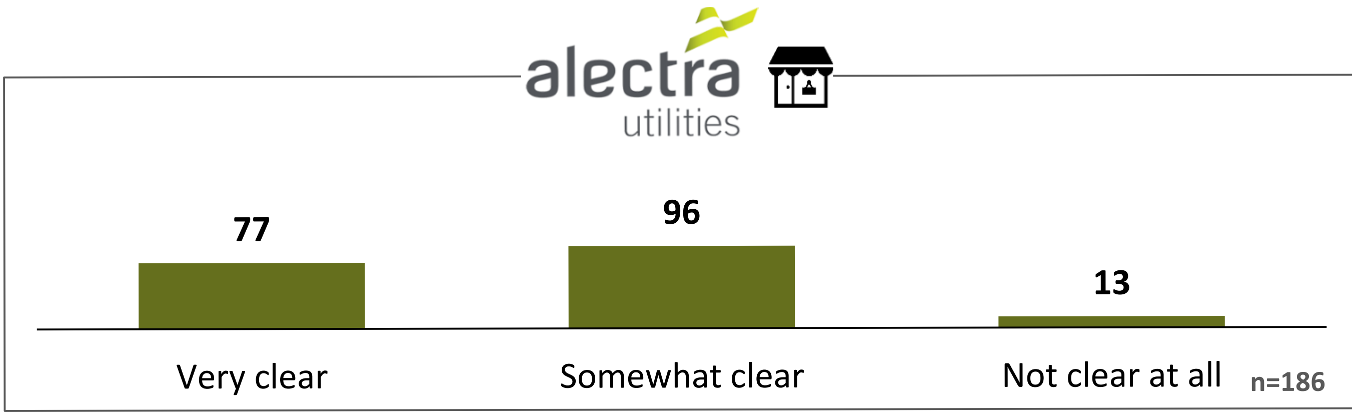
What is this consultation about?

Small Business

Q Do you feel that the purpose of Alectra Utilities' customer consultation is clear?



Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Very clear	11	7	23	24	12
Somewhat clear	11	4	36	38	7
Not clear at all	8	1	1	3	0

* Small sample size, interpret with caution.

Voluntary Online Workbook

Reliability Experience | Preamble

Small Business

Reliability Experience

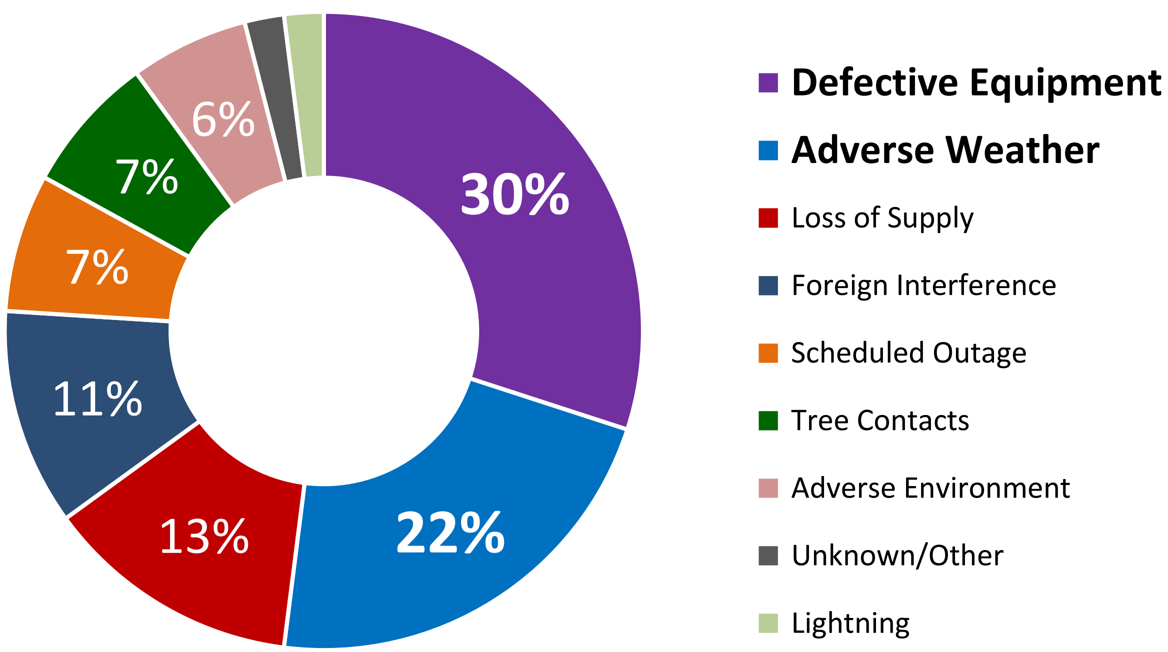
Reliability is a key priority for Alectra Utilities. Since 2014, both the average **number** and **duration** of outages has increased for the typical Alectra Utilities customer.

- The average number of outages (excluding major event days) has increased by an average of 6% per year from 2014-2018, rising from **1.27 to 1.53** over this period.
- The average duration of outages (excluding major event days) has increased by an average of 8% per year from 2014-2018, rising from **0.88 hours to 1.14** hours over this period.

The two primary contributors to outages account for more than 50% of all outages.

1. **Defective equipment** accounted for 30% of customer hours of interruption between 2014-2018, the single largest outage cause.
2. **Adverse weather** is the second leading cause of outages. It accounted for 22% of customer hours of interruption over the same period.

Customer Outage Duration (Hours) by Cause 2014-2018



Depending on what rate zone you are in, the subsequent pages will ask you to review between 7 and 13 choices, many of which address the issues identified in the chart above.

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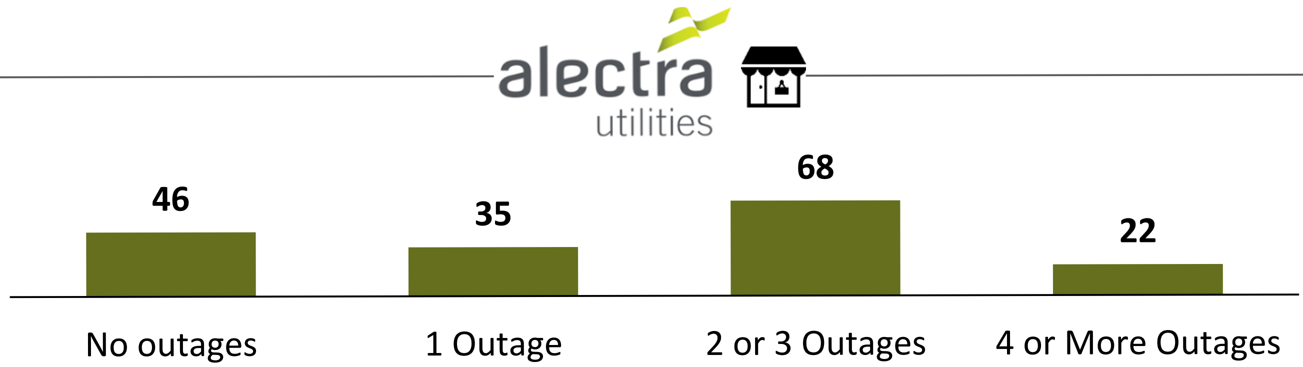
Reliability Experience

Small Business

Q In the past 12 months, how many power outages do you recall experiencing at home/your organization?



Note: “Don’t know” (15) not shown.
n=186

Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
No outages	8	5	12	14	7
1 outage	4	2	12	12	5
2 or 3 outages	9	4	25	24	6
4 or more outages	4	1	7	9	1
Don’t know	5	0	4	6	0

* Small sample size, interpret with caution.

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Mandatory Investments

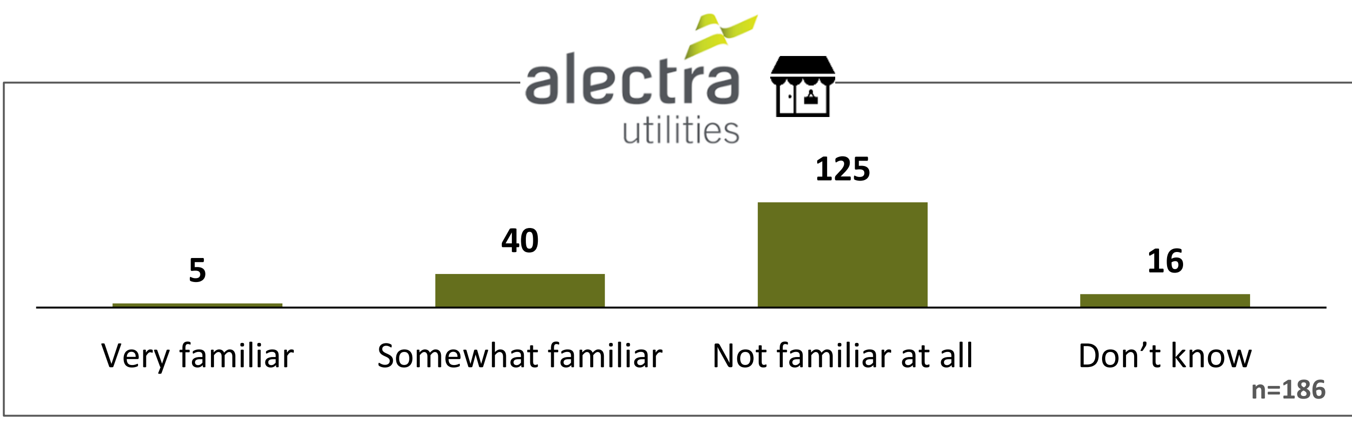
Small Business

Federal, provincial and municipal governments as well as regulators set requirements and standards that Alectra Utilities must satisfy. Mandatory investments can be broken down into three categories:

1. **Connecting customers:** This includes connecting customers to the grid when a new home or building is constructed or modified.
2. **Moving equipment:** This includes moving equipment like poles and cables for road widening.
3. **Mandated obligations:** This includes installing and maintaining customer meters and transferring electricity from the provincial transmission system.

These investments mean that about one-in-five dollars (20%) of your current rates are already committed and not available for other investments

Q Before this consultation, were you familiar that one-in-five dollars (20%) of your current rates are already committed to mandatory investments and not available for other projects?



Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Very familiar	1	0	0	3	1
Somewhat familiar	3	2	15	17	3
Not familiar at all	24	8	39	39	15
Don’t know	2	2	6	6	0

* Small sample size, interpret with caution.

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Unplanned Repairs and Replacements

On average, each year, Alectra Utilities spends approximately 19 million dollars or 6% of it's core budget to repair or replace equipment that has either failed, will fail imminently, or poses an imminent safety risk. This may include sudden equipment failure, or severe weather taking down a pole in front of your home or business.

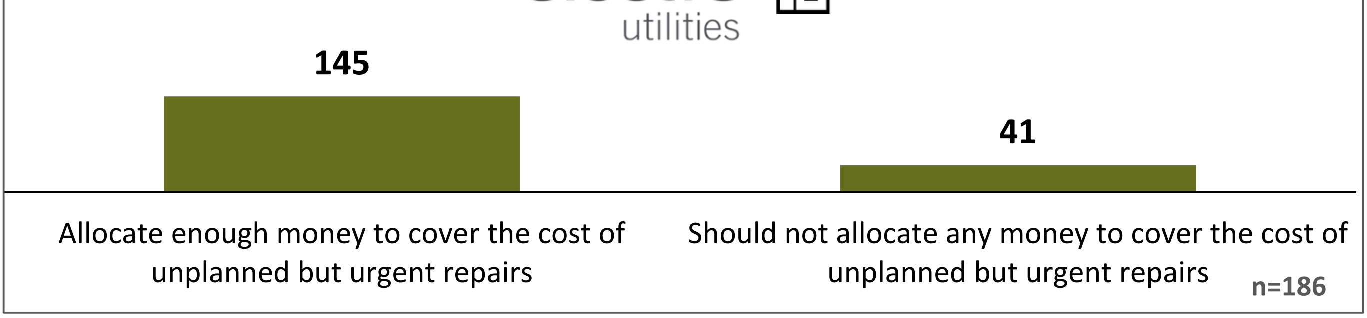
There are two possible approaches for how to fund these types of repairs:

1. By delaying other projects that had been planned but not started
2. By establishing an annual allocation for these unplanned repairs and replacements

If Alectra Utilities delays other projects, this can result in needs not being met and can create inefficiencies in project procurement and management.

If Alectra Utilities establishes an allocation for these unplanned repairs and replacements, that money is not available to fund other projects.

Q Which option do you prefer?



Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Alectra Utilities should allocate enough money (approximately 19 million or 6%) in its core budget to reactive capital to cover the cost of unplanned but urgent repairs	17	10	50	54	14
Alectra Utilities should not allocate any money in its core budget to reactive capital and simply delay planned projects to cover the cost of unplanned but urgent repairs	13	2	10	11	5

* Small sample size, interpret with caution.

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Eliminating Meter Data Security Risks

Small Business

Within the former PowerStream area, Alectra Utilities has identified an older type of meter that could be hacked. These meters collect and transmit information to Alectra Utilities about how much electricity you use, and when you use it, but do not have access to any other personal information.

While these meters are at increased risk of hacking, there has not been a known data breach, and it's possible that they won't be hacked in the future.

Between 2015 and 2019, Alectra Utilities will have replaced 41,000 of these at-risk meters, however, an additional 91,000 will still be in service at the end of 2019.

Alectra Utilities has a decision to make about how quickly or slowly they replace these meters. It's your data and it's your money, so Alectra Utilities would like to know what your preference is.

Q Which of the following options would you prefer?

Option	Expected Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities will be able to address all the metering needs identified for the distribution system during 2020-2024 including the replacement of first generation smart meters that do not support modern levels of data encryption
Base Pace *Within current rates*	Alectra Utilities will be able to address some of the metering needs identified for the distribution system during 2020-2024. Replacement of first generation smart meters that do not support modern levels of data encryption would be deferred beyond 2024

Investment only in PowerStream RZ

n=65

Keeping the Business Running

Alectra Utilities is more than just poles and wires – it’s a business that needs to invest in equipment such as tools, trucks, buildings, computers and software.

When deciding whether to continue to maintain existing equipment or replace them, Alectra Utilities considers whether the risks and costs of continuing to use them outweigh the benefits of waiting longer to replace them. Alectra Utilities business planning process has identified more needs for equipment investments than current rates will allow.

To stay within existing rates, Alectra Utilities has identified the most urgent priorities, things like: keeping large “bucket” trucks on the road; replacing computer equipment that is no longer functional; and repairing leaking roofs. This would mean that less urgent investments, like vans and other equipment would be delayed.

Alectra Utilities recognizes that delaying the less pressing investments will make it harder for staff to do their jobs safely and maintain reliability and security standards.

Bucket trucks (left) have been identified as the most urgent priority, while investments in vans (right) would be delayed in the *base approach.*

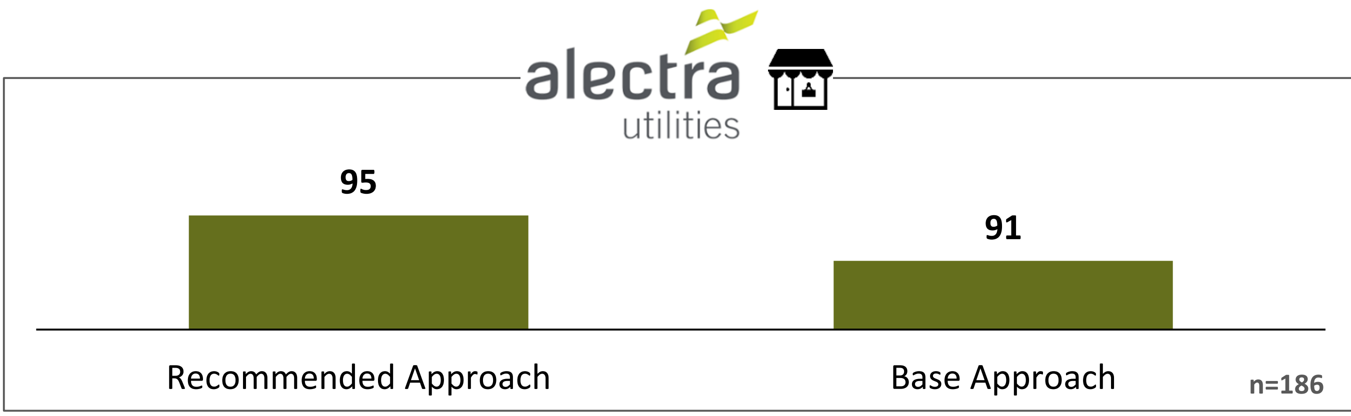
Voluntary Online Workbook

Keeping the Business Running

Small Business

Q Which of the following options would you prefer?

Option	Outcome
Recommended Approach ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Alectra Utilities staff will have access to equipment of the same standard as similar sized businesses
Base Approach *Within current rates*	Stay within its existing rates and only replace the equipment with the most urgent needs



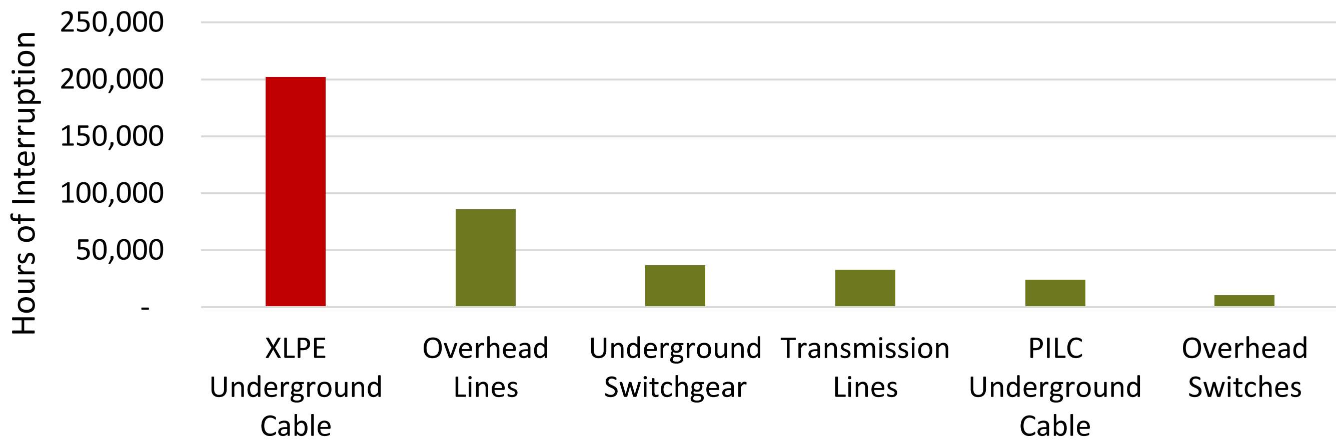
Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Recommended Approach	13	9	36	27	10
Base Approach	17	3	24	38	9

* Small sample size, interpret with caution.

Underground Asset Renewal

Equipment failure is the single largest cause of outages in Alectra Utilities' system. As the chart below illustrates, a particular type of equipment known as cross-linked polyethylene (XLPE) cable is the leading cause of outages across Alectra Utilities' system.

What type of equipment is causing the most outages? (5-year average)



Case Study

The deterioration of these cables is directly impacting customers. For example, the York/Hilda neighbourhood in Vaughan was originally scheduled to have its cables replaced in 2019. But in 2018, customers began to experience a cascading series of prolonged outages, due to cable failures. Cables repaired one week would fail again the next. In the summer, 250 customers experienced eight cable faults (one outage a week). As a result, the cable had to be replaced on an emergency basis at both a higher cost to Alectra Utilities and major inconvenience to the affected customers.

As Alectra Utilities reviewed all of its equipment across all of its operating areas, it became clear that replacing XLPE underground cable requires an accelerated investment plan. To provide the best value to customers, Alectra Utilities will be using two approaches:

- **Cable Rejuvenation**: Cable rejuvenation is a lower-cost solution that can extend the life of these cables without the need to excavate and replace the entire cable. While it is the better value for customers for cables in fair condition, it is not effective for cables that are already declining.

- **Cable Replacement**: In some cases, Alectra Utilities has no prudent choice but to replace the cable. Replacing this equipment now rather than trying to extend its life will cost more now, but will deliver superior reliability over time, relative to older standards of cable.

Alectra Utilities has a decision to make regarding the pace in which they invest in replacing or extending the life of at-risk underground equipment.

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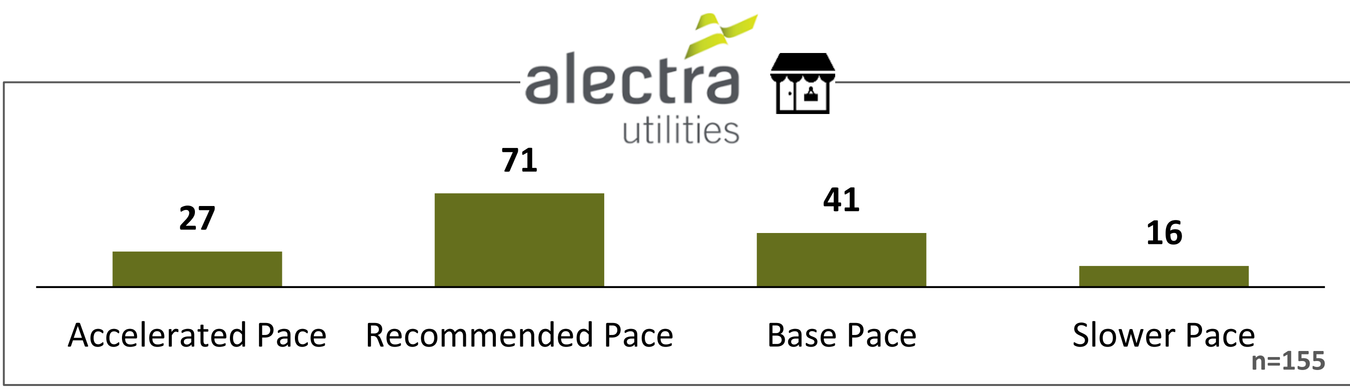
Pacing Investments in the Underground System

Small Business

Within current rates, the reliability of underground cable is expected to further worsen by approximately 4% from current 2018 levels. As such, Alectra Utilities is recommending a pace of cable replacement and rehabilitation that will maintain current levels of reliability.

Q Which of the following cable replacement strategies would you prefer?

Option	Cable replaced or rehabilitated	Expected Reliability Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**2,184 km** by 2024	Improve the reliability of cables by 8% from the current (2018) level
Recommended Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	**1,978 km** by 2024	Maintain the reliability of cables at the current (2018) level
Base Pace *Within current rates*	**1,861 km** by 2024	Reliability of cables to further worsen by 4% from the current (2018) level
Slower Pace ***Decrease*** *of $X.XX per month annually* *($Y.YY less per bill by 2024)*	**1,624 km** by 2024	Reliability of cables expected to further worsen by 10% from the current (2018) level



Rate Zone Breakdown	ERZ	HRZ	PRZ
Accelerated Pace	4	13	10
Recommended Pace	13	34	24
Base Pace	6	11	24
Slower Pace	7	2	7

Keeping Pace with Overhead System Renewal

Compared to previous years, Alectra Utilities is considering slowing down its overall spending on poles and wires, known as the overhead system. There are two primary reasons for this proposed reduction in spending:

1. **Additional focus on the underground system:** As noted earlier, customers served by the underground system are having more reliability issues than customers served by overhead lines.

2. **New technology increasing the lifespan of poles:** Advancements in testing and inspections are enabling Alectra Utilities to keep overhead poles and wires in service for longer and have enabled the utility to be smarter about replacing aging equipment.

Based on a recent condition study, most poles in Alectra Utilities' overhead system are in good or excellent condition. However, the study identified that 8,110 or 7.5% of the poles in Alectra Utilities' system are currently in poor or very poor condition. Alectra Utilities also projects that a portion of the 15% of poles currently in fair condition will deteriorate into poor or very poor condition over the next five years and will need to be replaced.

Generally, Alectra Utilities tries to replace groups of poles in similar condition which allows for a lower average cost of replacement than replacing poles one at a time. While the slower option reduces the total amount of spending, the cost per pole is higher because it would involve doing more single-pole replacements and more replacements that require overtime labour.

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Keeping Pace with Overhead System Renewal

Small Business

Q Which of the following options would you prefer?

Option	Poles replaced	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**8,110** by 2024	Address **all of the poor and very poor poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Recommended Pace *Within current rates*	**4,830** by 2024	Address **most of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**3,190** by 2024	Address **half of the very poor condition poles** in system by 2024, as well as all the poles prone to catastrophic failures under adverse weather conditions

Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ
Accelerated Pace	6	5	10	12
Recommended Pace	16	6	40	42
Slower Pace	8	1	10	11

* Small sample size, interpret with caution.

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Small Business

Overhead and Underground Renewal by Service Type

The questions below are broken down by the type of electricity service customers believe they receive.

- "Wires" refers to businesses that are serviced by the overhead system
- "Cables" refers to businesses that are serviced by the underground system

Q Underground System Renewal **by** Service Type

Rate Zone Breakdown	ERZ		HRZ		PRZ	
Service Type	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**
Accelerated Pace	2	0	8	3	2	6
Recommended Pace	5	5	21	10	2	11
Base Pace	2	1	8	2	9	9
Slower Pace	0	4	1	0	2	2

Small sample size, interpret with caution. **Considered directional only.**

Q Overheard System Renewal **by** Service Type

Rate Zone Breakdown	ERZ		BRZ		HRZ		PRZ	
Service Type	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**	**Wires**	**Cables**
Accelerated Pace	1	4	1	2	6	2	1	7
Recommended Pace	8	3	1	0	25	10	10	17
Slower Pace	0	3	0	0	7	3	4	4

Small sample size, interpret with caution. **Considered directional only.**

Alectra Utilities' Transformer Replacement Program

Transformers are a critical piece of distribution equipment that reduce voltage from the higher levels that are more efficient to move electricity long distances to lower levels that are safer to connect to homes and offices. They can either be located on the ground, in underground vaults or attached to distribution poles

- Through the annual Asset Condition Assessment, Alectra Utilities has identified that 2,998 transformers are now in a *poor* or *very poor* condition. Alectra Utilities already has funded plans to replace 1,148 of these transformers. However, there will still be a need to replace 1,850 transformers based on present day condition assessments.
- Over the next five years, Alectra Utilities projects that another 2,000 transformers will deteriorate and will need to be replaced as well.
- In addition to the *poor* and *very poor* condition transformers, Alectra Utilities has identified another 900 transformers that need to be replaced due to unsafe legacy configurations or that are consistently overloaded in current conditions.

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Small Business

Alectra Utilities' Transformer Replacement Program

Q Which of the following options would you prefer?

Option	Transformers replaced	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**4,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations or are consistently overloaded. • Replace all transformers that will decline to poor and very poor condition over the next five years
Recommended Pace *Within current rates*	**2,750** by 2024	• Replace transformers currently assessed to be in poor or very poor condition. • Replace all the transformers in unsafe legacy configurations that are consistently overloaded
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**1,850** by 2024	• Replace only transformers currently assessed to be in poor or very poor condition

Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Accelerated Pace	7	5	16	16	3
Recommended Pace	14	5	37	38	13
Slower Pace	9	2	7	11	3

* Small sample size, interpret with caution.

Monitoring and Control Equipment

Using proven technology like pole top monitors and automated switches allows Alectra Utilities to automatically reroute power during outages and planned maintenance, reducing the length of time customers are without power and reducing reliance on crews who need to travel to the site to physically reroute power.

When Alectra Utilities is rebuilding existing lines, it typically replaces equipment that is like-for-like. That means, rebuilt older lines would not have monitoring and control equipment installed.

Alectra Utilities is proposing a different approach for its main feeder lines. Feeder lines are high capacity lines that bring electricity from substations to the lines that connect to homes or businesses. An outage on a feeder line can impact a 1,000 or more customers. Alectra Utilities is planning to phase in monitoring and control equipment to each feeder in the system, so that when power does go out, it can be quickly restored for large numbers of customers.

Each of the three options will continue to phase in this equipment during typical renewal. The difference is in how quickly they modify the remaining feeder lines.

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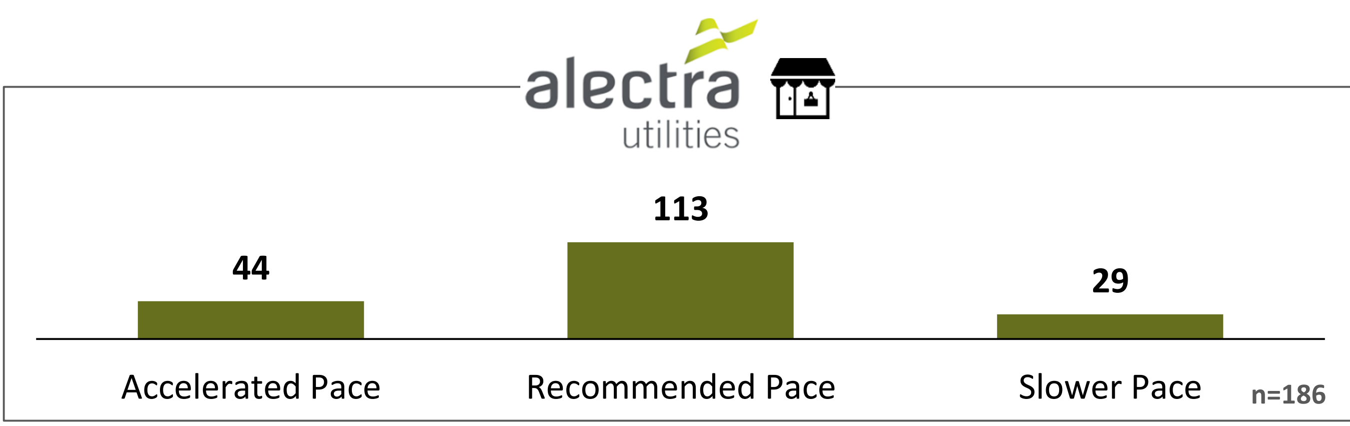
Monitoring and Control Equipment

Small Business

Q Which of the following options would you prefer?

Option	Devices installed over next 5 years	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**284** 95 additional targeted reliability improvements	Projected to improve reliability by 17% for approximately 142,000 customers. All feeders would be automated in 10 years
Recommended Pace *Within current rates*	**189** 47 additional worst performing feeders	Projected to improve reliability by 17% for approximately 95,000 customers. All feeders would be automated in 15 years
Slower Pace ***Decrease*** *of $X.XX per month annually ($Y.YY less per bill by 2024)*	**142**	Projected to improve reliability by 17% for approximately 71,000 customer. All feeders would be automated in 20 years



Rate Zone Breakdown	ERZ	BRZ*	HRZ	PRZ	GRZ*
Accelerated Pace	8	5	15	14	2
Recommended Pace	14	7	37	39	16
Slower Pace	8	0	8	12	1

* Small sample size, interpret with caution.

Converting Rear Lot Service

Alectra Utilities' service area contains multiple older suburban and urban neighbourhoods with rear lot or "backyard" infrastructure. In general, rear lot electricity lines are 40 years of age or older. This type of equipment presents three primary problems:

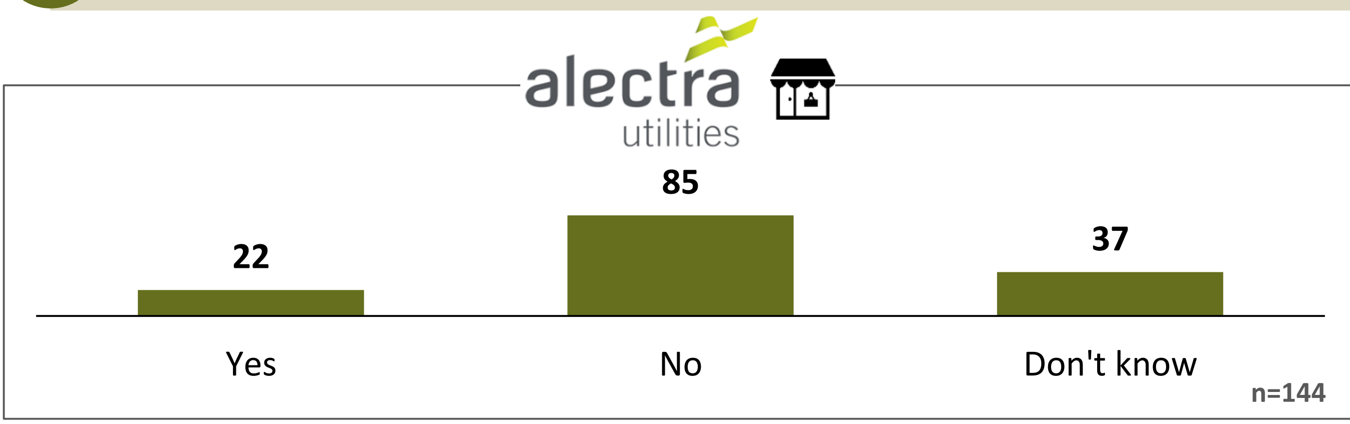
1. Repairs and maintenance are complicated because these lines are in the backyard of homes, rather than the front. Often regular equipment cannot access the backyards and repair crews need to work around trees, pools, sheds and other obstacles.

2. Rear lot equipment is subject to greater tree contact, especially during severe weather

3. The equipment presents elevated safety risks to the general public should the assets fail.

An Alectra Utilities study showed that rear lot restoration times are approximately 4.55 hours. This is three times higher than a comparable front lot restoration time of 1 to 1.4 hours.

Q To the best of your knowledge, does your power come from a line in a backyard behind your home or business?



Rate Zone Breakdown	HRZ	PRZ	GRZ*
Yes	7	10	5
No	42	32	11
Don't know	11	23	3

* Small sample size, interpret with caution.

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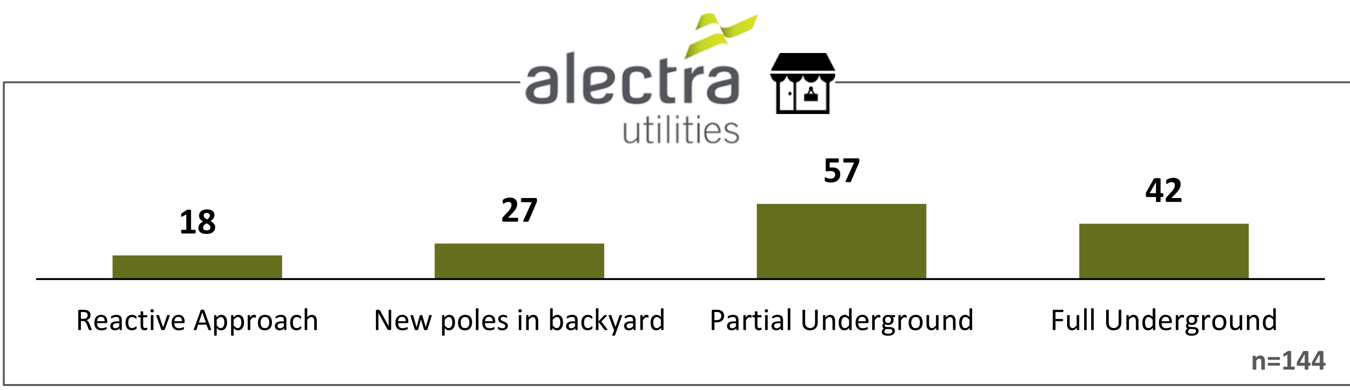
Converting Rear Lot Service

Small Business

Alectra Utilities has two choices to make in dealing with rear lot service, a design choice and a timing choice. The first question relates to what design approach the utility chooses. The options below assume that all rear lot equipment is converted within the next 70 years.

Q Which of the following design approaches would you prefer?

Option	Rear lot or "backyard" equipment design choices
Reactive Approach ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**Reactively** replace rear lot assets when they have reached their physical end-of-life criteria, knowing that there could be prolonged reliability impacts. This option leaves customers vulnerable to longer than average storm outages and resulting safety risks.
New poles in backyard ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**Proactively** replace old poles and equipment, with new poles and equipment in backyards. This would improve day-to-day reliability but leaves customers vulnerable to longer than average storm outages, and resulting safety risks.
Partial Underground ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**Proactively** re-locate some rear lot infrastructure to front lot underground. This would address some of the vulnerability to longer than average storm outages and resulting safety risks.
Full Underground ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	**Proactively** re-locate all rear lot infrastructure to front lot underground. This would completely resolve the vulnerability to longer than average storm outages and resulting safety risks.



Rate Zone Breakdown	HRZ	PRZ	GRZ*
Reactive Approach	5	10	3
New poles in backyard	10	16	1
Partial Underground	32	17	8
Full Underground	13	22	7

Timing of a Rear Lot Conversion Program

Approximately 11,000 customers throughout the former Horizon, PowerStream and Guelph Hydro rate zones are supplied by rear lot lines.

Because rear lot lines have reasonable reliability in normal weather, Alectra Utilities has given other projects priority within its current approved rates. However because rear lot conversions will reduce customer exposure to prolonged outages, and safety risks, Alectra Utilities has identified three timing options to replace rear lot lines proactively.

The exact cost will depend on the design, but for your feedback the options assume the full replacement with front lot underground service.

Examples of rear lot equipment

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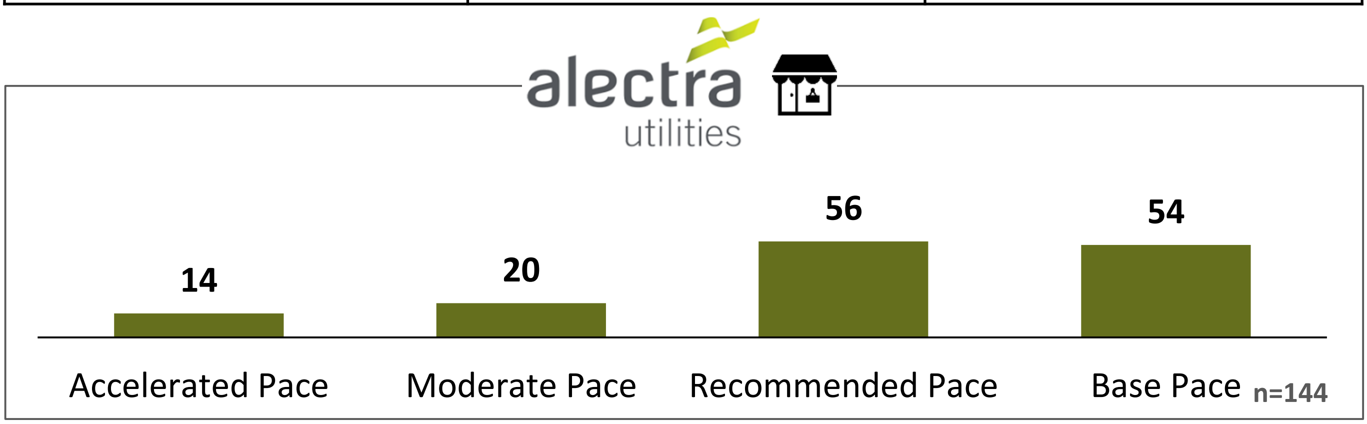
Timing of a Rear Lot Conversion Program

Small Business

Q Which of the following timing options would you prefer?

Option	Pacing of renewal and conversion	Service renewed and converted over 5-year period
Accelerated Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **30 year period**	Approximately **1,810 customers** (16% of customer with rear lot)
Moderate Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **40 year period**	Approximately **1,360 customers** (12% of customer with rear lot)
Recommended Pace ***<u>Additional</u>*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew and convert existing rear lot overhead locations over **70 year period**	Approximately **851 customers** (8% of customer with rear lot)
Base Pace *Within current rates*	Renew and convert existing rear lot overhead locations on a reactive emergency basis	Expose customers serviced by these lines to prolonged outage and safety risks



Rate Zone Breakdown	HRZ	PRZ	GRZ*
Accelerated Pace	6	6	2
Moderate Pace	7	9	4
Recommended Pace	28	25	3
Base Pace	19	25	10

* Small sample size, interpret with caution.

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Rear Lot Questions by Service Type

Q Converting Rear Lot Service (Design) **by** Service Type

Rate Zone Breakdown	Alectra Utilities	
Service Type	**Rear Lot**	**Not Rear Lot**
Reactive Approach	4	9
New poles in backyard	5	15
Partial Underground	7	37
Full Underground	6	24

Note: Due to small sample sizes, results from individual rate zones have been combined to create an Alectra Utilities average.

Q Timing of a Rear Lot Conversion Program (Timing) **by** Service Type

Rate Zone Breakdown	Alectra Utilities	
Service Type	**Rear Lot**	**Not Rear Lot**
Accelerated Pace	3	10
Moderate Pace	5	12
Recommended Pace	6	31
Base Pace	8	32

Note: Due to small sample sizes, results from individual rate zones have been combined to create an Alectra Utilities average.

Planning for Expansion, Intensification and Back-up

Expansion, increased intensification and increased back-up projects all involved adding high capacity feeder lines to the grid.

- **Expansion:** Where there is no line or a line might have been initially built to service a farm, it is now serving a subdivision and can no longer meet the needs of those customers.
- **Intensification and redevelopment:** Multiple downtown areas are becoming more densely populated, which has resulted in insufficient supply to meet the increased demand.
- **Back-up capacity:** Because of the way the grid has grown, there are certain areas within Alectra Utilities' service territory that no longer have access to adequate back-up capacity in the case of an outage.

While most expansion related projects cannot be deferred due to the obligation to connect new customers, some intensification and back-up capacity projects could be delayed.

Intensification:

- Since these projects are often completed with other infrastructure projects such as road widening and sewer work, deferral could lead to increased costs and service disruptions.
- Building expansion projects now allows the projects to be built at lower cost with less disruptions than waiting until development is underway and the need is pressing.

Back-up capacity:

- Deferral of back-up projects could lead to increased outage times during contingency condition and may cause reliability issues on some heavily loaded lines.
- Adding back-up capacity now allows for quicker restoration of power when caused by transmission system failures or severe weather events.

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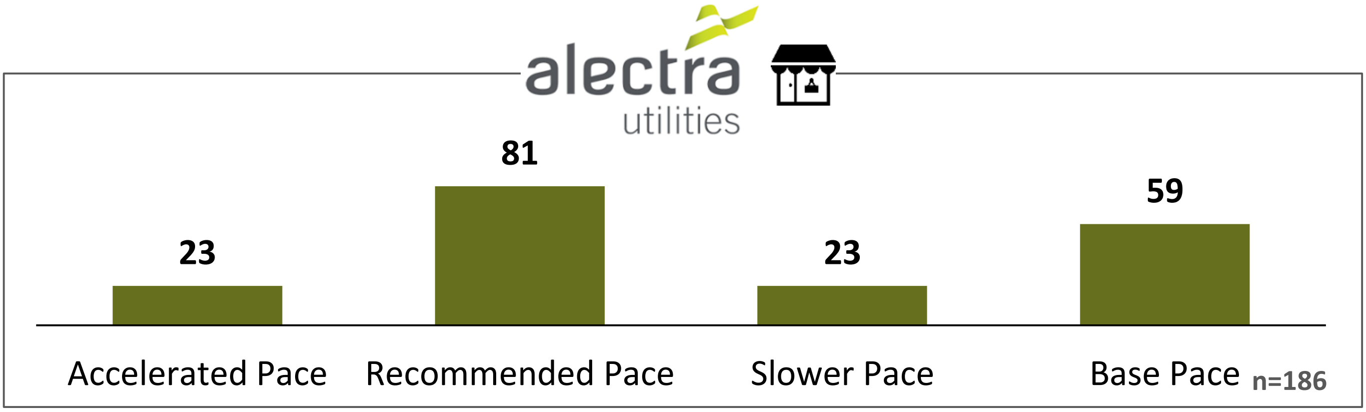
Planning for Expansion, Intensification and Back-up

Small Business

Q Which of the following timing options would you prefer?

Option	2020 – 2024 Expansion & Intensification Projects
Accelerated Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	Address all the expansion, intensification and contingency needs identified for the distribution system during 2020-2024.
Recommended Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	Address all the expansion needs and many of the intensification and required back-up projects. Some projects related to intensification or back-up capability will be deferred.
Slower Pace ***Additional*** *$X.XX per month annually* *($Y.YY more per bill by 2024)*	Address all expansion projects but defer majority of intensification and all required back-up capability projects. Reliability and power quality may be affected on heavily loaded feeders.
Base Pace *Within current rates*	Complete key expansion projects but defer significant amount of intensification and back up capability projects during 2020 -2024.



Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Accelerated Pace	4	4	6	7	2
Recommended Pace	11	5	30	29	6
Slower Pace	6	2	10	2	3
Base Pace	9	1	14	27	8

* Small sample size, interpret with caution.

Voltage Conversion

About 8.5% of Alectra Utilities' customers are serviced by low voltage distribution systems. These lines were built in the 1950's and represent some of Alectra Utilities' oldest distribution assets. These lines have much less capacity than modern lines. During an outage, the modern lines cannot be used to restore power to the low voltage lines, because they don't operate at the same voltage levels.

This equipment has become functionally obsolete, and the risk of equipment failure is increasing. Since there is no urgent threat to reliability, there are no low voltage conversion investments included within existing rates.

However, investing in voltage conversion projects would:

- improve reliability through the new lines and transformers;
- provide access to increased supply from higher voltage substations; and
- improve outage restoration from the enhanced back-up and availability of tie points at this higher voltage level.

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Voltage Conversion

Small Business

Q Which of the following timing options would you prefer?

Option	Voltage Conversion	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **11** low voltage substations	Enable Alectra Utilities to convert 10,533 customers to present day supply voltage
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **9** low voltage substations	Enable Alectra Utilities to convert 9,984 customers to present day supply voltage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Decommission a total of **5** low voltage substations	Enable Alectra Utilities to convert 6,566 customers to present day supply voltage
Base Pace *Within current rates*	Alectra Utilities will not decommission any stations	Current rates support the investment to enable Alectra Utilities to convert 3,600 customer to present day supply voltage

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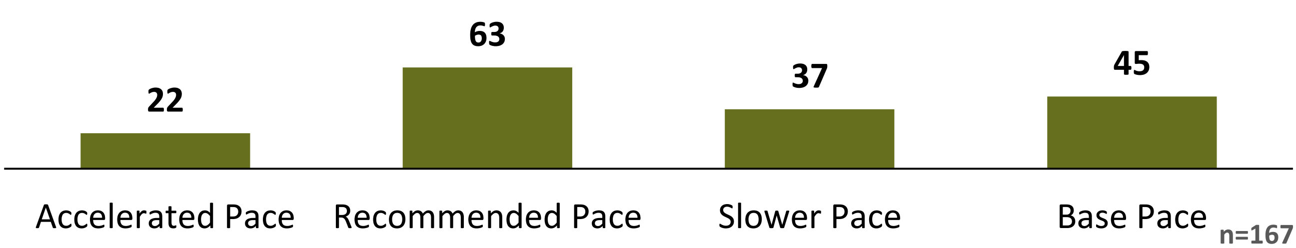

Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ
Accelerated Pace	3	4	6	9
Recommended Pace	11	3	20	29
Slower Pace	7	3	19	8
Base Pace	9	2	15	19

* Small sample size, interpret with caution.

Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity in order to provide electricity for existing and new developments; provide more resilience to deal with extreme weather event and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline in Alectra Utilities' quality of service to current customers.

Here in Mississauga, Alectra Utilities has two stations that need investment.

- The proposed new Duke station is located immediately north of Square One and will help serve the growing demands of that area.
- A station in the East Credit area of Mississauga is currently located on leased land that Alectra Utilities would like to purchase for long term security.

The lead time to build a station is 2 to 3 years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures.

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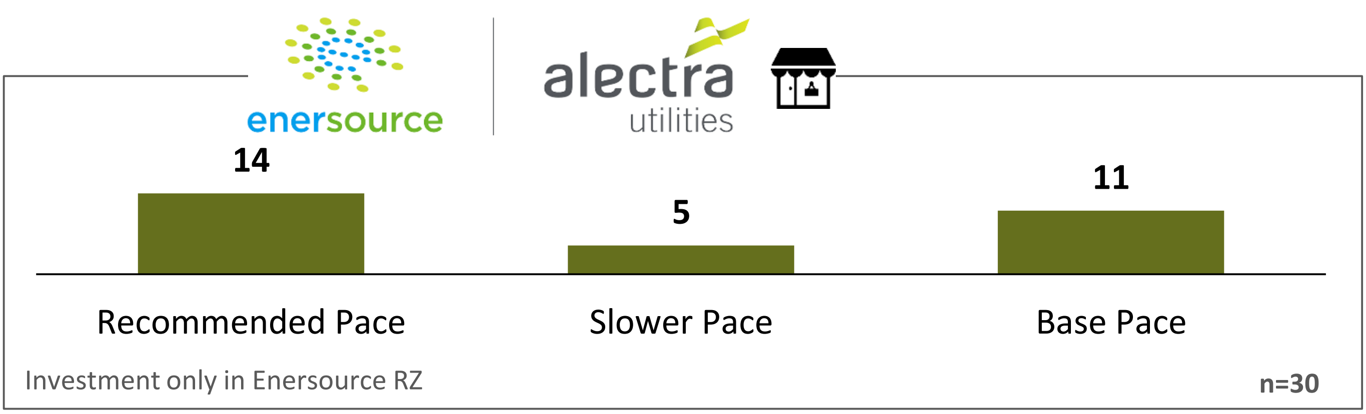
Distribution Stations Capacity (ERZ)

Small Business

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station and increase capacity at one station	Enable Alectra Utilities to build Duke station as well as buy leased land at the East Credit area station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new station	Enable Alectra Utilities to build Duke station, while assuming the risk that it will cost more to purchase leased land at a station in East Credit in the future.
Base Pace *Within current rates*	Delay any station capacity investments	Risk that it will cost more to purchase leased land in future. Existing stations likely to experience overloading and increased risk of reliability issues.



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Distribution Stations Capacity

The stations capacity investment provides funding necessary to build station capacity to provide electricity for existing and new developments; provide more resilience to deal with extreme weather events and loss of power from the transmission grid; and secure land for future station locations.

Alectra Utilities' is connecting more customers due to growth in the Greater Toronto area. In the areas where this customer growth is occurring, many of Alectra Utilities' substations are approaching capacity limits. Delaying planned investments could result in a decline Alectra Utilities' quality of service to current customers.

Here in the former PowerStream area, Alectra Utilities has four stations that need investment:

- The existing Melbourne station in Bradford is located on leased land that Alectra Utilities would like to purchase for long-term stability. Furthermore, this station requires an upgrade.
- Barrie and Alliston both have growing demand that will need Alectra Utilities to buy the land for and to build new stations.
- Growth in Markham and Richmond Hill requires building a new transformer station after 2024. However, prior to building this new station, an environmental assessment is needed.

The lead time to build a station is two to three years and Alectra Utilities paces the investment over the time period considering the load growth while carefully managing expenditures. Alectra Utilities has presented the following options that balance system needs and rate impacts.

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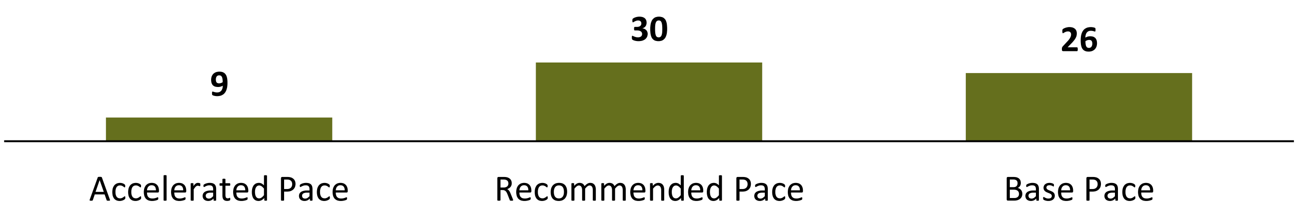
Distribution Stations Capacity (PRZ)

Small Business

Q Which of the following timing options would you prefer?

Option	Stations Renewed	Investment Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build two new stations and increase capacity at one station	• Upgrade Bradford station • Build new stations in both Alliston and Barrie • Complete environmental assessment for Markham station.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Build one new stations and increase capacity at one Station	• Upgrade Bradford station • Build station in Alliston • Complete environmental assessment for Markham station. Risk that existing Barrie stations will experience overloading and increased risk of reliability issues.
Base Pace *Within current rates*	Upgrade one station and secure land for future station build.	• Upgrade Bradford station • Complete environmental assessment for Markham station. Risk that existing Alliston and Barrie stations will experience overloading and increased risk of reliability issues.



Investment only in PowerStream RZ

n=65

Additional Station Investments

Beyond the transformers and other equipment that directly operate the grid, other investments are required for security, communications and control systems. Distribution stations play an important role in Alectra Utilities' electricity grid, transforming high voltage electricity to a lower voltage that is suitable for distribution. A failure in a distribution station can result in an outage for thousands of customers.

- **Communications and control systems** allow Alectra Utilities staff in central control rooms to remotely monitor and control the equipment in distribution stations in order to avoid equipment failures and manage failures when they do occur. Monitoring equipment is also used for security purposes.

While new investments to keep these systems up to date would help to maintain reliability and security, delaying these investment is less likely to cause problems compared to delaying other projects discussed earlier.

To manage within existing rates, Alectra Utilities is proposing to postpone any investments in distribution station, communications and control systems. Managers know that as these systems age, there will likely be more outages, but it is not possible to estimate the exact risks involved.

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Additional Station Investments

Small Business

Q Which of the following timing options would you prefer?

Option	Level of Investment	Expected Outcome
Accelerated Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Renew communication, replace end-of-life station equipment, obsolete protection equipment and upgrade station facilities.	• Maintain reliability • Ensure reliable communication performance of the system • Increases security at the station.
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication, replace end of life station equipment and obsolete protection equipment.	• Maintain reliability • Ensure reliable communication performance of the system • Does not increase security at the station.
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Upgrade communication and replace end of life station equipment.	• Maintain reliability • Ensure reliable communication infrastructure. • Does not increase security at the station.
Base Pace *Within current rates*	Monitor station equipment and reactively replace when necessary. Defer other investments beyond 2024	This option would require allocating funds from the reactive budget as necessary.

Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Accelerated Pace	4	5	12	10	5
Recommended Pace	11	4	27	26	9
Slower Pace	2	0	9	9	-
Base Pace	13	3	12	20	5

Combined Alectra Utilities results not shown because “slower pace” option was not presented in the Guelph rate zone.

* Small sample size, interpret with caution.

Preparing for More Consumer Choice

New technologies are changing the way that consumers are able to interact with the electricity system. Emerging technologies like solar power, battery storage and electric vehicles are constantly evolving; they are becoming more affordable, more widely available, and better performing.

Properly planned and managed, the integration of these technologies with Alectra Utilities' traditional "poles and wires" equipment is expected to provide benefits to customers by way of:

- reducing the amount of infrastructure costs related to meeting the increased demand for electricity; and
- generating electricity more locally, reducing the amount of generation that is needed elsewhere in the province.

Regardless of whether you are considering new energy choices like an electric vehicle for yourself today, the market is changing quickly, and Alectra Utilities must be prepared as adoption becomes more widespread over the next five years. For instance, charging each electric vehicle draws as much energy as two average homes. If a dozen or so people come home and start changing their vehicles at a period of peak demand, it could overload the grid in that neighbourhood. Not being prepared could result in increased equipment failure due to overloaded lines, as well as costly infrastructure upgrades to meet the demand posed by this technology.

Alectra Utilities has identified three pilot projects to ensure the system is ready when more consumers adopt this technology. These pilots are intended to answer questions like;

- *How will the grid respond if a neighbourhood rapidly adopts new technology, such as electric vehicles?*
- *How can Alectra Utilities reduce the strain on the system by using smart technology to dispatch electricity?*

These pilots are not required to meet immediate reliability issues, however, they will help to ensure that Alectra Utilities is able to meet the challenged as more consumers embrace this technology in the next few years.

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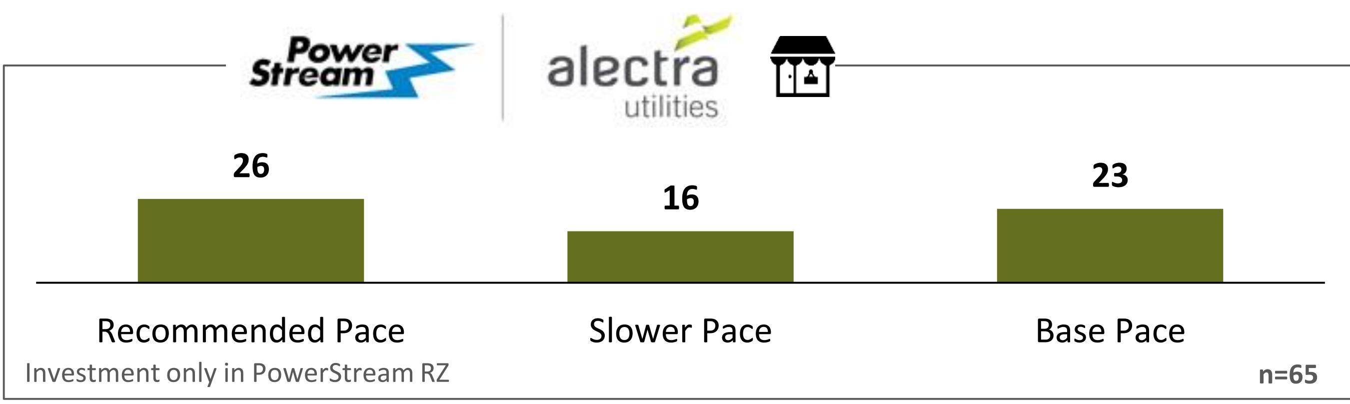
Preparing for More Consumer Choice

Small Business

Q Which of the following timing options would you prefer?

Option	Approach
Recommended Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Conduct three pilot projects to prepare to integrate new technology like electric vehicles, solar power and battery storage
Slower Pace ***Additional*** *$X.XX per month annually ($Y.YY more per bill by 2024)*	Wait until new technology like electric vehicles, solar power and battery storage becomes more widely adopted
Base Pace *Within current rates*	Reactively respond to technology uptake by investing in traditional 'poles and wires' infrastructure as reliability and capacity issues become apparent



Investment Alternative Summary

Throughout this workbook, you have been asked about some key choices that could impact your rates. Below is a summary of your answers to the questions that could impact your rates.

At the bottom of this page you will find the total bill impact of all the answers you gave that would result in a bill increase.

Having seen the total bill impact, please review your answers and change your responses if you desire; your potential rate impact will be re-calculated. You will have the opportunity to adjust your answers again until you feel you've reached the best balance for you.

Q Small Business Customer Bill Impact Change and Magnitude of Bill Impact

Bill Impact Analysis	ERZ**	BRZ**	HRZ	PRZ	GRZ**
Average $ Initial	$0.37	$0.44	$0.40	$0.45	$0.13
Average $ Final	$0.36	$0.44	$0.38	$0.44	$0.14
Difference: Initial VS. Final	-($0.01)*	$0.00	-($0.02)	-($0.02)	$0.01

Differences that are statistically significant at 95% are noted by an asterisk (*).

** Small sample size, interpret with caution.

Impact of Choices on Rates

As noted earlier, all the projects identified in this workbook have been evaluated and found to provide meaningful benefits. However, there just isn't enough room in the current rates to pay for them all.

Under the OEB rules, Alectra Utilities can apply for additional rates, beyond the scheduled 1.2% increase, to pay for these improvements.

Alectra Utilities has calculated the rate impact of implementing the options recommended by their planners.

These priorities may change based on your input but give you a sense of the cost for an investment program that aims to:

- maintain reliability for the average customer;
- fix or avoid equipment issues that cause below average reliability for some customers; and
- help the system do a better job of responding to major outages caused by severe weather or transmission grid failures.

Following Alectra Utilities planners' recommended approach would result in an average additional [PIPE-RID1] cents per month annually for the typical customer in your rate class.

At the end of the 5-year plan, the typical customer in your rate class would see the distribution portion of their electricity bill increase by [PIPE-RID2] above the current projected rate of [PIPE-TOT] in 2024.

Rate Zone Breakdown	ERZ	BRZ	HRZ	PRZ	GRZ
[PIPE-RID1]	$0.68	$0.56	$0.61	$0.83	$0.22
[PIPE-RID2]	$3.38	$2.78	$3.05	$4.13	$1.12
[PIPE-TOT]	$79.63	$66.21	$70.09	$75.09	$48.44

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Impact of Choices on Rates

Small Business

Q Which of the following statements best represents your view?

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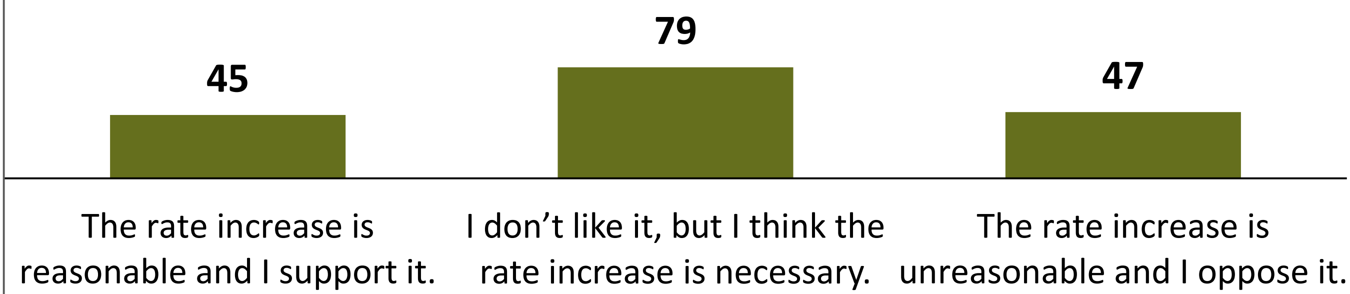

Note: "Don't know" (15) not shown.

n=186

Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
The rate increase is reasonable and I support it	5	4	16	17	3
I don't like it, but I think the rate increase is necessary	13	5	26	23	12
The rate increase is unreasonable and I oppose it	11	3	11	20	2
Don't know	1	-	7	5	2
Reasonable and support it + don't like it, but think it's necessary	**18**	**9**	**42**	**40**	**15**

* Small sample size, interpret with caution.

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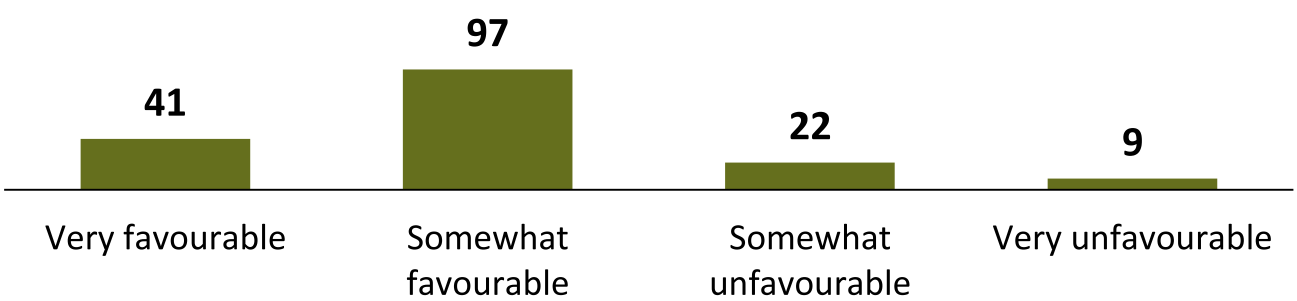
Workbook Diagnostics | Overall Impression

Small Business

Q Did you have a favourable or unfavourable impression of the workbook you just completed?



Note: "Don't know" (17) not shown.

n=186

Rate Zone Breakdown	ERZ	BRZ*	HRZ	PRZ	GRZ*
Very favourable	6	5	11	13	6
Somewhat favourable	15	6	28	40	8
Somewhat unfavourable	3	0	11	4	4
Very unfavourable	3	0	2	4	0
Don't know	3	1	8	4	1
Favourable	**21**	**11**	**39**	**53**	**14**
Unfavourable	**6**	**0**	**13**	**8**	**4**

* Small sample size, interpret with caution.

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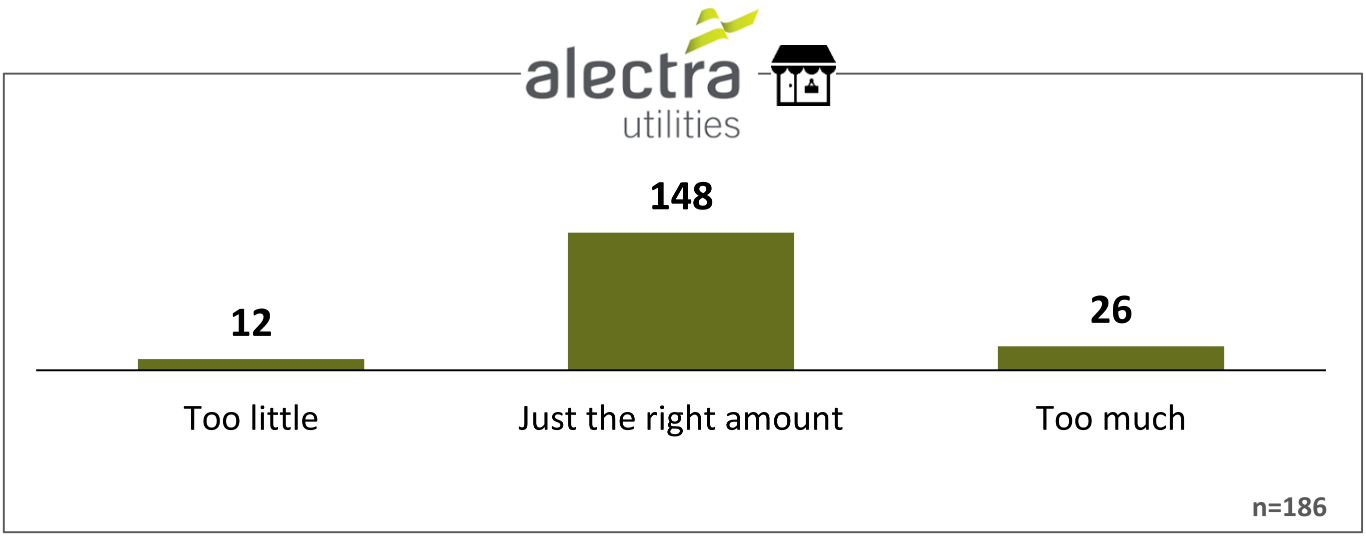
Workbook Diagnostics | Volume of Information

Small Business

Q Did Alectra Utilities provide too much information, not enough, or just the right amount?



Rate Zone Breakdown	ERZ*	BRZ*	HRZ	PRZ	GRZ*
Too little	2	1	4	3	2
Just the right amount	24	10	46	52	16
Too much	4	1	10	10	1

* Small sample size, interpret with caution.

Appendix 1

Bill Impacts By Investment

Residential Bill Impacts

Investment Decisions by rate zone

Investment Category	ERZ	BRZ	HRZ	PRZ	GRZ
Eliminating Meter Data Security Risks				1	
Keeping the Business Running	1	1	1	2	1
Pacing Investments in the Underground System	2		2	3	
Keeping Pace with Overhead System Renewal	3	2	3	4	
Alectra Utilities' Transformer Replacement Program	4	3	4	5	2
Monitoring and Control Equipment	5	4	5	6	3
Converting Rear Lot Service			6	7	4
Timing of a Rear Lot Conversion Program			7	8	5
Planning for Expansion, Intensification and Back-up	6	5	8	9	6
Voltage Conversion	7	6	9	10	
Distribution Stations Capacity	8			11	
Additional Station Investments	9	7	10	12	7
Preparing for More Consumer Choice				13	

Residential Bill Impacts

Residential

Summary of bill impacts by investment option and rate zone

Eliminating meter safety risks	ERZ		BRZ		HRZ		PRZ		GRZ	
							2020	2024		
Recommended Pace							$0.06	$0.28		
Base Pace							-	-		

Keeping the business running	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Approach	$0.07	$0.34	$0.08	$0.39	$0.07	$0.35	$0.07	$0.35	$0.06	$0.29
Base Approach	-	-	-	-	-	-	-	-	-	-

Pacing Investments in the Underground System	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024			2020	2024	2020	2024		
Accelerated Pace	$0.04	$0.18			$0.02	$0.09	$0.05	$0.26		
Recommended Pace	$0.02	$0.09			$0.01	$0.04	$0.02	$0.12		
Base Pace	-	-			-	-	-	-		
Slower Pace	($0.05)	($0.23)			($0.02)	($0.11)	($0.06)	($0.31)		

Keeping Pace with Overhead System Renewal	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024		
Accelerated Pace	$0.04	$0.18	$0.04	$0.22	$0.03	$0.16	$0.07	$0.34		
Recommended Pace	-	-	-	-	-	-	-	-		
Slower Pace	($0.02)	($0.09)	($0.02)	($0.11)	($0.02)	($0.08)	($0.03)	($0.17)		

Alectra Utilities' transformer replacement program	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.02	$0.10	$0.02	$0.10	$0.01	$0.04	$0.02	$0.11	$0.02	$0.10
Recommended Pace	-	-	-	-	-	-	-	-	-	-
Slower Pace	($0.01)	($0.05)	($0.01)	($0.05)	($0.00)	($0.02)	($0.01)	($0.06)	($0.01)	($0.05)

INNOVATIVE RESEARCH GROUP

Residential Bill Impacts

Residential

Summary of bill impacts by investment option and rate zone

Monitoring and Control Equipment	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.01	$0.04	$0.01	$0.05	$0.01	$0.03	$0.02	$0.11	$0.03	$0.13
Recommended Pace	-	-	-	-	-	-	-	-	-	-
Slower Pace	($0.01)	($0.03)	($0.01)	($0.03)	($0.00)	($0.02)	($0.01)	($0.07)	($0.02)	($0.08)

Converting Rear Lot Service Not included in overall rate impact calculations	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Reactive Approach					$0.01	$0.05	$0.01	$0.06	$0.00	$0.02
New poles in backyard					$0.01	$0.04	$0.01	$0.05	$0.00	$0.02
Partial Underground					$0.01	$0.06	$0.02	$0.08	$0.01	$0.03
Full Underground					$0.02	$0.11	$0.03	$0.14	$0.01	$0.05

Timing of a Rear Lot Conversion Program	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace					$0.05	$0.23	$0.06	$0.31	$0.02	$0.10
Moderate Pace					$0.03	$0.17	$0.05	$0.23	$0.01	$0.07
Recommended Pace					$0.02	$0.11	$0.03	$0.14	$0.01	$0.05
Base Pace					-	-	-	-	-	-

Planning for Expansion, Intensification and Back-up	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.10	$0.50	$0.06	$0.29	$0.05	$0.25	$0.13	$0.64	$0.08	$0.42
Recommended Pace	$0.09	$0.44	$0.05	$0.25	$0.04	$0.22	$0.11	$0.56	$0.07	$0.36
Slower Pace	$0.06	$0.32	$0.04	$0.19	$0.03	$0.16	$0.08	$0.41	$0.05	$0.27
Base Pace	-	-	-	-	-	-	-	-	-	-

Residential Bill Impacts

Residential

Summary of bill impacts by investment option and rate zone

Voltage Conversion	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.02	$0.12	$0.06	$0.30	$0.11	$0.53	$0.00	$0.02		
Recommended Pace	$0.02	$0.12	$0.06	$0.28	$0.10	$0.49	$0.00	$0.02		
Slower Pace	$0.01	$0.05	$0.02	$0.12	$0.04	$0.21	$0.00	$0.01		
Base Pace	-	-	-	-	-	-	-	-		

Distribution Stations Capacity (ERZ)	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace	$0.02	$0.12								
Slower Pace	$0.02	$0.09								
Base Pace	-	-								

Distribution Stations Capacity (PRZ)	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace							$0.03	$0.14		
Recommended Pace							$0.02	$0.09		
Base Pace							-	-		

Additional Station Investments	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.01	$0.06	$0.01	$0.03	$0.00	$0.02	$0.02	$0.08	$0.00	$0.02
Recommended Pace	$0.01	$0.05	$0.00	$0.02	$0.00	$0.01	$0.01	$0.07	$0.00	$0.01
Slower Pace	$0.01	$0.05	$0.00	$0.02	$0.00	$0.01	$0.00	$0.02	-	-
Base Pace	-	-	-	-	-	-	-	-	-	-

Residential Bill Impacts

Residential

Summary of bill impacts by investment option and rate zone

Preparing for more consumer choice	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace							$0.05	$0.23		
Slower Pace							$0.02	$0.08		
Base Pace							-	-		

Small Business Bill Impacts

Small Business

Summary of bill impacts by investment option and rate zone

Eliminating meter safety risks	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace							$0.12	$0.60		
Base Pace							-	-		

Keeping the business running	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Approach	$0.20	$0.99	$0.19	$0.97	$0.17	$0.84	$0.15	$0.75	$0.09	$0.45
Base Approach	-	-	-	-	-	-	-	-	-	-

Pacing Investments in the Underground System	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024			2020	2024	2020	2024		
Accelerated Pace	$0.11	$0.54			$0.04	$0.21	$0.11	$0.55		
Recommended Pace	$0.05	$0.25			$0.02	$0.10	$0.05	$0.25		
Base Pace	-	-			-	-	-	-		
Slower Pace	($0.13)	($0.66)			($0.05)	($0.26)	($0.13)	($0.67)		

Keeping Pace with Overhead System Renewal	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024		
Accelerated Pace	$0.11	$0.53	$0.11	$0.55	$0.08	$0.39	$0.15	$0.73		
Recommended Pace	-	-	-	-	-	-	-	-		
Slower Pace	($0.05)	($0.26)	($0.06)	($0.28)	($0.04)	$0.19	($0.07)	($0.36)		

Alectra Utilities' transformer replacement program	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.06	$0.30	$0.05	$0.26	$0.02	$0.10	$0.05	$0.24	$0.03	$0.16
Recommended Pace	-	-	-	-	-	-	-	-	-	-
Slower Pace	($0.03)	($0.15)	($0.03)	($0.13)	($0.01)	($0.05)	($0.02)	($0.12)	($0.02)	($0.08)

Small Business Bill Impacts

Small Business

Summary of bill impacts by investment option and rate zone

Monitoring and Control Equipment	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.03	$0.13	$0.03	$0.13	$0.01	$0.07	$0.05	$0.23	$0.04	$0.20
Recommended Pace	-	-	-	-	-	-	-	-	-	-
Slower Pace	($0.02)	($0.08)	($0.02)	($0.08)	($0.01)	($0.05)	($0.03)	($0.14)	($0.02)	($0.12)

Converting Rear Lot Service Not included in overall rate impact calculations	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Reactive Approach					$0.02	$0.11	$0.03	$0.13	$0.01	$0.03
New poles in backyard					$0.02	$0.09	$0.02	$0.10	$0.00	$0.02
Partial Underground					$0.03	$0.16	$0.04	$0.18	$0.01	$0.04
Full Underground					$0.05	$0.26	$0.06	$0.30	$0.01	$0.07

Timing of a Rear Lot Conversion Program	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace					$0.11	$0.56	$0.13	$0.66	$0.03	$0.15
Moderate Pace					$0.08	$0.42	$0.10	$0.49	$0.02	$0.12
Recommended Pace					$0.05	$0.26	$0.06	$0.30	$0.01	$0.07
Base Pace					-	-	-	-	-	-

Planning for Expansion, Intensification and Back-up	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.29	$1.46	$0.14	$0.72	$0.12	$0.61	$0.27	$1.36	$0.13	$0.65
Recommended Pace	$0.25	$1.27	$0.13	$0.63	$0.11	$0.53	$0.24	$1.19	$0.11	$0.56
Slower Pace	$0.19	$0.94	$0.09	$0.46	$0.08	$0.39	$0.18	$0.88	$0.08	$0.42
Base Pace	-	-	-	-	-	-	-	-	-	-

Small Business Bill Impacts

Small Business

Summary of bill impacts by investment option and rate zone

Voltage Conversion	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.07	$0.36	$0.15	$0.75	$0.25	$1.27	$0.01	$0.05		
Recommended Pace	$0.07	$0.33	$0.14	$0.69	$0.23	$1.17	$0.01	$0.05		
Slower Pace	$0.03	$0.14	$0.06	$0.29	$0.10	$0.49	$0.00	$0.02		
Base Pace	-	-	-	-	-	-	-	-		

Distribution Stations Capacity (ERZ)	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace	$0.07	$0.36								
Slower Pace	$0.05	$0.27								
Base Pace	-	-								

Distribution Stations Capacity (PRZ)	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace							$0.06	$0.31		
Recommended Pace							$0.04	$0.19		
Base Pace							-	-		

Additional Station Investments	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Accelerated Pace	$0.03	$0.16	$0.01	$0.07	$0.01	$0.05	$0.03	$0.16	$0.00	$0.02
Recommended Pace	$0.03	$0.14	$0.01	$0.04	$0.01	$0.04	$0.03	$0.14	$0.00	$0.02
Slower Pace	$0.03	$0.14	$0.01	$0.04	$0.01	$0.04	$0.01	$0.05	-	-
Base Pace	-	-	-	-	-	-	-	-	-	-

Small Business Bill Impacts

Small Business

Summary of bill impacts by investment option and rate zone

Preparing for more consumer choice	ERZ		BRZ		HRZ		PRZ		GRZ	
	2020	2024	2020	2024	2020	2024	2020	2024	2020	2024
Recommended Pace							$0.10	$0.48		
Slower Pace							$0.03	$0.16		
Base Pace							-	-		

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Personalized research to connect you and your audiences.

For more information, please contact:

Julian Garas
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(t) 416-640-4133
(e) jgaras@innovativeresearch.ca

APPENDIX 3.1

Telephone Reference Survey

Residential Questionnaire

March 2019

Prepared by:

Innovative Research Group, Inc.
www.innovativeresearch.ca

Vancouver
888 Dunsmuir Street, Suite 350
Vancouver BC | V6C 3K4

Toronto
56 The Esplanade, Suite 310
Toronto, Ontario | M5E 1A7

Residential Telephone Questionnaire

Internal Questionnaire Notes

Method: Telephone (Random Digit Dialling)

Questionnaire Length: Approximately 10 question (5 minutes)

Language: English

Sample Frame: Residential Customers

Sample Size: (n=500 residential and n=200 small business)

Piping variables

Residential	Enersource	Brampton	Horizon	PowerStream	Guelph
PIPE-PER	23%	23%	25%	27%	26%
PIPE-DEL	$25.16	$24.81	$27.07	$28.90	$29.34
PIPE-TOTL	$103.18	$100.91	$103.54	$102.00	$107.01

A. SCREENING AND QUALIFICATIONS

Introduction

Hello, my name is ______________ and I'm calling from **Innovative Research Group** on behalf of **Alectra Utilities**, your local electricity distributor.

Innovative Research Group is a national public opinion research firm. **We need your input on choices that will affect the service you receive from Alectra Utilities.**

We are simply interested in hearing your opinions – no attempt will be made to sell you anything.

A1. Do you have about **5 minutes** to answer some survey questions? All your responses will be kept strictly confidential.

1	Yes	**[continue]**
2	No – NOT PRIMARY BILL PAYER	**[go to TRANSFER-1]**
3	No – BAD TIME	**ARRANGE CALLBACK**
4	No – HARD REFUSAL	**[Terminate]**

MONIT

This call may be monitored or audio taped for quality control and evaluation purposes.

1 PRESS TO CONTINUE

CELL. Are you currently operating a car, truck or other motor vehicle?

1	YES	ARRANGE CALLBACK
2	NO	[continue to A2]
98	Refused – LOG (THANK AND TERMINATE)	**[Terminate]**

A2. Are you the person primarily responsible for paying the electricity bill in your household?

1	Yes – I pay the bill	[continue to A3]
2	Yes – shared responsibility	[continue to A3]
3	No	[go to TRANSFER-1]
98	Don't know (**DNR**)	**[Terminate]**

TRANSFER-1

Can I speak with the person in your household who usually pays the electricity bill?

1	Yes	[**BACK TO *INTRO***]
2	No – NOT AVAILABLE/BAD TIME	[ARRANGE CALLBACK]
3	No – HARD REFUSAL	[**Terminate**]
98	Don't know (**DNR**)	[**Terminate**]

A3. Can you confirm that your household receives an electricity or hydro bill from **Alectra Utilities**?

1	Yes	[**continue**]
2	No	[**Terminate**]
98	Don't know (**DNR**)	[**Terminate**]

GENDER **Note gender by observation:**

1	Male
2	Female

A4. For statistical purposes, can you please indicate which age category you fall in? Is that ... [**READ LIST**]

01	Younger than 18	**DNR**
02	18 to 24	
03	25 to 34	
04	35 to 44	
05	45 to 54	
06	55 to 64	
07	65 to 74	
08	75 or older	
99	Refused	**READ**: For this survey we need to identify customers' age. **IF STILL REFUSE**: THANK & TERMINATE

B. INTRODUCTION AND CORE MEASURES

B5. To start, I'd like to ask you a few questions about the electricity system …

As you may know, Ontario's electricity system has three key components**: generation, transmission** and **distribution.**

- **Generating stations** convert various forms of energy into electric power
- **Transmission lines** connect the power produced at generating stations to where it is needed across the province

Alectra Utilities is responsible for the last step of the journey: distributing electricity to customers through its distribution network. This is the system that takes the electricity from provincial transmission lines and brings it to your home through a network of wires, poles and other equipment.

B6. Before this survey, how familiar were you with the various parts of the electricity system and how they work together? Would you say… **[READ LIST]**

01	Very familiar and could explain the details of Ontario's electricity system to others
02	Somewhat familiar, but could not explain all the details of Ontario's electricity system to others
03	Have heard of some of the terms and organizations mentioned in this workbook, but knew very little about Ontario's electricity system
04	I knew nothing about Ontario's electricity system
98	Don't know [**DO NOT READ**]
99	Refused [**DO NOT READ**]

B7. In general, how satisfied or dissatisfied are you with the services you receive from **Alectra Utilities**? Would you say you are *very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied*?

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
98	Don't know (DO NOT READ)
99	Refused (DO NOT READ)

B8. I'd now like to talk with you about your electricity bill …

Every item and charge on your bill is mandated by the provincial government or regulated by the Ontario Energy Board, the provincial energy regulator.

While Alectra Utilities is responsible for collecting payment for the entire electricity bill, it retains only the distribution portion of the delivery charge.

Distribution makes up about [**PIPE-PER**] of the typical residential customer's bill.

This is about [**PIPE-DEL**] on an average [**PIPE-TOTL**] monthly residential electricity bill.

Before this survey, how familiar were you with the percentage of your electricity bill that goes to Alectra Utilities? Would you say you were *very familiar*, *somewhat familiar* or *not familiar at all*?

01	Very familiar
02	Somewhat familiar
03	Not familiar at all
98	Don't know
99	Refused (DO NOT READ)

B9. *Now, let's talk about the reliability of electricity service you receive.* Have you experienced any power outages at **home** **in the past 12 months** which *lasted longer than one minute*? If so, approximately how many of these power outages did you experience? [**DO NOT READ LIST**]

00	No outages	
01	1 outage	
02	2 outages	
03	3 outages	
04	4 outages	
05	5 outages	
06	6 outages	
07	7 outages	
08	8 or more outages	
98	Don't know [**DO NOT READ**]	
99	Refused [**DO NOT READ**]	

B10. To the best of your knowledge, does your home receive electrical service via overhead wires, underground cables or would you say you *don't know*?

01	Overhead wires	
02	Underground cables	
98	Don't know	
99	Refused [**DO NOT READ**]	

C. DEMOGRAPHICS

Lastly, I'd like to ask you some general questions about the electricity system in Ontario.

For each statement please tell me if you would strongly agree, somewhat agree, somewhat disagree or strongly disagree. If you don't know enough to say or don't have an opinion just let me know.

01	Strongly agree
02	Somewhat agree
03	Somewhat disagree
04	Strongly disagree
98	Don't know/No opinion
99	Refused [**DNR**]

[ROTATE]

C11. The cost of my electricity bill has a major impact on my finances and requires I do without some other important priorities.

C12. Customers are well served by the electricity system in Ontario.

[END BATTERY]

These final two questions are to help us understand whether you qualify for programs that lower electricity bills for lower-income household. This is for statistical purposes only.

C13. Counting yourself, how many people live in your household? [**DO NOT READ LIST**]

01	1 person
02	2 people
03	3 people
04	4 people
05	5 people
06	6 people
07	7 people
08	8 or more people
99	Refused (DO NOT READ)

C14. To the best of your ability, please tell me which of the following categories best describes your household's **AFTER TAX** income. **READ LIST**

01	Less than $28,000
02	Just over $28,000 to $39,000
03	Just over $39,000 to $48,000
04	Just over $48,000 to $52,000
05	More than $52,000
98	Not sure (DO NOT READ)
99	Refused (DO NOT READ)

THANK and END SURVEY

Thank you very much for taking the time to complete this survey.

APPENDIX 3.2

Telephone Reference Survey

Small Business Questionnaire

March 2019

Prepared by:

Innovative Research Group, Inc.
www.innovativeresearch.ca

Vancouver
888 Dunsmuir Street, Suite 350
Vancouver BC | V6C 3K4

Toronto
56 The Esplanade, Suite 310
Toronto, Ontario | M5E 1A7

Small Business Telephone Questionnaire

Internal Questionnaire Notes

Method: Telephone (Random Digit Dialling)

Questionnaire Length: Approximately 10 question (5 minutes)

Language: English

Sample Frame: Small Business Customers

Sample Size: (n=500 residential and n=200 small business)

Piping variables

Residential	Enersource	Brampton	Horizon	PowerStream	Guelph
PIPE-PER	26%	23%	24%	26%	17%
PIPE-DEL	$75.02	$62.38	$66.03	$70.74	$45.64
PIPE-TOTL	$279.10	$260.44	$265.31	$261.62	$248.71

A. SCREENING AND QUALIFICATIONS

Introduction

Hello, my name is ____________ and I'm calling from **Innovative Research Group** on behalf of **Alectra Utilities**, your local electricity distributor.

Innovative Research Group is a national public opinion research firm. **We need your input on choices that will affect the service you receive from Alectra Utilities.** Your answers will be combined with others to protect your privacy.

Can I please speak to the person who is in-charge of managing the electricity bill at your organization?

1) Yes, speaking <**contact on the line**>	**[skip to A1]**
2) Yes <**transferred to contact**>	**[skip to A1]**
3) No <**not the right contact person**>	**[GO to "NEW"]**
4) No <**busy**> "When is a good time to callback?"	**[record callback time]**
5) Maybe <**may I ask who is calling?**>	**[skip to GATE]**

NEW. And … can I have their …

First Name __________
Last Name __________
Title/Position _________
Phone Number ________

ASK to be transferred …

- **if transferred → go to A2**
- **if not transferred → Thank & Add to Callback List**

GATE. Hello, my name is ____________ and I'm calling from **Innovative Research** on behalf of **Alectra Utilities,** your local electricity distributor.

INTERVIEWER NOTE: If gatekeeper asks the purpose of call → I'd like to ask the person in-charge of managing the electricity bill at your organization a few questions concerning **Alectra Utilities** customer consultation.

1) Yes <**transferred to contact**>		**[skip to A2]**
2) No <**not available**>	"*When is a good time to callback*?"	**[record call-back time and go to "NEW"]**
3) No <**not interested in talking**>		**[Thank & Terminate]**

A1 QUAL PREAMBLE:

Read preamable again, if transferred to new person:

Hello, my name is ______________ and I'm calling from **Innovative Research** on behalf of **Alectra Utilities**, your local electricity distributor.

Innovative Research is a national public opinion research firm**.** We have been hired by **Alectra Utilities** to help them better understand the needs and preferences of non-residential customers who are responsible for paying their organization's electricity bill.

A1. Can I have roughly **5 minutes** of your time to ask you some questions? All your responses will be kept strictly confidential.

Yes – I don't mind	1	[CONTINUE]
No – Not primary bill payer (i.e. not best person to speak to)	2	[go to TRANSFER]
No – BAD TIME	3	[ARRANGE CALLBACK]
No – HARD REFUSAL	4	[THANK & TERMINATE]

MONIT [INTERNAL]
This call may be monitored or audio taped for quality control and evaluation purposes.
PRESS TO CONTINUE 1

A2. Can you confirm that your organization receives an electricity or hydro bill from **Alectra Utilities**?

YES	1	[CONTINUE]
NO	2	[THANK & TERMINATE]
DK (volunteered)	98	[THANK & TERMINATE]

Only those in charge of managing/overseeing organizations electricity bill will be interviewed.

A3. As part of your job, are you in charge of managing or overseeing your organization's electricity or hydro bill?

YES	1		[CONTINUE]
NO	2	"Can I speak to the person who manages your organization's electricity bill?"	[Return to **NEW**]
DK	3	"Can I speak to the person who manages your organization's electricity bill?"	[Return to **NEW**]

TRANSFER

Can I please speak to the person who is in-charge of managing the electricity bill at your organization?

Yes	1	[BACK TO *INTRO*]
No – NOT AVAILABLE/BAD TIME – (ARRANGE CALLBACK)	2	[ARRANGE CALLBACK]
No – HARD REFUSAL	3	[THANK & TERMINATE]

98 Don't know (**DNR**) **[Terminate]**

B. INTRODUCTION AND CORE MEASURES

B4. To start, I'd like to ask you a few questions about the electricity system …

As you may know, Ontario's electricity system has three key components**: generation, transmission** and **distribution.**

- **Generating stations** convert various forms of energy into electric power
- **Transmission lines** connect the power produced at generating stations to where it is needed across the province

Alectra Utilities is responsible for the last step of the journey: distributing electricity to customers through its distribution network. This is the system that takes the electricity from provincial transmission lines and brings it to your home through a network of wires, poles and other equipment.

B5. Before this survey, how familiar were you with the various parts of the electricity system and how they work together? Would you say… **[READ LIST]**

01	Very familiar and could explain the details of Ontario's electricity system to others
02	Somewhat familiar, but could not explain all the details of Ontario's electricity system to others
03	Have heard of some of the terms and organizations mentioned in this workbook, but knew very little about Ontario's electricity system
04	I knew nothing about Ontario's electricity system
98	Don't know [**DO NOT READ**]
99	Refused [**DO NOT READ**]

B6. In general, how satisfied or dissatisfied are you with the services your organization receives from **Alectra Utilities**? Would you say you are *very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied*?

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
98	Don't know (**DO NOT READ**)
99	Refused (**DO NOT READ**)

B7. I'd now like to talk with you about your organization's electricity bill …

Every item and charge on your bill is mandated by the provincial government or regulated by the Ontario Energy Board, the provincial energy regulator.

While Alectra Utilities is responsible for collecting payment for the entire electricity bill, it retains only the distribution portion of the delivery charge.

Distribution makes up about [**PIPE-PER**] of the typical small business customer's bill.

This is about [**PIPE-DEL**] on an average [**PIPE-TOTL**] monthly small business electricity bill.

Before this survey, how familiar were you with the percentage of your organization's electricity bill that goes to Alectra Utilities? Would you say you were *very familiar*, *somewhat familiar* or *not familiar at all*?

01	Very familiar
02	Somewhat familiar
03	Not familiar at all
98	Don't know
99	Refused (DO NOT READ)

B8. *Now, let's talk about the reliability of electricity service you receive.* Have you experienced any power outages at **your organization** **in the past 12 months** which *lasted longer than one minute*? If so, approximately how many of these power outages did you experience? [**DO NOT READ LIST**]

00	No outages	
01	1 outage	
02	2 outages	
03	3 outages	
04	4 outages	
05	5 outages	
06	6 outages	
07	7 outages	
08	8 or more outages	
98	Don't know [**DO NOT READ**]	
99	Refused [**DO NOT READ**]	

B9. To the best of your knowledge, does your organization receive electrical service via overhead wires, underground cables or would you say you *don't know*?

01	Overhead wires	
02	Underground cables	
98	Don't know	
99	Refused [**DO NOT READ**]	

C. DEMOGRAPHICS

Lastly, I'd like to ask you some general questions about the electricity system in Ontario.

For each statement please tell me if you would strongly agree, somewhat agree, somewhat disagree or strongly disagree. If you don't know enough to say or don't have an opinion just let me know.

01	Strongly agree
02	Somewhat agree
03	Somewhat disagree
04	Strongly disagree
98	Don't know/No opinion
99	Refused [**DNR**]

[ROTATE]

C10. The cost of my electricity bill has a major impact on the bottom line of my organization and results in some important spending priorities and investments being put off.

C11. Customers are well served by the electricity system in Ontario.

[END BATTERY]

These last two questions are for for statistical purposes only.

C12. Which of the following best describes the sector in which your business operates? Would you say… [**READ LIST**]

01	Commercial	
02	Manufacturing/Industrial	
03	Data Centre	
04	Hospitality	
05	Restaurant/Tavern	
06	Retail	
07	Warehouse	
08	Real Estate	
88	Other [Please specify:_______________]	

C13. Including yourself, how many people work at your organization?
[Don't read list, select category based on response]

01	1 person
02	2 to 5 people
03	6 to 10 people
04	11 to 25 people
05	26 to 50 people
06	More than 50 people
98	Don't know [**DNR**]

THANK and END SURVEY

Thank you very much for taking the time to complete this survey.

Brampton GS>50 Results

Below are the final results of the Brampton GS>50 rate class. The Brampton workbook was extended to May 22nd to allow more GS>50 customers the opportunity to participate. Due to the small sample size, results are presented as frequencies.

Q. Before this consultation, how familiar were you with the various parts of the electricity system and how they work together?

Very familiar....2
Somewhat familiar....8
Heard of some of the terms and organizations....2
Knew nothing about the electricity system....1

Q. Before this consultation, how familiar were you with the percentage of your electricity bill that goes to Alectra Utilities?

Very familiar....3
Somewhat familiar....4
Not familiar at all....6

Q. Generally, how satisfied or dissatisfied are you with the services you receive from Alectra Utilities?

Very satisfied....2
Somewhat satisfied....7
Neither satisfied nor dissatisfied....4
Somewhat dissatisfied....0
Very dissatisfied....0
Don't know....0

Q. Do you feel that the purpose of Alectra Utilities' customer consultation is clear?

Very clear....3
Somewhat clear....8
Not clear at all....2

Q. In the past 12 months, how many power outages do you recall experiencing at your organization?

No outages....2
1 outage....3
2 or 3 outages....5
4 or more outages....2
Don't know....1

Q. Before this consultation, were you familiar that one-in-five dollars (20%) of your current rates are already committed to mandatory investments and not available for other projects?

Very familiar 0
Somewhat familiar 7
Not familiar at all 6
Don't know 0

Q. Which option do you prefer?

Alectra Utilities should allocate enough money (approximately 19 million or 6%) in its core budget to reactive capital to cover the cost of unplanned but urgent repairs 10
Alectra Utilities should not allocate any more in its core budget to reactive capital and simply delay planned projects to cover the cost of unplanned but urgent repairs 3

Q. Keeping the Business Running: Which option do you prefer?

Recommended Approach 4
Base Approach 9

Q. Keeping Pace with Overhead System Renewal: Which of the following options would you prefer?

Accelerated Pace 3
Recommended Pace 9
Slower Pace 1

Q. Alectra Utilities Transformer Replacement Program: Which of the following options would you prefer?

Accelerated Pace 2
Recommended Pace 9
Slower Pace 2

Q. Monitoring and Control Equipment: Which of the following options would you prefer?

Accelerated Pace 3
Recommended Pace 9
Slower Pace 1

Q. Planning for Expansion, Intensification and Back-up: Which of the following options would you prefer?

Accelerated Pace........1
Recommended Pace........3
Slower Pace........2
Base Pace........7

Q. Voltage Conversion: Which of the following options would you prefer?

Accelerated Pace........2
Recommended Pace........3
Slower Pace........1
Base Pace........7

Q. Additional Station Investments: Which of the following options would you prefer?

Accelerated Pace........1
Recommended Pace........7
Slower Pace........0
Base Pace........5

Appendix D

Asset Condition Assessment – 2018

Alectra Utilities

Distribution System Plan (2020-2024)

2018

alectra
Discover the possibilities

Asset Condition Assessment - 2018

ASSET MANAGEMENT

2018 ACA REPORT
SEPTEMBER 2018

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Executive Summary

This Asset Condition Assessment (ACA) report presents the findings of the consolidated and harmonized condition based assessments performed on the assets owned and operated by Alectra Utilities Corporation (Alectra).

Alectra manages an asset base of over $ 4.5 Billion, extending from the city of St. Catharines, located on the shores of Lake Ontario, to the town of Penetanguishene, located along the southeastern shores of Georgian Bay. The service territory spans over 1,800 sq. km, providing electricity to approximately one million customers. Alectra's power delivery is currently facilitated via 14 Transformer stations and 155 Municipal substations operating a total of 269 power class transformers. Additionally, there are about 125,000 distribution class transformers. Alectra's distribution system also incorporates about 3,400 distribution class pad mounted switchgear connected to over 22,000 kilometers of underground medium-voltage power cable. The overhead system is comprised of over 130,000 pole structures supporting about 16,400 kilometers of overhead conductor and nearly 4,000 pole mounted load-interrupting switches.

This ACA report is the result of efforts to harmonize the condition assessment methods and models used by the legacy utilities and presents the findings of the first harmonized condition assessment performed on major distribution system assets owned and operated by Alectra.

The inputs to this asset condition assessment were based on 2018 GIS data, information from third party asset testing programs and from field inspections. Inputs to this ACA required an evaluation of the inspection and testing programs in use by the legacy utilities as well as the examination of the criteria used for scoring the findings captured.

The Health Index (HI) model used is an analytical model based on weighted inputs that quantify the condition of an asset in a consistent manner. The number and type of inputs are dependent on the asset class and existing data. Input weights are based on the asset class, the extent to which the input reflects asset degradation, industry guidelines and Alectra's experience. The HI inputs, models, and results are stored in a Relational Database that allows agile development and provides a platform for future enhancements and additional inspection criteria data.

HI was calculated for the following distribution asset classes. Results are presented in Figure 1.

- Pole mounted transformers
- Pad mounted transformers

- Vault type transformers
- Pad mounted switchgear
- Pole mounted load interrupting switches
- Overhead primary conductors
- Wood poles
- Concrete poles
- Underground medium-voltage power cables

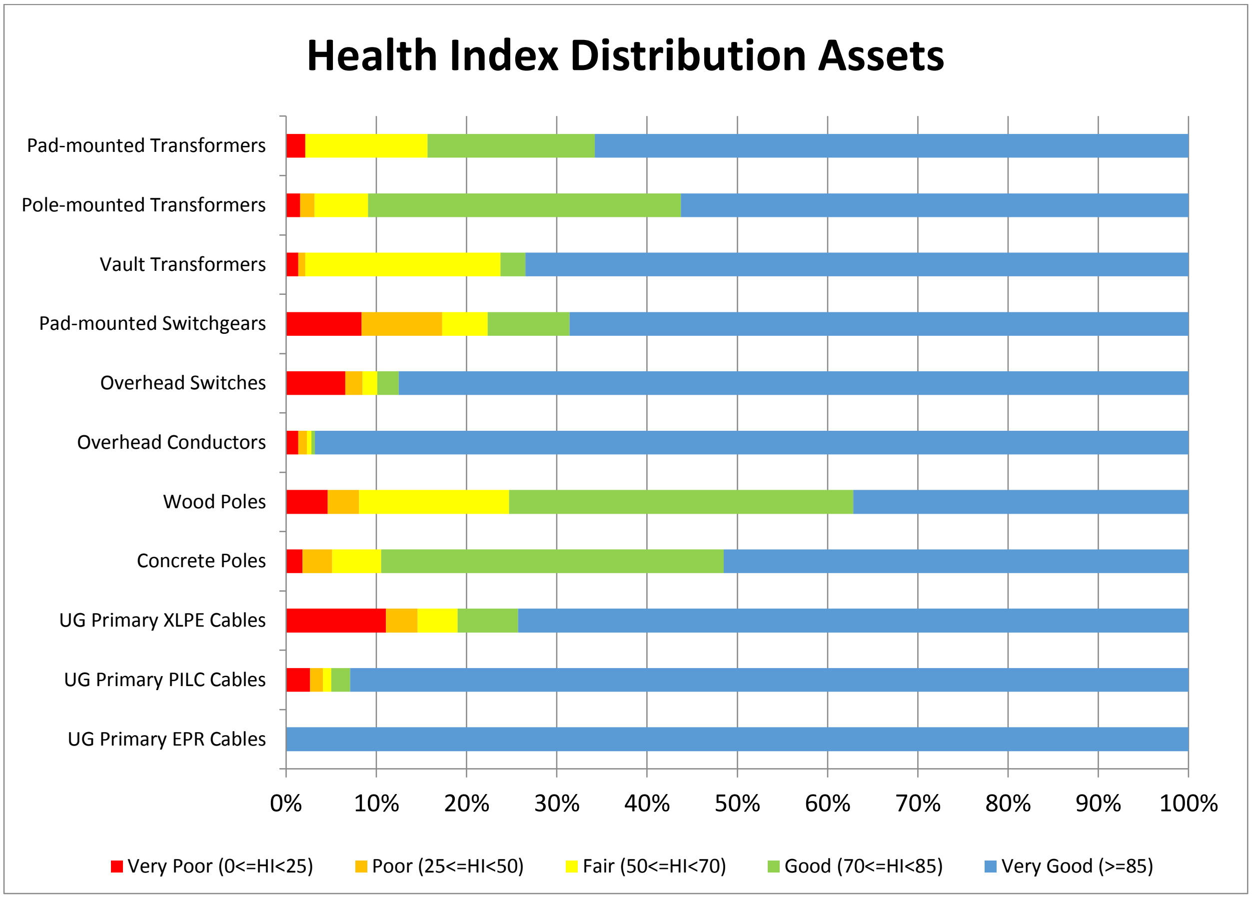

Figure 1 Distribution Asset Health Index Results Summary

Distribution assets HI results and sustainment pacing considerations were provided to subject matter experts (SME) to determine system sustainment needs and for business case development based on a recommended number of assets that require attention. SMEs prepared business cases based on assets that warrant action and submitted the business case into Alectra's Capital Investment Portfolio application (CopperLeaf C55) for optimization.

The HI was calculated for the following station asset classes. Results are presented in Figure 2.

- Power transformers
- Circuit breakers
- Station class switchgear

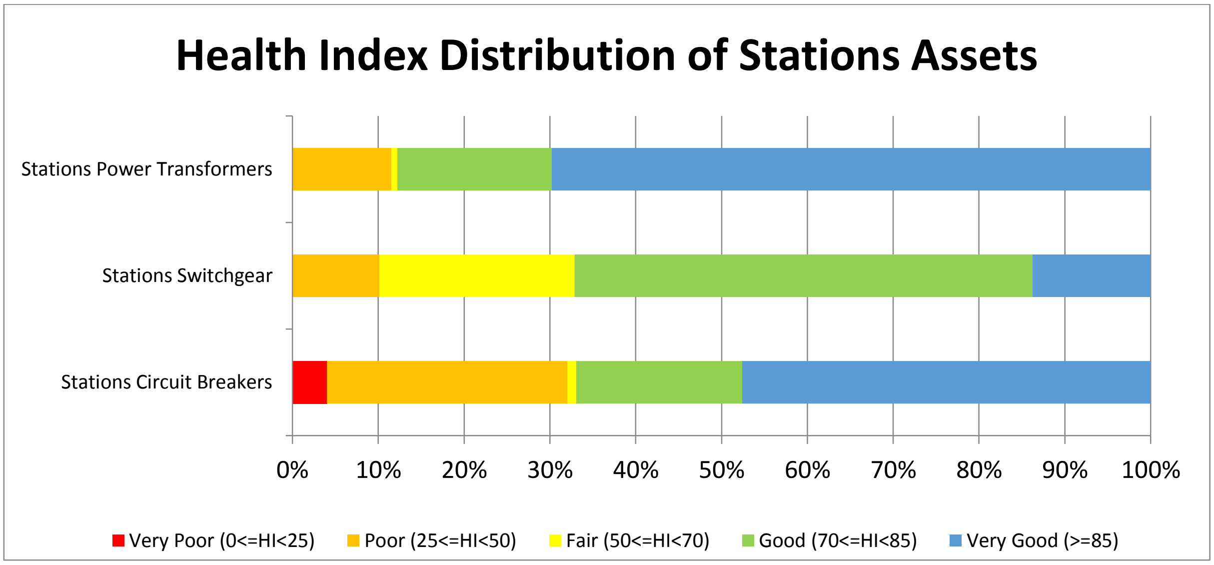

Figure 2 Station Asset Health Index Results Summary

Station assets HI results were compiled on a per station basis and published to SMEs for evaluation. Grouping assets by station facilitated a station centric approach, which enabled a thorough review process with SMEs in multiple departments. SMEs leveraged the HI results along with station decommissioning schedules associated with voltage conversion projects, expansion requirements, magnitude and criticality of the load that is supplied, type of customers supplied, potential stranded load conditions, distribution system load transfer capabilities, obsolescence, availability of parts, maintainability, safety and environmental concerns and available budget.

Alectra prepared business cases for station needs and opportunities identified through this exercise and submitted into Alectra's Capital Investment Portfolio application (CopperLeaf C55) for optimization.

1 Introduction

This Asset Condition Assessment ("ACA") report has been prepared to address system renewal, and sustainment investment needs drivers as part of Alectra's Asset Management practices. The report also addresses specific elements of the Asset Management Process as noted in Chapter 5.3.3 of the Ontario Energy Board's "Filing Requirements for Electricity Distribution Rate Applications - 2018 Edition for 2019 Rate Applications".

The 2018 ACA represents the consolidated and harmonized in-house harmonized ACA for the legacy utilities that formed Alectra Utilities Corporation ("Alectra") including Guelph Hydro. The harmonization process included the alignment of all computational models' inputs, nomenclature and methodology.

A data snapshot was taken in early 2018 from the different systems (e.g. the different legacy GIS systems) to be used in this ACA. As new evidence is acquired through inspection and testing programs, it will be incorporated into future ACAs. As a result, the HI will change based on the new evidence.

Legacy utilities that formed Alectra had different maintenance, inspection and data management practices. The harmonization process adopted asset specific HI models that can accommodate the data of legacy utilities.

This report describes an analytical approach to asset condition assessment using Health Indices (HI) for Alectra's distribution and station assets. HI results are then used to derive system sustainment and asset management strategies.

ACA is an internal process utilized by Alectra as part of the overall asset management process. Outputs from the ACA are evaluated for sustainment needs. Figure 3 shows the needs drivers in Alectra's asset management process and identifies the alignment of the ACA in the process.

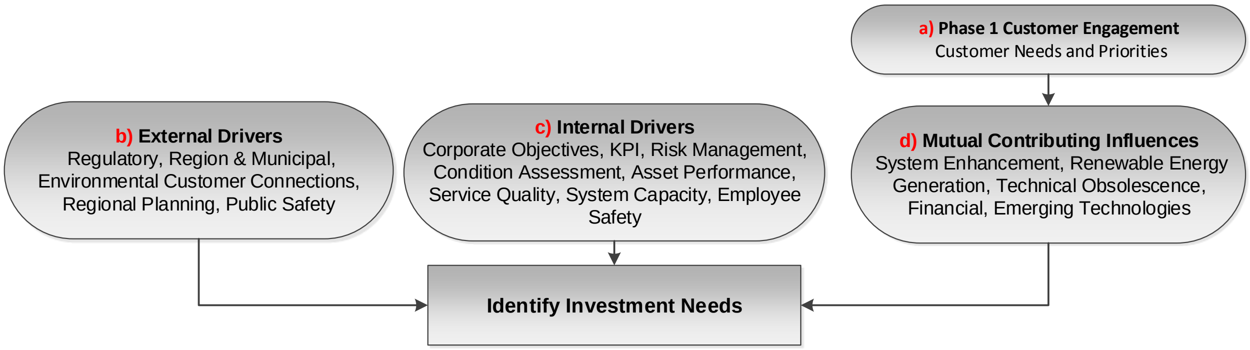

Figure 3 Asset Management Process Investment Drivers and Considerations

Distribution assets ACA results are provided to SMEs for evaluation to determine system sustainment needs and for business case development. SMEs incorporate the outcome of the ACA to build business cases for assets that warrant action. Distribution assets business cases are based on a recommended number of assets that require attention. Business cases are documented in Alectra's Capital Investment Portfolio system (Copperleaf C55). *Figure 4* illustrates the process of identifying investment needs for distribution assets.

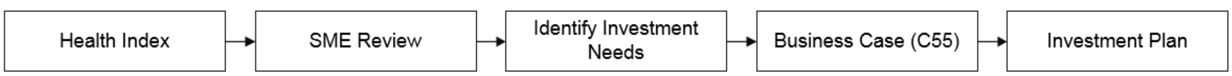

Figure 4 Distribution Assets Condition Process

Station assets HI results for multiple asset classes are grouped by individual station and provided to SMEs for evaluation. Grouping multiple assets classes by the station facilitates a station centric approach, which enables a thorough review process with SMEs in multiple departments. SMEs determine the system sustainment needs where HI is one of several considerations taken into account in determining the needs.

In addition to the HI data, decisions on sustainment for station assets include considerations related to: station decommissioning schedules associated with voltage conversion projects, expansion requirements, magnitude and criticality of the load that is supplied, number of customers that are supplied, potential stranded load conditions, distribution system load transfer capabilities, obsolescence, availability of parts, maintainability, safety and environmental concerns and available budget. Where station needs warrant sustainment activities, business cases are documented in COPPERLEAF C55, integrating all applicable cross-functional drivers as part of Alectra’s integrated planning. Figure 5 shows the process identifying investment needs for station assets.

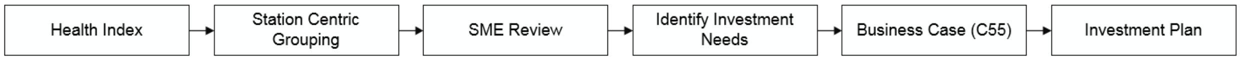

Figure 5 Station Assets Condition Assessment Drivers

Capital investment portfolio optimization is completed in CopperLeaf C55, where investments are optimized across all investment categories of Alectra. The optimization provides the prioritized allocation and pacing of investments. The optimization considers the risk and benefit in conjunction with financial attributes (e.g. weighted average cost of capital, factoring in inflation).

2 Health Index Methodology

The HI model is an analytical model based on weighted inputs that quantify condition of an asset in a consistent manner. The number and type of inputs are dependent on the asset class and existing available data. Input weights are based on the asset class, industry guidelines and Alectra's experience. The Health Index inputs, models and results are stored in a Relational Database which enables agile development and a platform for future enhancements as well as additional criteria data.

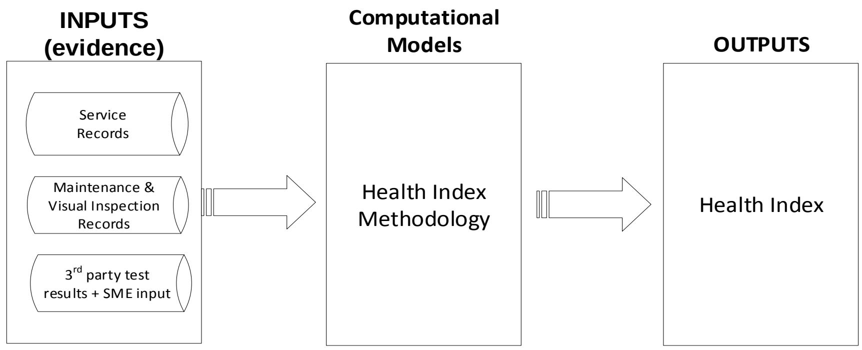

Figure 6 Health Index Methodology: Inputs, Computation, & Outputs

The advantage of using an evidence-based HI is having a practical and consistent method to gauge the condition of assets analytically in a quantified manner. Having a standardized model for assets across Alectra ensures that all assets are being measured in a consistent manner to guide asset management strategies and policies. The generic equation below shows the calculation of the Health Index:

$$\boldsymbol{Health\ Index} = \frac{\sum_{i=1}^{n}(Input\ Weight_i \times Input\ Score_i)}{\sum_{i=1}^{n}(Input\ Weight_i)} * Condition\ Multiplier \qquad (\mathbf{1}),\ \ where$$

$$\boldsymbol{n}: number\ of\ available\ inputs\ for\ an\ asset\ class,$$

$$\boldsymbol{Input\ Score}: percentage\ (0-100\%)\ ,$$

$$\boldsymbol{Health\ Index}: percentage\ (0-100\%),$$

$$\boldsymbol{Input\ Weight}: percentage, where \sum_{i=1}^{n} Input\ Weight_i = 100\%$$

$$\boldsymbol{Condition\ Multiplier}: maximum\ allowable\ HI\ given\ asset\ specific\ metrics$$

$$described\ further\ in\ this\ report$$

2.1 Input Score

Inputs to the HI are scored in one of two ways: a step score and percentage score. Each input that makes up the Health Index is scored accordingly.

2.1.1 Step score

Step score is a points based scoring method used for inputs of the HI that are non-continuous; for example, field inspections. Step scoring is reserved for inputs with distinct levels measured against defined criteria.

Station assets and distribution assets are inspected and monitored through different processes and criteria. Field inspections and HI components that utilize step scoring for distribution assets utilize a six-point scoring system (0-5). Table 1 shows the distribution assets step scoring criteria and associated scores.

Table 1 Distribution Assets Step Scoring

Inspection Score	Criteria	HI Input Score
5	Excellent condition	100%
4	Relatively good condition	80%
3	Fair condition	60%
2	Moderate degradation	40%
1	Major degradation/not fit for service	20%
0	Imminent failure	0%

Field inspections and HI components that utilize step scoring for station assets utilize a five-point scoring system (0-4). Table 2 shows the station assets step scoring criteria and associated scores.

Table 2 Station Assets step Scoring

Inspection Score	Criteria	HI Input Score
4	Excellent - Like new	100%
3	Good - Within operating context	75%
2	Fair - Not failed but watching	50%
1	Poor - Not within operating context	25%
0	Very Poor - Imminent failure	0%

2.1.2 Percentage score

Percentage scoring is the continuous (i.e. graduated) scoring of an input. Percentage scoring is used when more granular data are available and where step scoring is not accurately representative of an input's impact. This representation is used for certain measurements (e.g. pole residual remaining strength) as well as for other data, such as age.

For example, age is represented as a percentage score based on a continuous function given by the Gompertz-Makeham Model described by the following set of equations:

$$Age\ score = e^{\frac{-(f(t)-e^{-\alpha\beta})}{\beta}} \qquad (\mathbf{2}) \quad ,where$$

$$f(t) = e^{\beta(t-\alpha)}, where$$

$$t: age\ (years)$$

$$\alpha, \beta\text{: constants}$$

The constants α, β are calculated so as to yield an age score of 80% at the Typical Useful Life (TUL) and 1% at the End of Useful Life (EUL) of an asset. Use of the Gompertz-Makeham Model is a widely accepted industry practice for assessing asset condition.

Asset TUL is based on the "Asset Depreciation Study for the Ontario Energy Board Kinectrics Inc. Report No: K-418033-RA-001-R000 July 8, 2010" report. Similarly, asset EUL is based on the Max UL from the same report.

2.2 Condition Multiplier

In order to adequately represent the health of an asset using the HI, conditions that determine major degradation or imminent failure of an asset are accounted for by limiting the HI to a maximum value, using the condition multiplier. Once certain conditions are triggered, the HI of an asset is limited to a maximum score, regardless of the status of other inputs.

Condition multipliers are based on dominant inputs to the HI that significantly impact the asset's health. For example, pole residual strength is a dominant input and indicator of a wood pole's health.

Examples of Condition multipliers are as follows:

- **Field inspection multiplier** is applied to assets that exhibit major degradation or imminent failure as determined by field inspection.
- **Measurement multiplier** is applied to assets that exhibit major degradation or imminent failure as determined by a measurement.
- **Safety hazard multiplier** is applied to assets that pose a safety hazard or in a condition that is below the acceptable industry safety standards, guidelines and practices.
- **Obsolescence multiplier** is applied to assets that are no longer supported by vendors, have limited or no parts availability and/or no longer meet current safety or performance standards. Obsolescence is largely driven by specification changes, compatibility, and/or manufacturer/supplier.

Where two or more condition multipliers are applicable, the smallest multiplier (by value) is applied.

2.3 Health Index Categorization

The HI of assets is expressed as a percentage. Categorization based on percentage ranges enables the identification of groups within an asset class that exhibit similar characteristics from an overall condition perspective. The HI is classified into one of the following five categories, as shown in Table 3.

Table 3 Health Index Categories

Category	Criteria	Range
Very Good	Asset is in excellent condition.	$HI \geq 85\%$
Good	Asset is still relatively in excellent condition.	$70\% \leq HI < 85\%$
Fair	Asset is functional but showing signs of deterioration.	$50\% \leq HI < 70\%$
Poor	Asset is exhibiting degraded condition.	$25\% \leq HI < 50\%$
Very Poor	Asset is showing major degradation / imminent failure.	$HI < 25\%$

Figure 7 shows the five HI categories that an asset in Alectra Utilities' system can be classified into, ranging from very good all the way down to very poor.

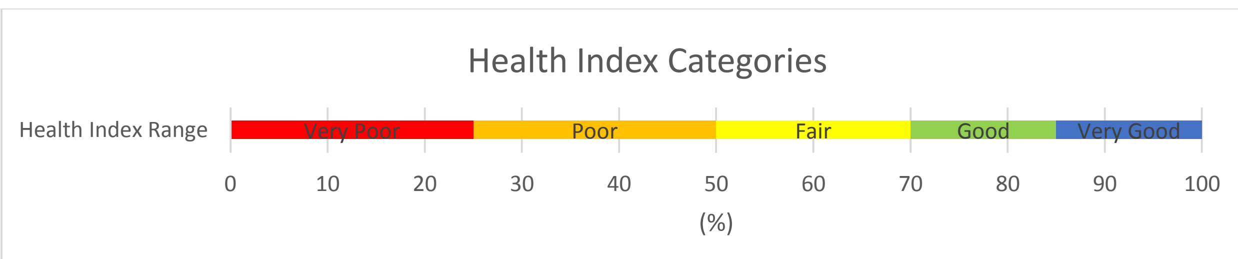

Figure 7 Health Index Categories

2.4 Data Availability

In order to assess the data completeness required by the computational model, a Data Availability Index ("DAI") is calculated for each asset evaluated in this report.

The main function of DAI is to represent the amount of information, in percentage by input data weight, which went into calculating the HI of an asset. DAI only represents the completeness and not quality of data.

$$DAI = \sum_{i=1}^{m} (Input\ Weight_i \times Input\ Data\ Available_i) \qquad (\mathbf{3})$$

$$,where$$

$$\boldsymbol{m}: number\ of\ inputs\ required\ in\ the\ Health\ Index\ model\ of\ an\ asset\ class$$

$$\boldsymbol{Input\ Weight}: percentage, where \sum_{i=1}^{n} Input\ Weight_i = 100\%$$

$$\boldsymbol{Input\ Data\ Available}: True = 1\ or\ False = 0$$

$$\boldsymbol{DAI}: percentage\ (0 - 100\%)$$

For each asset class, the average DAI is presented as part of the Health Index results section. DAI is used by SMEs when evaluating the completeness of, and confidence in the HI results (relative to the HI model inputs) and applicable sustainment strategies.

As Alectra harmonizes its inspection, maintenance, testing and data collection practices, it is expected that the DAI will increase in the future.

3 System Sustainment Strategies

The ACA identified assets within each asset class that require action. System sustainment strategies are dependent on the type of asset, consequences of failure and asset management practices. These strategies are:

- **Further assessment** (detailed risk assessment, inspection, testing)
- **Planned replacements** (like-for-like or right sizing)
- **Maintenance or rehabilitation**
- **Continue to monitor**
- **Run to failure**

Further assessment is required to ensure the prudent selection of a strategy. This is applicable to assets that can be maintained to extend their service life. For example, poles can be rehabilitated in some cases so as to restore them to acceptable operational and safety parameters. Such further assessments determine the viability of maintenance (versus replacement) on a case-by-case basis.

Planned replacement approach applies to critical assets that carry significant risk to the safe and reliable operation of the distribution system and protection of the environment. This strategy is also applicable to assets that have undergone further investigation and were determined unmaintainable. Safety considerations include safety of both the public and distribution system workers (Alectra's staff and contractors). For example, failure of wood poles carries significant safety risk to the public; therefore, a planned replacement strategy is prudent. In the case of concrete poles, if maintenance is not an option, a planned replacement strategy is applicable.

Maintenance or rehabilitation strategy applies to assets where only certain components of the asset are exhibiting degradation which can be corrected by cleaning or washing, repairing, replacing or re-tightening of components, or utilizing technologies such as cable rejuvenation or concrete bracing. For example, dirty insulators in air-insulated switchgear may be remedied by dry-ice cleaning.

Continue to monitor applies to assets where condition is approaching what is typically considered to be at its end of life. Good examples are increasing asset inspection cycles and the installation of on-line monitoring on power transformers. On-line monitoring, in conjunction with analytical tools, can provide an indication of the condition of the transformer's insulation, which is a primary indication of the transformer's health. Adoption of on-line monitoring and associated analytical tools in conjunction with the development of a modified condition based maintenance protocol is a strategy for prolonging the operational life of a transformer.

Run to failure applies to assets having minimal impact on reliability and no impact on public or employee safety, or the environment. Such assets are run to failure and are replaced reactively when they no longer perform their intended function. The decision to run to failure considers redundancy, contingencies and availability of spare units or components.

From a system sustainment perspective, Alectra has aligned its sustainment outlook horizons to match the Ontario Energy Board's Distribution System Plan cycles, where one cycle is five years.

- **Short-term** outlook is based on one DSP cycle (**5 years**)
- **Long-term** outlook is based on two DSP cycles (**10 years**)
- **Medium-term** outlook is between short-term and long-term outlooks (**7.5 years**).

Distribution assets SMEs use quantities of Very Poor and Poor assets as the needs driver for business cases. In order to assist SMEs and to ensure smooth transitions between DSP cycles in which sudden increases in rates and resource capacities are avoided, a pacing guide is presented in Table 4 using three scenarios based on the planning outlooks.

Table 4 Distribution Assets Sustainment Pacing Scenarios

Pace	Description	Quantity per year
Baseline pace	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years}$
Moderate pace	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years}$
Slow pace	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years}$

Station asset investments follow a risk-based approach incorporating a station centric approach to identify specific asset sustainment initiatives. SMEs consider multiple factors along with the HI results for individual components. The sustainment strategies for station assets are guided by risk mitigation and not pacing/timing.

4 ACA Data & Implementation

The implementation of this ACA utilized a Microsoft Structured Query Language (SQL) database. This implementation enabled the following:

- **Integrating multiple data sources**, which enables the integration of multiple static data sources, while maintaining data integrity and consistency in the transfer process
- **Centralized storage**, which provides a common repository for the required ACA data and calculations
- **Multiple user access,** which allows for simultaneous access by multiple users, thus providing significant contribution to productivity.
- **Version control**, which enables future assessments while maintaining a high level of productivity, data accuracy and benchmarking functionality
- **Development agility**, which enables fast and accurate future improvements/development to the ACA data, models and computations

In previous ACA's, Microsoft Excel was utilized. Excel presented challenges in the following areas.

- **Complex workbooks** with embedded formulas and potential for dependencies within sheets and other workbooks. This made it very difficult to audit the spreadsheets for accuracy of implementation.
- **Performance** becomes an issue when opening a large workbook with multiple spreadsheets and trying to conduct analysis. Productivity and effectiveness are impacted by delays in loading/performing computation in large Excel workbooks, some of which exceeded 50 MB.
- **Single user capability** did not allow for the ability to provide multiple user access to the data.
- **Versioning of spreadsheets** to maintain a "master" copy is also difficult if multiple users are reviewing and tweaking the models contained within the spreadsheets.

Utilizing this new process methodology for data collection, storage, harmonization and computation of HI through SQL database provided better data management, version control, development agility and productivity improvements.

5 Distribution Asset Class Details and Results

Alectra's distribution assets are described in details in terms of asset degradation, demographics, HI results categorization, and sustainment pacing. The assets covered as part of distribution are:

- Distribution transformers
- Distribution switchgear
- Overhead switches
- Overhead conductors
- Wood poles
- Concrete poles
- Underground primary cables

5.1 Distribution Transformers

Distributions transformers are a vital component to servicing the end users with utilization voltages from the distribution system. Distribution transformers include three types: Overhead, Underground, and Vault. Distribution transformers are moderately complex assets with a varying price per unit.

5.1.1 Summary of Asset Class

Underground transformers, also referred to as pad-mounted transformers, connect customers to the distribution system where service laterals are underground. Pad-mounted transformers typically employ sealed tank construction and are liquid filled, with mineral insulating oil being the predominant insulating medium.

Overhead transformers, also known as pole top transformers, change primary distribution voltages from overhead conductors to secondary voltages (utilization voltages) for use in residential and commercial applications. Typically overhead transformers connect customers to the distribution system where service laterals are overhead. This type of transformer is mounted on wood or concrete poles. Overhead transformers include single-phase transformers, banked single-phase transformers and three-phase transformers (known as polyphase).

Vault transformers are similar to overhead transformers in construction but are designed to be placed in chambers (below or above grade or rooms inside buildings). Vault transformers connect customers to the distribution system where service laterals are underground.

5.1.2 Asset Degradation

Distribution class transformer life is affected by a number of factors including, but not limited to: voltage impulses from lightning and switching, current surges resulting from secondary cable faults, mechanical damage from vehicle contact and corrosive salts, loading and ambient temperature. In view of the above, a combination of field inspection attributes and age criteria are commonly used to determine the health of the asset.

Field inspections provide considerable information on transformer asset condition. Presence and magnitude of oil leaks and structural corrosion are quantified during field inspections.

The failure of a distribution transformer has a relatively minor impact on reliability. However, if a transformer is in a condition that poses risk to the safety of the public or the environment, a proactive replacement strategy is executed.

5.1.3 Asset Class Demographics

Alectra's distribution system has 124,955 distribution transformers, comprised of 79,487 pad-mounted transformers, 32,123 pole-mounted transformers and 13,345 vault transformers. Figure 8, Figure 9 and Figure 10 shows the age demographics of distribution transformers by type in Alectra's distribution system.

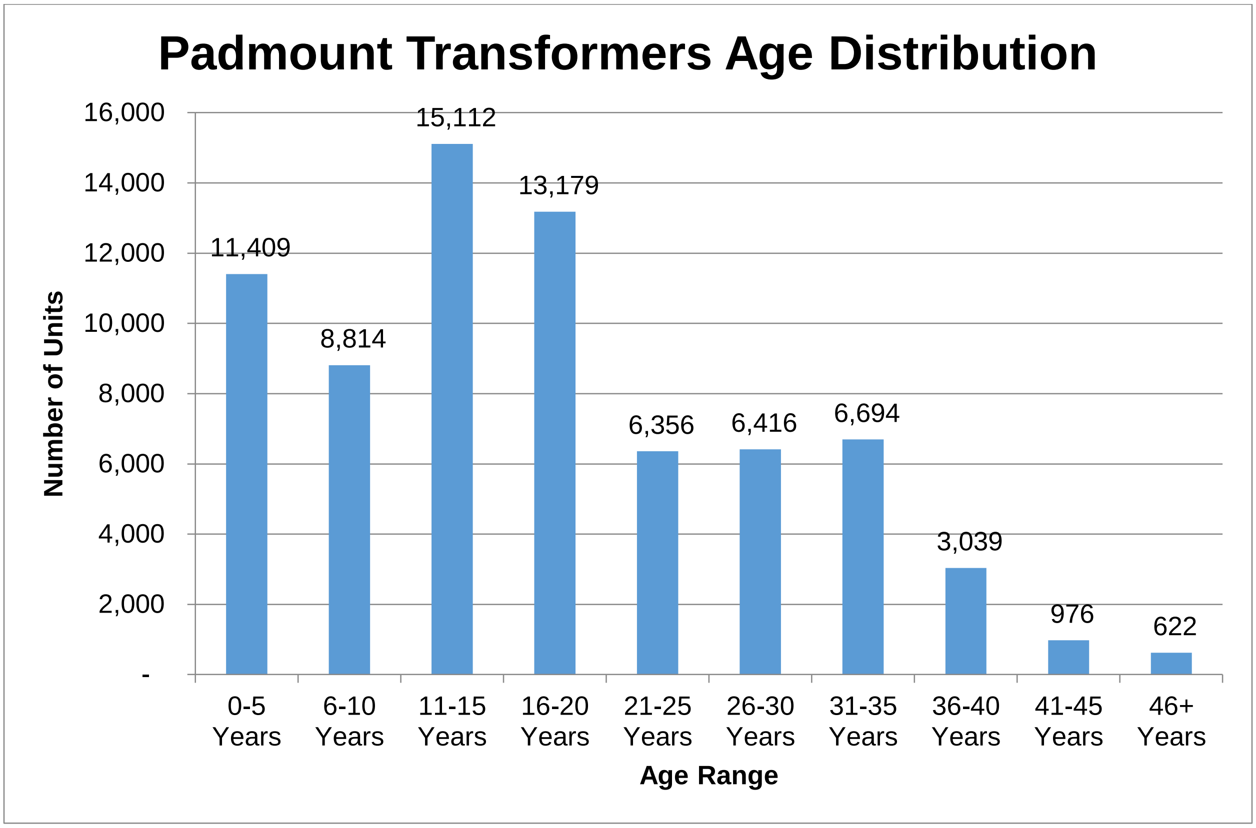

Figure 8 Pad-mounted Transformers Age Distribution

The Pad-mounted transformers have a Typical Useful Life (TUL) of 40 years and are deemed to have reached End of Useful Life (EUL) at 45 years of age.

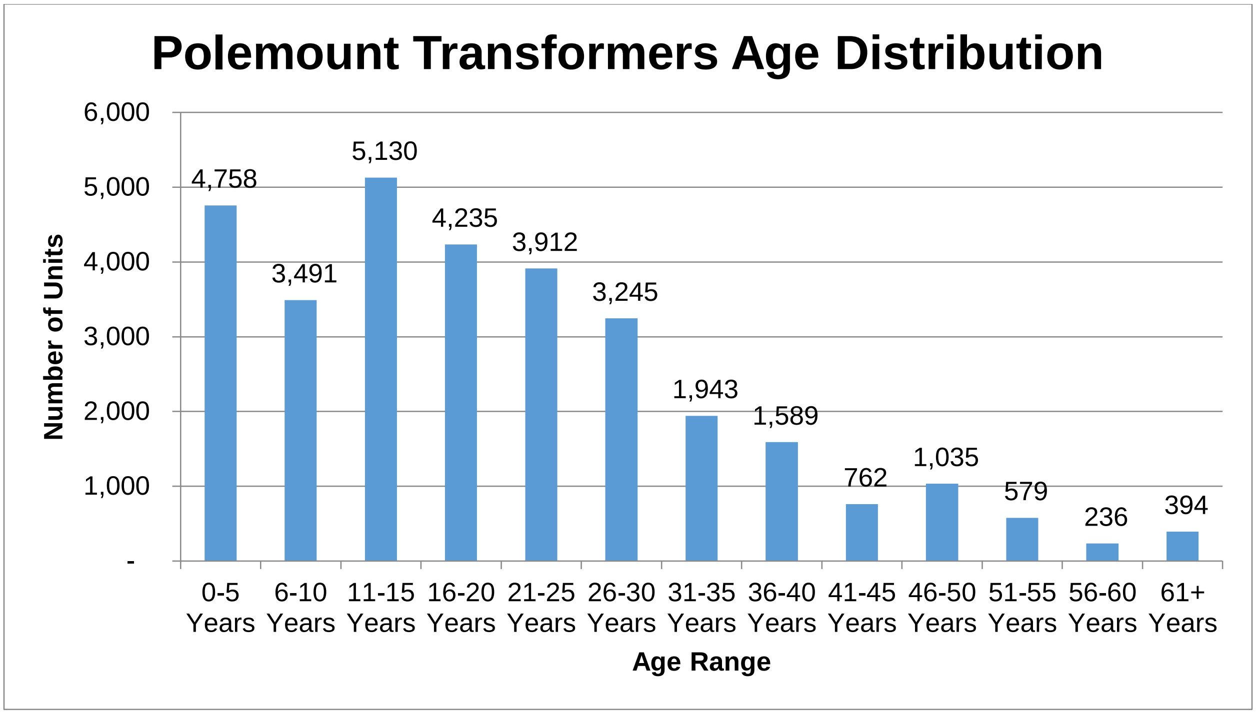

Figure 9 Pole-mounted Transformers Age Distribution

A pole-mounted transformer, also known as overhead transformer, has a Typical Useful Life (TUL) of 40 years and is deemed to have reached End of Useful Life (EUL) at 60 years of age.

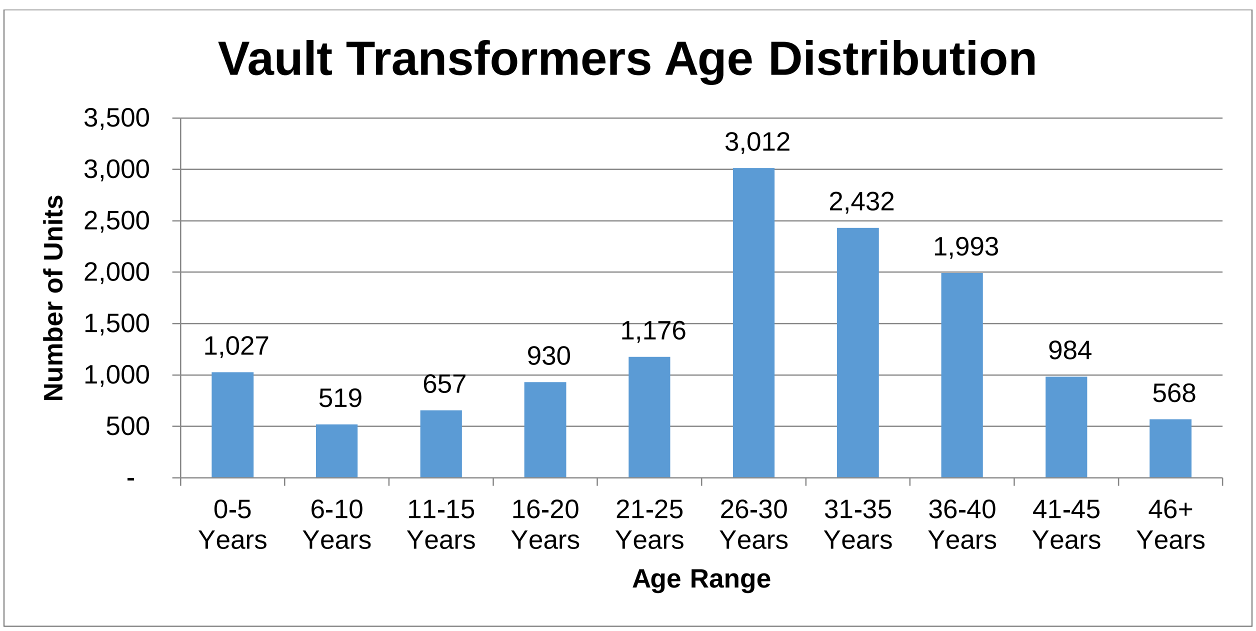

Figure 10 Vault Transformers Age Distribution

Vault transformers have a Typical Useful Life (TUL) of 35 years and are deemed to have reached End of Useful Life (EUL) at 45 years of age.

5.1.4 Health Index Formula and Results

Health index of distribution transformers assesses the condition of the transformer according to three components: Corrosion, Oil leak, and Age. Severity of corrosion and oil leak are determined through inspections and are scored as a step score.

Age represents deterioration due to other factors not captured by the other components of the model. The age scoring method is based on the Gompertz-Makeham function where TUL and EUL correspond to 80% and 1% score, respectively.

The Health Index is computed by adding the weighted inputs of corrosion, oil leak and age, as shown in Table 5.

Table 5 Distribution Transformers Health Index Parameters and Weights

#	Input	Input Weight for Pad-mounted Transformer	Input Weight for Pole-mounted Transformer	Input Weight for Vault Transformer	Scoring Method
1	Corrosion	44%	35%	25%	Step Score
2	Oil Leak	44%	35%	61%	Step Score
3	Age	12%	30%	14%	Percentage Score

Field inspection multiplier

If a distribution transformer exhibits major degradation or imminent failure as determined by field inspection, it is considered to be of very poor health. The physical conditions considered in this criterion are major corrosion or major oil leak.

$$field\ inspection\ multiplier = 25\%$$

Figure 11 shows the distribution of Health Index values of pad-mounted transformers classified from Very Good to Very Poor. The average DAI is 95%.

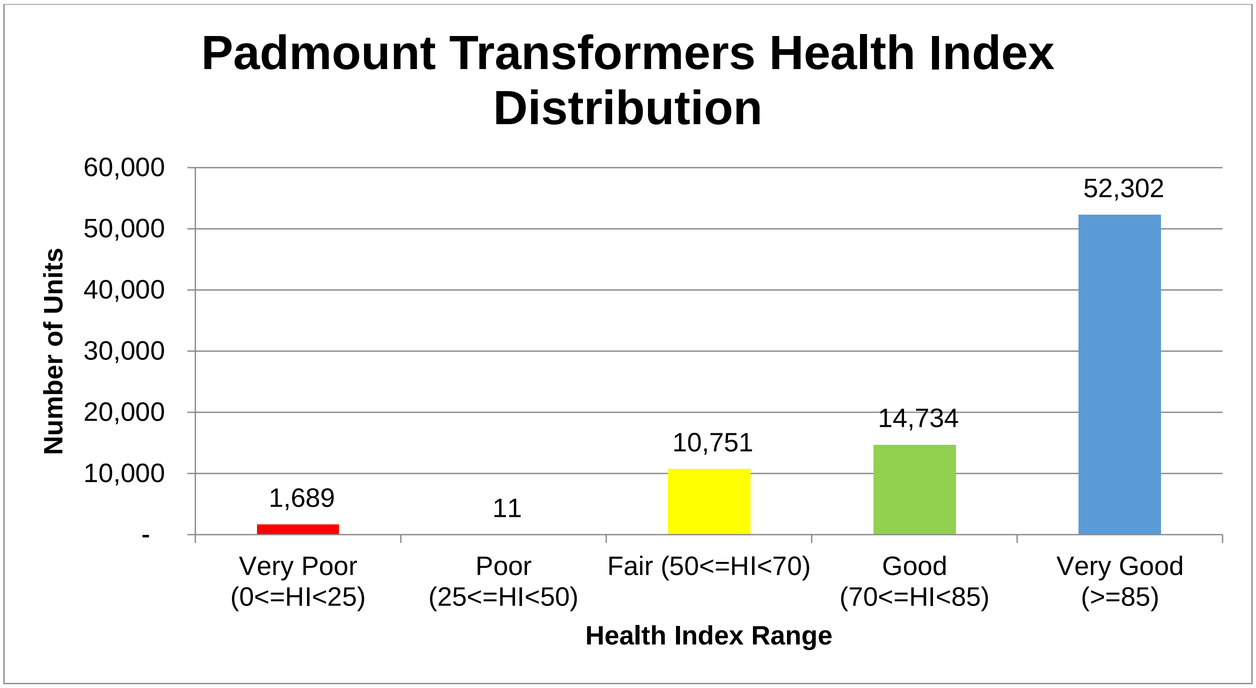

Figure 11 Pad-mounted Transformers Health Index Distribution

Figure 12 shows the distribution of Health Index values for pole-mounted transformers classified from Very Good to Very Poor. The average DAI is 92%.

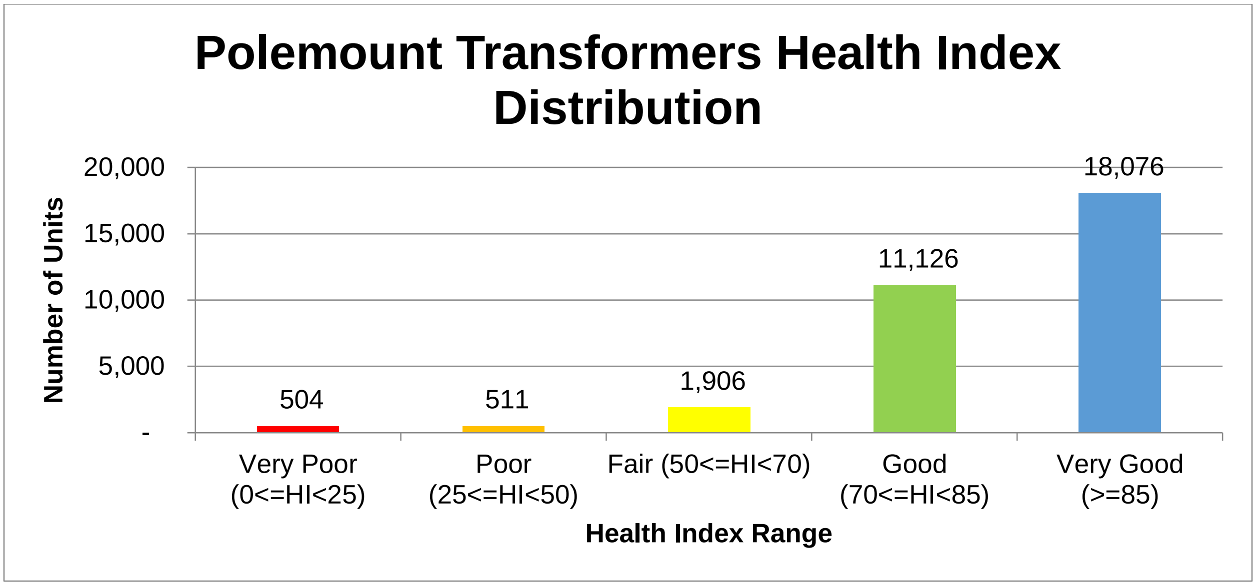

Figure 12 Pole-mounted Transformers Health Index Distribution

Figure 13 shows the distribution of Health Index values of vault transformers classified from Very Good to Very Poor. The average DAI is 80.5%.

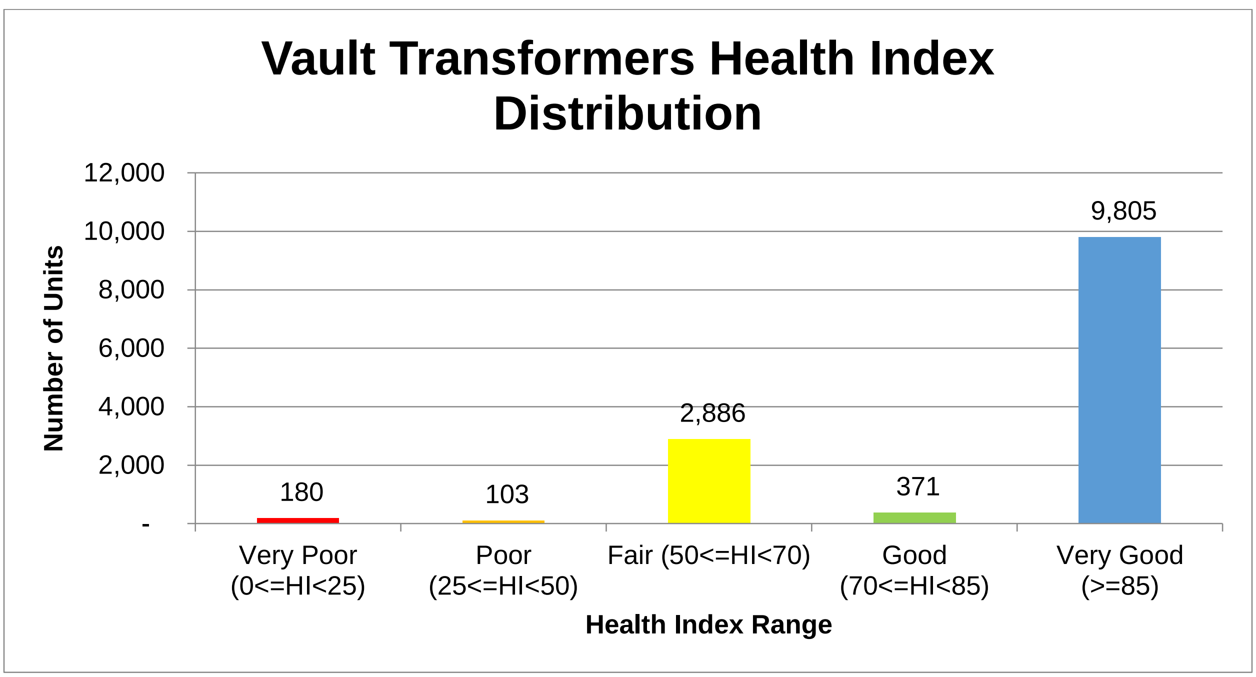

Figure 13 Vault Transformers Health Index Distribution

5.1.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of all distribution transformers presented in: Figure 11, Figure 12 and Figure 13 is 2,998 units.

Table 6 shows the pacing scenarios, namely, Baseline, Moderate or Slow paces that correspond to sustainment quantities over 5 years, 7.5 years and 10 years, respectively.

It is expected that regular inspections and testing might cause the ACA results to change over time and the quantities in each asset HI categorization to change.

Table 6 Distribution Transformer Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 600\ units$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 400\ units$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 300\ units$

5.2 Distribution Switchgear

5.2.1 Summary of Asset Class

Pad-mounted switchgear units are used in the underground distribution system to facilitate the connection of local distribution circuits from main line underground feeder cable systems as well as interconnecting main line feeder circuits. Switchgear provide fused connection points for residential subdivisions and commercial/industrial customers. Switchgear units are used for isolating, sectionalizing, fusing for laterals and to reconfigure cable loops for maintenance, restoration and other operating requirements. A single switchgear can impact as a many as 5,000 customers.

5.2.2 Asset Degradation

Switchgear aging and eventual end of life is often established by mechanical failures, e.g. rusting of the enclosures or ingress of moisture and dirt into the switchgear causing corrosion of operating mechanism and degradation of insulation.

To extend the life of these assets and to minimize in-service failures, a number of strategies are employed on a regular basis: e.g. inspection with thermographic analysis and cleaning with CO2 for air insulated pad-mounted switchgear.

Failures of switchgear are most often not directly related to the age of the equipment, but are associated instead with outside influences. For example, pad-mounted switchgear is most likely to fail due to dirt/contamination, vehicle accidents, rusting of the case, rodents, and broken insulators caused by misalignment during switching. Failures caused by fuse malfunctions can result in a catastrophic switchgear failure.

Automated switchgear has the same construction as pad-mounted switchgear, but with the addition of motorized remote switch controls.

Automated switchgear has the same degradation mechanism as pad-mounted switchgear. In addition, failure of motor and/or its control may contribute to the end of life of the switchgear.

5.2.3 Asset Class Demographics

Alectra's distribution system has 3,389 pad-mounted switchgears, with varying insulation types, namely, air, solid dielectric, SF6 and oil. Pad-mounted switchgear has a Typical Useful Life (TUL) of 30 years and is deemed to have reached End of Useful Life (EUL) at 45 years of age.

Air insulted switchgears operating on the 27.6 kV system have different life characteristics based on Alectra’s and industry experience, the TUL for these units is 20 years and EUL is 35 years.

Figure 14 shows the age demographics of all pad-mounted switchgears in Alectra’s distribution system.

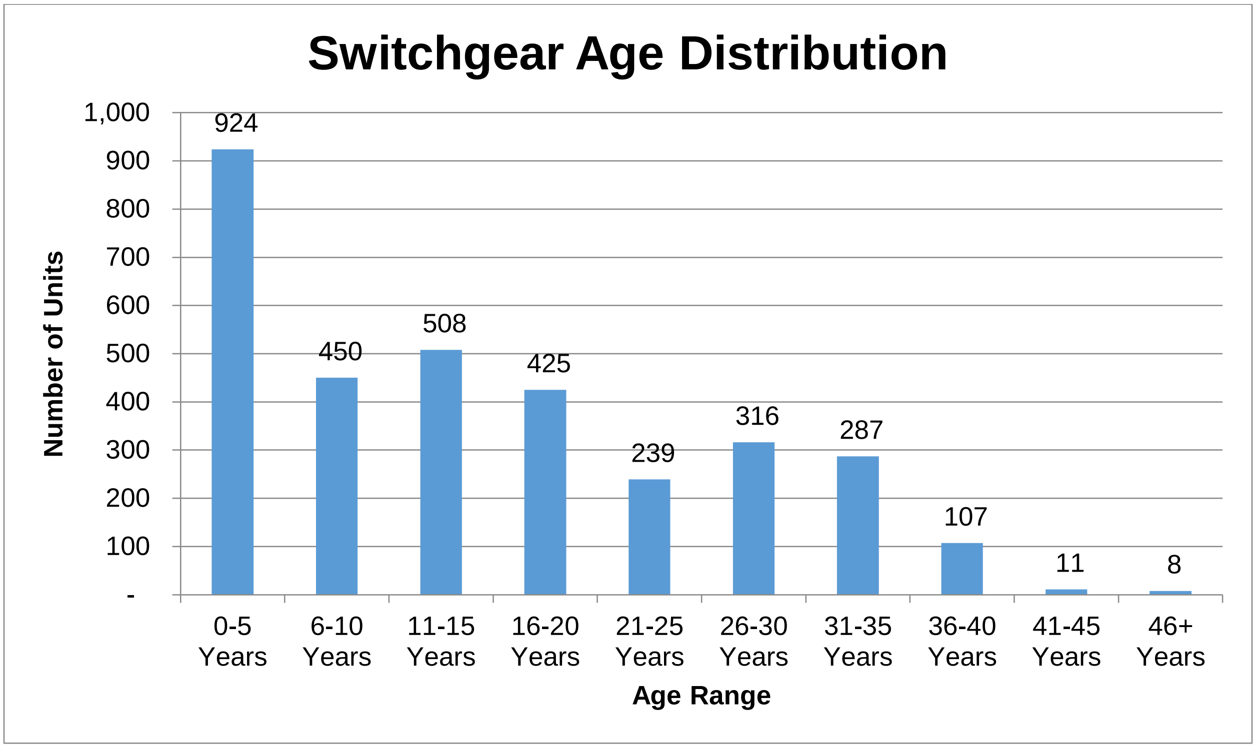

Figure 14 Pad-mounted Switchgears Age Distribution

5.2.4 Health Index Formula and Results

Health index of pad-mounted switchgears assesses the condition according to five components: corrosion, component failure, insulation, oil leak (for oil types) and age. Presence and magnitude of oil leaks (for oil insulated switchgears) and structural corrosion are quantified during field inspections and are scored as step score.

Age represents deterioration due to other factors not captured by the other components of the model. The TUL of a pad-mounted switchgear is 30 years and the maximum useful life is 45 years according to industry averages. Therefore, the scoring method is based on the Gompertz-Makeham function where 30 years and 45 years correspond to 80% and 1% score respectively. Similarly for air insulated switchgears operating on 27.6 kV, 20 years and 35 years correspond to 80% and 1% score respectively.

The Health Index for Air, Solid Dielectric and SF6 type switchgear is computed by adding the weighted components of corrosion, component (e.g. mechanical spring, motor in motorized units, fuse supports) failure, insulation and age, as shown in Table 7.

Table 7 Pad-mounted Air, Solid Dielectric and SF6 Switchgears Health Index Parameters and Weights

#	Input	Input Weight (AIR, SF6, SD)	Scoring Method
1	Corrosion	21%	Step Score
2	Component Failure	21%	Step Score
3	Insulation	43%	Step Score
4	Age	15%	Percentage Score

The Health Index for Oil type switchgear is computed by adding the weighted components of corrosion, component (e.g. mechanical spring, motor in motorized units, fuse supports) failure, insulation, oil leak and age, as shown in Table 8.

Table 8 Pad-mounted Oil-type Switchgears Health Index Parameters and Weights

#	Input	Input Weight (OIL)	Scoring Method
1	Corrosion	15%	Step Score
2	Component Failure	15%	Step Score
3	Insulation	40%	Step Score
4	Oil Leak	15%	Step Score
5	Age	15%	Percentage Score

Field inspection multiplier

If a pad-mounted switchgear exhibits major degradation or imminent failure as determined by field inspection, it is considered to be of very poor health. The physical conditions considered in this criterion are major corrosion, major oil leak, major component failure and major insulation failure.

$$field\ inspection\ multiplier = 25\%$$

Accelerated Degradation Multiplier

Air insulated switchgear are highly susceptible to flashover due to contamination from dust particles that breach the enclosure. Their continuous nominal operating voltage rating is 25kV with a maximum operating rating of 29.2 kV. These units function relatively well when new; however, during their normal duty they are exposed to multiple voltage stresses, which reduce their insulating performance, particularly when installed on the 27.6 kV distribution system. The 25 kV nominal voltage rating has been an inherent flaw in the equipment since it was first introduced to the Ontario market. This lower nominal voltage contributes to the reduced life of the switchgear and reduces the ability of the switchgear to perform under abnormal conditions, leading to premature failures.

$$Aceelerated\ degradation\ multiplier = 50\%$$

5.2.4.1 Health Index Results

Figure 15 shows the distribution of Health Index values of pad-mounted switchgears classified from Very Good to Very Poor. The average DAI is 94.7%.

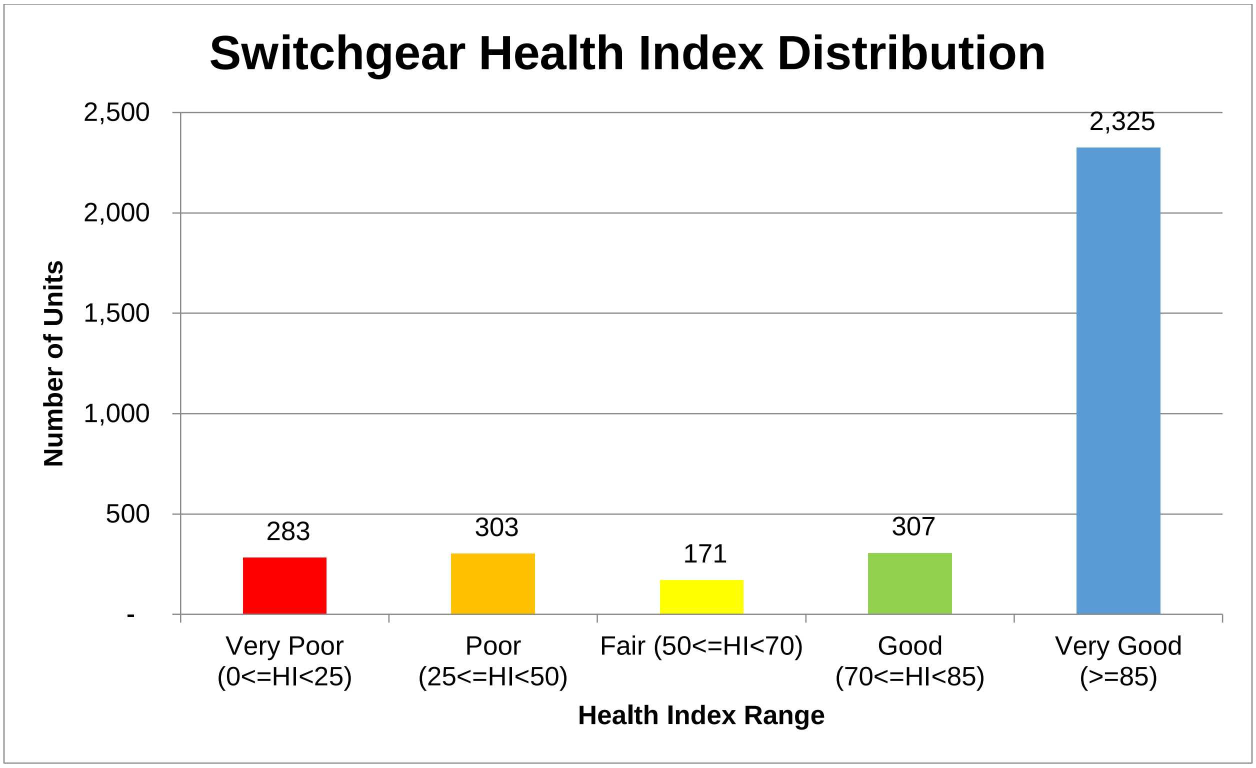

Figure 15 Pad-mounted Switchgears Health Index Distribution

5.2.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of all pad-mounted switchgears is 586 units.

Table 9 shows the pacing scenarios, namely, Baseline, Moderate or Slow paces that correspond to sustainment quantities over 5 years, 7.5 years and 10 years, respectively.

It is expected that regular inspections and testing might cause the ACA results to change over time and the quantities in each asset HI categorization to change.

Table 9 Pad-mounted Switchgear Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 117\ units$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 78\ units$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 59\ units$

5.3 Overhead Switches

5.3.1 Summary of Asset Class

The primary function of overhead switches is to facilitate transfer of loads between feeders, allow isolation of line sections or equipment for maintenance, safety or other operating requirements. This class of switches are also known as Load Break Distribution Switch (LBDS), or Load Interrupting Switch (LIS). These switches can break load current.

5.3.2 Asset Degradation

The main degradation processes associated with switches include:

- Corrosion of steel hardware or operating rod
- Mechanical deterioration of linkages
- Switch blades falling out of alignment, which may result in excessive arcing during operation
- Loose connections
- Damaged insulators

The rate and severity of these degradation processes depend on a number of inter-related factors including the operating duties and environment in which the equipment is installed. In most cases, corrosion or rust represents a critical degradation process.

Consequences of overhead line switch failure may include customer interruption and safety consequences for operators.

5.3.3 Asset Class Demographics

Alectra's distribution system has 3,889 overhead switches. Overhead switches have a Typical Useful Life (TUL) of 40 years and are deemed to have reached End of Useful Life (EUL) at 55 years of age. Figure 16 shows the age demographics of overhead switches in the Alectra's distribution system.

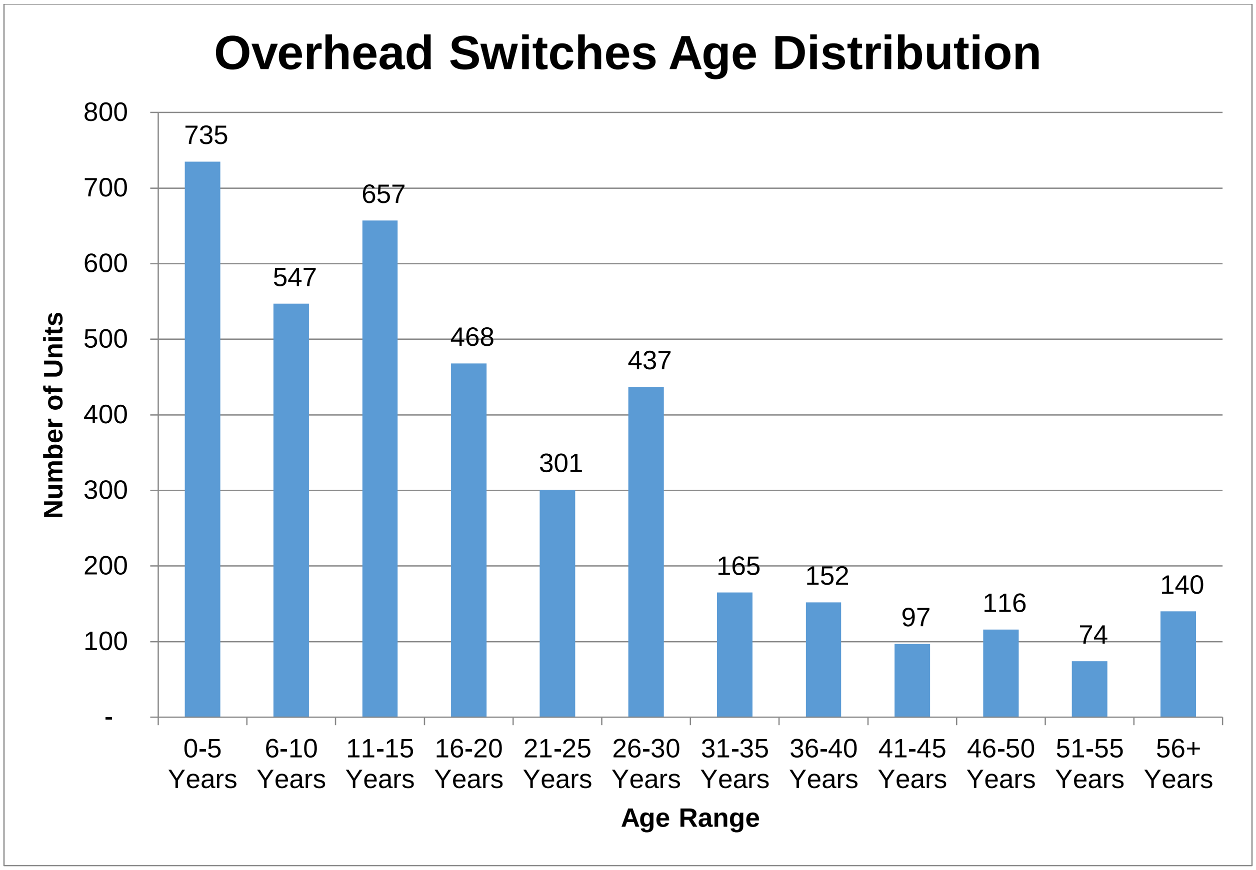

Figure 16 Overhead Switches Age Distribution

5.3.4 Health Index Formula and Results

Health Index of overhead switches assesses the condition of reliable and safe operation. Age represents deterioration due to environmental and operational factors. Health Index is computed as a function of age (i.e. percentage score), as shown in Table 10.

The typical useful life of a switch is 40 years and the maximum useful life is 55 years according to industry averages. Therefore, the scoring method is based on the Gompertz-Makeham function where 40 years and 55 years correspond to 80% and 1% score respectively.

Table 10 Overhead Switches Health Index Parameters and Weights

Input	Input Weight	Scoring Method
Age	100%	Percentage Score

Figure 17 shows the distribution of Health Index values of overhead switches classified from Very Good to Very Poor. The average DAI is 100%.

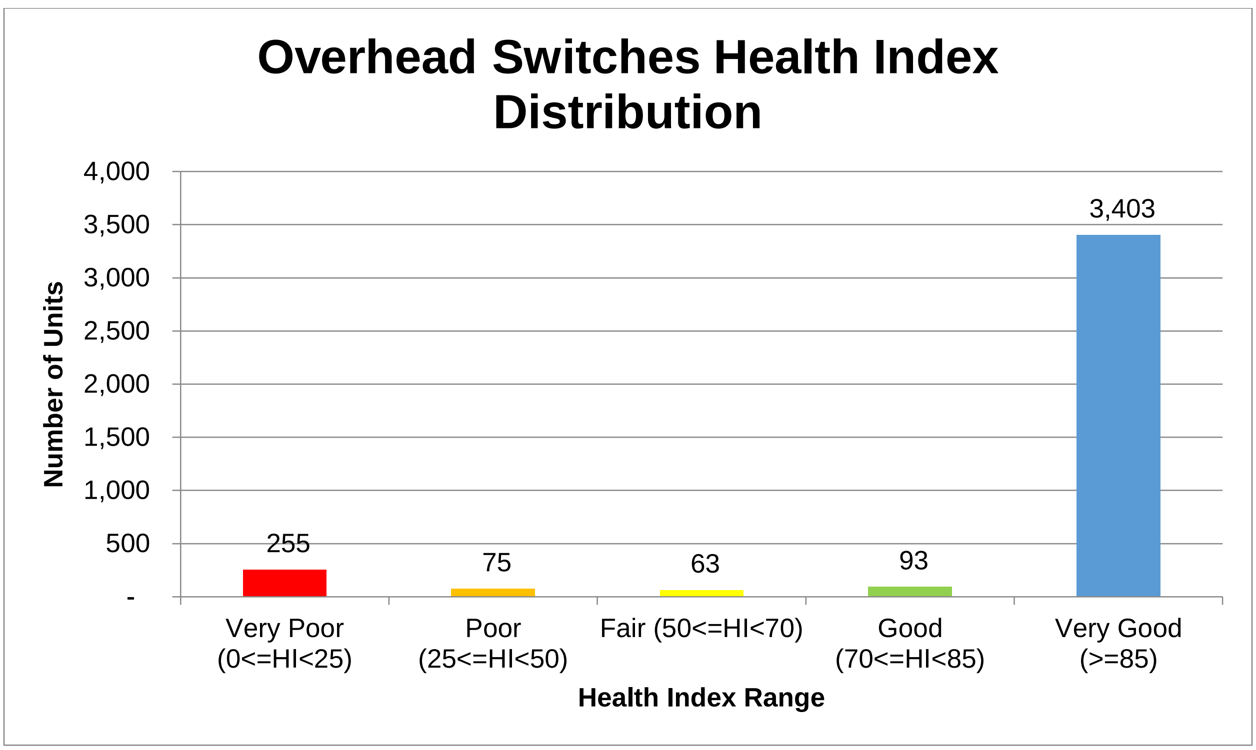

Figure 17 Overhead Switches Health Index Distribution

5.3.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of overhead switches is 330 units.

Table 10 shows the pacing scenarios, namely, Baseline, Moderate or Slow paces that correspond to sustainment quantities over 5 years, 7.5 years and 10 years, respectively.

It is expected that as the system ages, the Health Index results and quantities in each HI category will change.

Table 11 Overhead Switches Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 66\ units$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 44\ units$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 33\ units$

5.4 Overhead Conductors

5.4.1 Summary of Asset Class

Electrical current flows through distribution line conductors facilitating the movement of power throughout the distribution system. These conductors are supported by metal, wood, or concrete structures to which they are attached by insulator strings selected based on operating voltage. The conductors are sized for the maximum amount of current to be carried and other design requirements. Conductors hold mechanical tension in conjunction with electrical properties that facilitate flow of electricity.

5.4.2 Asset Degradation

The flow of electrical current causes the conductors' temperature to increase. As a result, the conductors expand. Fluctuations of current flow cause the conductors to expand and contract in cyclical manner, which causes the conductors to deteriorate over time. Mechanical processes such as fatigue, creep and corrosion are accelerated by the expansion and contraction. The rate of degradation depends on several factors including the size of conductor, metal/alloy component(s) of the conductor, type of conductor (e.g. solid), ambient temperature, the flow of current, the variation in the flow of current and ambient temperature.

Overloading conductors accelerates the deterioration process and can cause serious safety concerns, similarly excessive fault currents. Conductor failure is a safety hazard to the public and can cause significant power interruptions.

5.4.3 Asset Class Demographics

Alectra's distribution system has 16,400 km of overhead conductors with various sizes and age ranges. An overhead conductor has a Typical Useful Life (TUL) of 60 years and is deemed to have reached End of Useful Life (EUL) at 75 years of age. Figure 18 shows the age demographics of overhead conductors in the Alectra's distribution system.

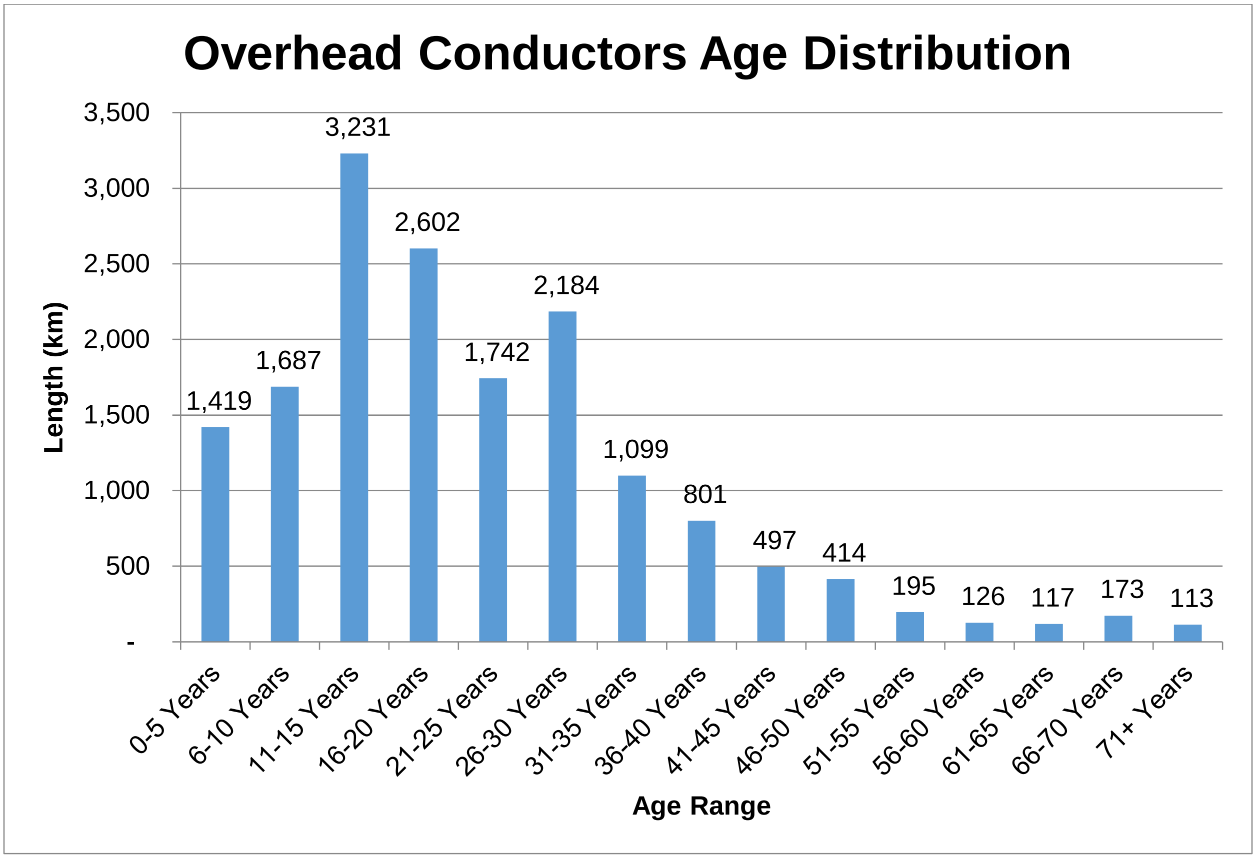

Figure 18 Overhead Conductors Age Distribution

5.4.4 Health Index Formula and Results

Health Index of overhead conductors assesses the condition of reliable and safe operation of overhead conductors. Age represents deterioration due to environmental and operational factors. Health Index is computed as a function of age (i.e. percentage score), as shown in Table 12.

Age represents deterioration due to environmental and operational factors. The Typical Useful Life of a conductor is 60 years and the maximum useful life is 75 years according to industry averages. Therefore, the scoring method is based on the Gompertz-Makeham function where 60 years and 75 years correspond to 80% and 1% score, respectively.

Table 12 Overhead Conductors Health Index Parameters and Weights

Input	Input Weight	Scoring Method
Age	100%	Percentage Score

Restricted Conductors Multiplier

Certain conductor sizes fall below the acceptable conductor sizes for the safe and reliable operation of the system. Any conductor below wire AWG (American Wire Gauge) size #6 is considered restricted and undersized according to current utility practices. Such conductors represent a major safety risk.

$$Restricted\ conductor\ multiplier = 25\%$$

Figure 19 shows the distribution of Health Index values of overhead conductors classified from Very Good to Very Poor. The average DAI is 100%.

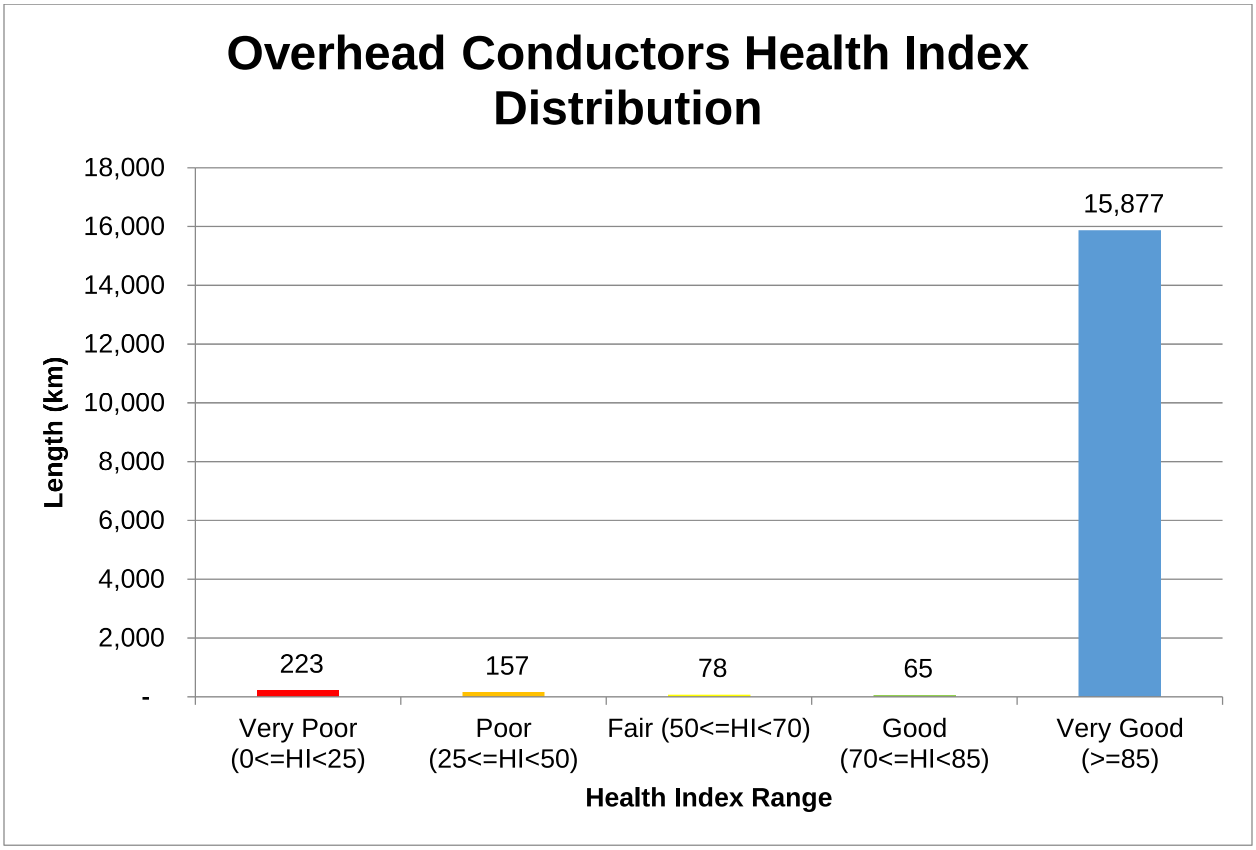

Figure 19 Overhead Conductors Health Index Distribution

5.4.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of overhead conductors is 380 kilometers.

It is expected that as the system ages, the Health Index results and quantities in each HI category will change.

Table 13 shows the pacing scenarios, namely, Baseline, Moderate or Slow paces that correspond to sustainment quantities over 5 years, 7.5 years and 10 years, respectively.

It is expected that as the system ages, the Health Index results and quantities in each HI category will change.

Table 13 Overhead Conductors Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 76\ km$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 51\ km$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 38\ km$

5.5 Wood Poles

5.5.1 Summary of Asset Class

Wood poles support overhead primary & secondary distribution lines. Any deterioration in structural strength of poles impacts the safe and reliable operation of the distribution system. Poles are a critical component of the distribution system and support many assets including: conductors, transformers, switches, street lights, telecommunication attachments, and other items, as well as providing physical separation between ground level and energized conductors. As a pole's physical condition and structural strength deteriorate, the pole may become inadequate for its intended function, and should be replaced to maintain the integrity of the distribution system and to protect public safety. A regular field inspection is conducted on wood poles to assess their condition. In addition to the field inspection, a remaining strength measurement is conducted using third party test to provide evidence based measurement that reflects the integrity of the pole. The wood species commonly used for distribution wood poles include Red Pine, Jack Pine and Western Red Cedar (WRC).

5.5.2 Asset Degradation

Since wood is a natural material, the degradation processes are different from those which affect other physical assets on electricity distribution systems. The degradation processes result in decay of the wood fibers; thus reducing the structural strength of the pole. The nature and severity of the degradation depends both on the type of wood, treatment, and the environment.

As a structural item, assessing the condition of a wood pole is based on measuring the remaining structural strength and inspecting for signs of deterioration (e.g. cracks). Field inspection checks for indicators of decay (e.g. hollowing, pole top feathering, structural cracks, and other field indications of degradation). Pole residual strength testing is a test performed by drilling a small probe through the pole to measure quantitatively the remaining structural strength of the wood fibers.

Consequences of a pole failure are quite serious. Poles with reduced strength present a significant risk to the public, Alectra staff and contractors, and also have reliability impacts to the distribution system. The combination of severe weather along with reduced strength can lead to end-of-life failure scenarios where multiple poles lose their structural integrity and fail, possibly falling to the ground. The risk is mitigated through the regular inspection and field-testing to identify candidates for replacement prior to their failure.

5.5.3 Asset Class Demographics

Alectra's distribution system has 105,569 wood poles. A wood pole has a Typical Useful Life (TUL) of 45 years and is deemed to have reached End of Useful Life (EUL) at 75 years of age. Figure 20 shows the age demographics of wood poles in the Alectra's distribution system.

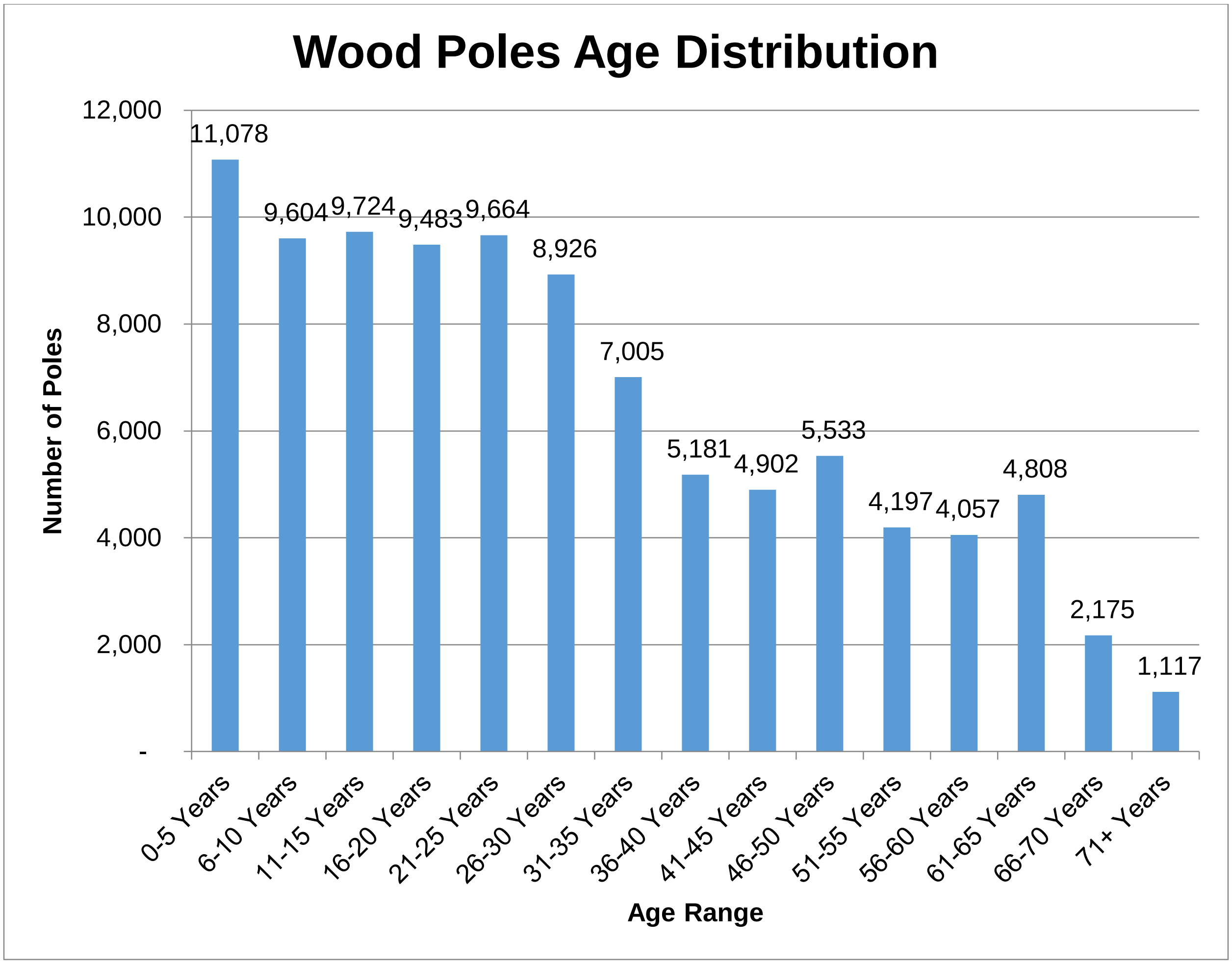

Figure 20 Wood Poles Age Distribution

5.5.4 Health Index Formula and Results

Health Index of poles assesses the condition of the pole according to three components: Pole remaining strength, Overall condition and Age. Pole remaining strength is a vital component to the Health Index of wood poles and is a specialized test that is performed by a third party. Remaining strength measurement is an evidence based measurement of physical condition and it is scored using percentage scoring.

Overall condition is captured during the field inspection cycle of the wood poles and includes, but is not limited to, signs of mechanical damage, cracks and feathering. Overall condition of wood poles is scored using step scoring.

Age represents deterioration due to other factors not captured by the other components of the model. The Typical Useful Life of a wood pole is 45 years and the maximum useful life is 75 years according to industry averages. Therefore, the scoring method is based on the Gompertz-Makeham function where 45 years and 75 years correspond to 80% and 1% score respectively.

The Health Index is computed by adding the weighted inputs of pole remaining strength, overall condition field inspection and age, as shown in Table 14.

Table 14 Wood Poles Health Index Parameters and Weights

#	Input	Input Weight	Scoring Method
1	Pole Strength	49%	Percentage Score
2	Field Inspection	36%	Step Score
3	Age	15%	Percentage Score

Pole Residual Strength Multiplier

If a wood pole is measured to have 60% or less in remaining strength, it is considered to be of very poor health.

The Canadian Safety Association (CSA) defines the standards for overhead distribution system construction and the use of wood poles. Among other factors, Alectra is guided in its pole assessment process by Clause 8.3.1.3 of CSA Standard C22.3 No. 1-10, which states that:

> *"when the strength of a structure has deteriorated to 60% of the required capacity, the structure shall be reinforced or replaced".*

$$Pole\ residual\ multiplier = 25\%$$

Field inspection multiplier

If a wood pole was scored 1 out of 5 on condition based on field inspection, it is considered to be of very poor health.

If a wood pole exhibits major degradation or imminent failure as determined by field inspection, it is considered to be of very poor health. The physical conditions considered in this criterion are major rotting, decay, splitting, insect infestation, bending and leaning.

$$field\ inspection\ multiplier = 25\%$$

Figure 21 shows the distribution of Health Index values of wood poles classified from Very Good to Very Poor. The average DAI is 68.7%.

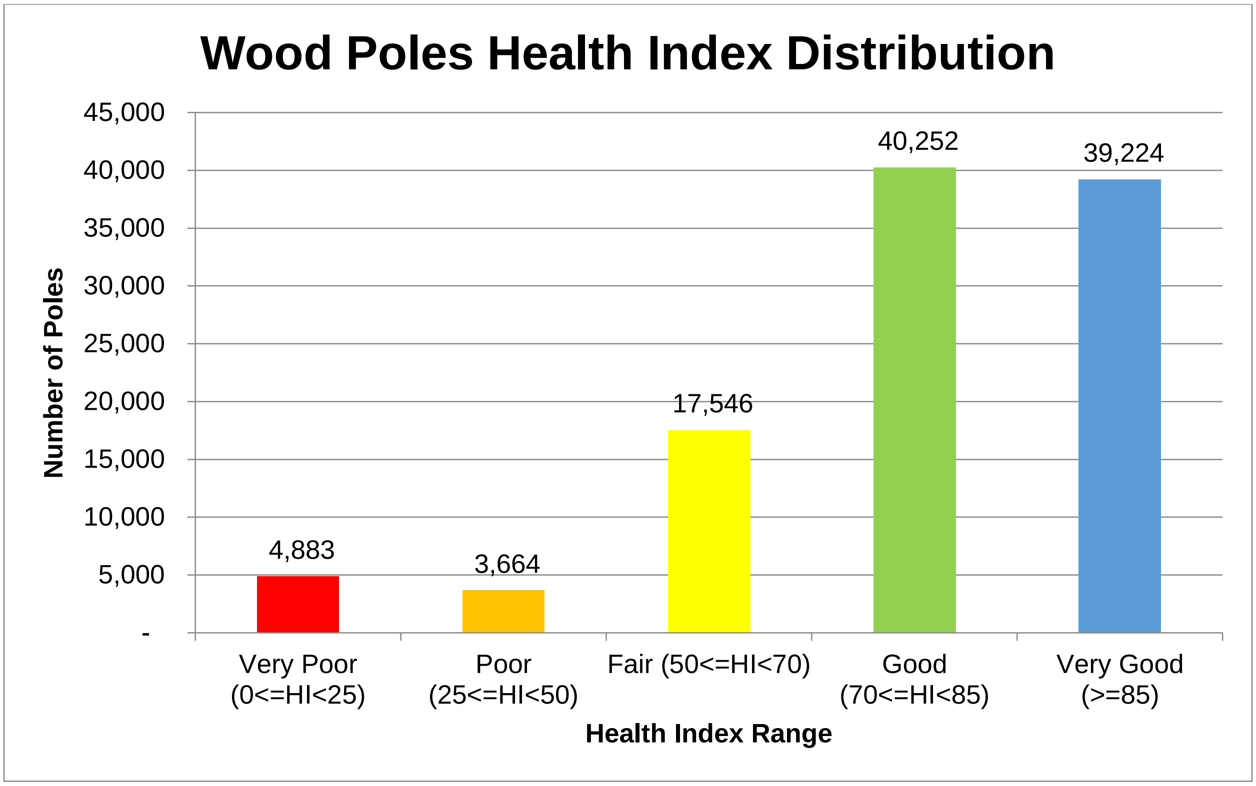

Figure 21 Wood Poles Health Index Distribution

5.5.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of wood poles is 8,547 poles.

Table 15 shows the pacing scenarios, namely, Baseline, Moderate or Slow paces that correspond to sustainment quantities over 5 years, 7.5 years and 10 years, respectively.

It is expected that regular inspections and testing might cause the HI results to change over time and the quantities in each HI category to change.

Table 15 Wood Poles Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 1{,}709\ poles$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 1{,}140\ poles$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 855\ poles$

5.6 Concrete Poles

5.6.1 Summary of Asset Class

Concrete poles support primary & secondary distribution lines. Any deterioration in structural strength of poles impacts the safe and reliable operation of the distribution system. Poles are a critical component of the distribution system and support many appurtenances including: conductors, transformers, switches, street lights, telecommunication attachments and other items. Poles also provide physical separation between ground level and energized conductors. As a pole's physical condition and structural strength deteriorate, the pole may become inadequate for its intended function, and should be replaced to maintain the integrity of the distribution system and to protect public safety. A regular field inspection is conducted on concrete poles to assess their condition.

In some cases, concrete poles can be rehabilitated from mechanical damage (e.g. damage of snowplows or vehicle accidents) or deterioration. Each case requires a specialized assessment by a subject matter expert to recommend the appropriate intervention.

5.6.2 Asset Degradation

Concrete poles age in the same manner as any other concrete structure. Any moisture ingress inside the concrete pores would result in freezing during the winter and damage to the concrete surface. Road salt spray can further accelerate the degradation process and lead to concrete spalling (piece of concrete flaking off the pole). Cracks develop over time from stretching or bending forces. These cracks propagate over time resulting in structural cracks and spalling of the concrete.

Concrete poles contain metal rebar for reinforcement, water ingress and contaminants lead to corrosion of the rebar thus reducing the structural integrity of the concrete pole. Rebar corrosion can lead to the accelerated deterioration resulting in a reduced lifespan of a concrete pole.

Consequences of a pole failure are quite serious. Poles with reduced strength present a significant risk to the public, Alectra staff and contractors, and also have reliability impacts to the distribution system. The combination of severe weather along with reduced strength can lead to end-of-life failure scenarios where multiple poles lose their structural integrity and fail, possibly falling to the ground. The risk is mitigated through the regular inspection and field-testing to identify candidates for replacement prior to their failure.

5.6.3 Asset Class Demographics

Alectra's distribution system has 25,340 concrete poles. A concrete pole has a Typical Useful Life (TUL) of 60 years and is deemed to have reached End of Useful Life (EUL) at 80 years of age. Figure 22 shows the age demographics of concrete poles in the Alectra's distribution system.

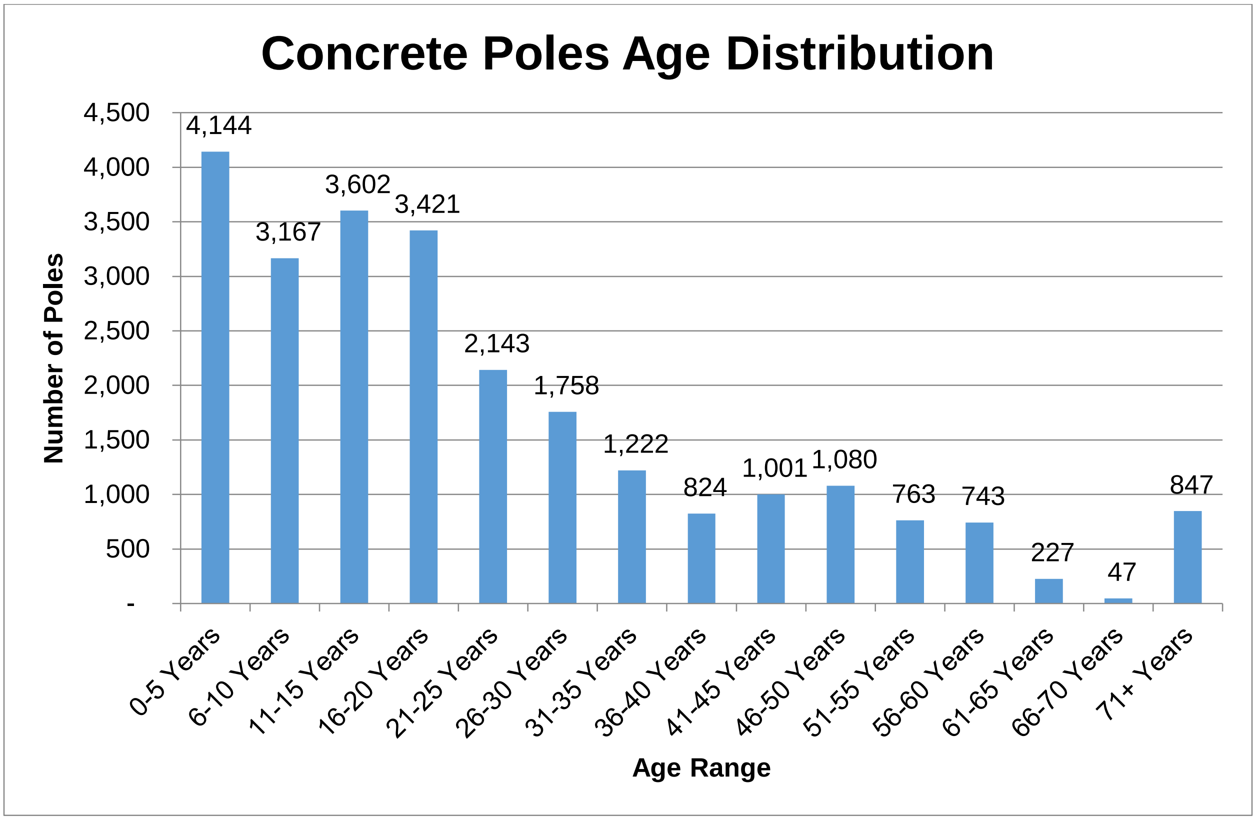

Figure 22 Concrete Poles Age Distribution

5.6.4 Health Index Formula and Results

Health Index of poles assesses the condition of the pole according to two inputs: Overall condition and Age.

Overall condition is a captured during the field inspection cycle of the concrete poles and includes but not limited to, signs of mechanical damage and cracks.

Age represents deterioration due to other factors not captured by the other inputs of the model. The Typical Useful Life of a concrete pole is 60 years and the maximum useful life is 80 years according to industry averages. Therefore, the scoring method is based on the Gompertz-Makeham function where 60 years and 80 years correspond to 80% and 1% score respectively.

The Health Index is computed by adding the weighted inputs of overall condition from field inspections and age as shown in Table 16.

Table 16 Concrete Poles Health Index Parameters and Weights

#	Input	Input Weight	Scoring Method
1	Field Inspection	69%	Step Score
2	Age	31%	Percentage Score

Field inspection multiplier

If a concrete pole exhibits major degradation or imminent failure as determined by field inspection, it is considered to be of very poor health. The physical conditions considered in this criterion are major cracking, exposed rebar or rusted rebar.

$$field\ inspection\ multiplier = 25\%$$

Figure 23 shows the distribution of Health Index values of concrete poles classified from Very Good to Very Poor. The average DAI is 88%.

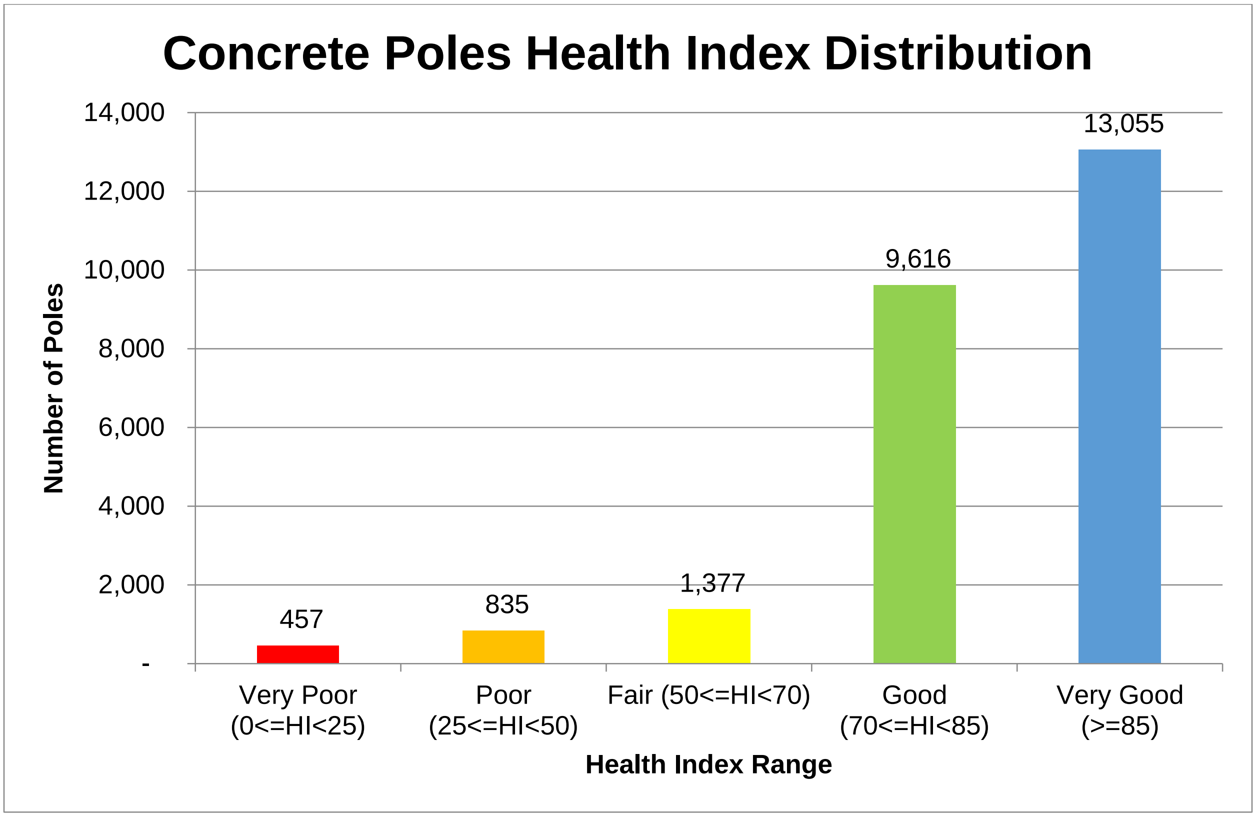

Figure 23 Concrete Poles Health Index Distribution

5.6.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of concrete poles is 1,292 poles.

Table 17 shows the pacing scenarios, namely, Baseline, Moderate or Slow paces that correspond to sustainment quantities over 5 years, 7.5 years and 10 years, respectively.

It is expected that regular inspections and testing might cause the ACA results to change over time and the quantities in each HI category to change.

Table 17 Concrete Poles Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 258\ poles$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 172\ poles$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 129\ poles$

5.7 Underground Primary Cables

Underground distribution cables are mainly used in urban areas where obstacles to pole line construction are encountered. These can include aesthetic, legal, political and physical constraints.

5.7.1 Summary of Asset Class

The asset category of distribution system underground cables includes underground cross-link-polyethylene (XLPE) cables, paper insulated lead covered (PILC) cables, ethylene-propylene rubber (EPR) cables at voltage levels 44 kV and below. It includes direct buried and installed-in-duct feeder cables, underground cable sections running from stations to overhead lines and from overhead lines to customer stations and switches.

5.7.2 Asset Degradation

Faults on primary underground cables are usually caused by insulation failure within a localized area.

Polymeric insulation is very sensitive to discharge activity. It is therefore very important that the cable, joints and accessories are discharge free when installed. Older vintage cables are susceptible to moisture ingress, especially if installed direct buried or with terminations and splices susceptible to insulation breakdown that can result in localized failures.

Manufacturing improvements and development of tree retardant XLPE cables have reduced the rate of deterioration from treeing.

For PILC cables, the two significant long-term degradation processes are corrosion of the lead sheath and dielectric degradation of the oil impregnated paper insulation. Isolated sites of corrosion resulting in moisture penetration or isolated sites of dielectric deterioration resulting in insulation breakdown can result in localized failures. However, if either of these conditions becomes widespread there will be frequent cable failures and the cable can be deemed to be at end-of-life.

For Ethylene-Propylene Rubber Cables (EPR) cables, long term degradation can occur due to mechanical damage, overheating, or the impact of moisture ingress and chemical deterioration.

5.7.3 XLPE (Cross-Linked Polyethylene) Cables

5.7.3.1 Asset Class Demographics

Alectra's distribution system has 21,638 km of primary underground XLPE cable. XLPE cables are three types each having different expected useful lives as follows:

- **Non Tree Retardant cables (NON TR)**:
  Vintage 1988 or older; TUL 30 years; EUL 40 years
- **Tree Retardant Direct Buried cables (TR-DB)**:
  Vintage 1989-1993; TUL 35 years; EUL 45 years
- **Tree Retardant or Strand Blocked In-Duct cables(TR-ID):**
  Vintage 1994 or newer; TUL 40 years; EUL 55 years

Figure 24 shows the age demographics of XLPE cables in Alectra's distribution system.

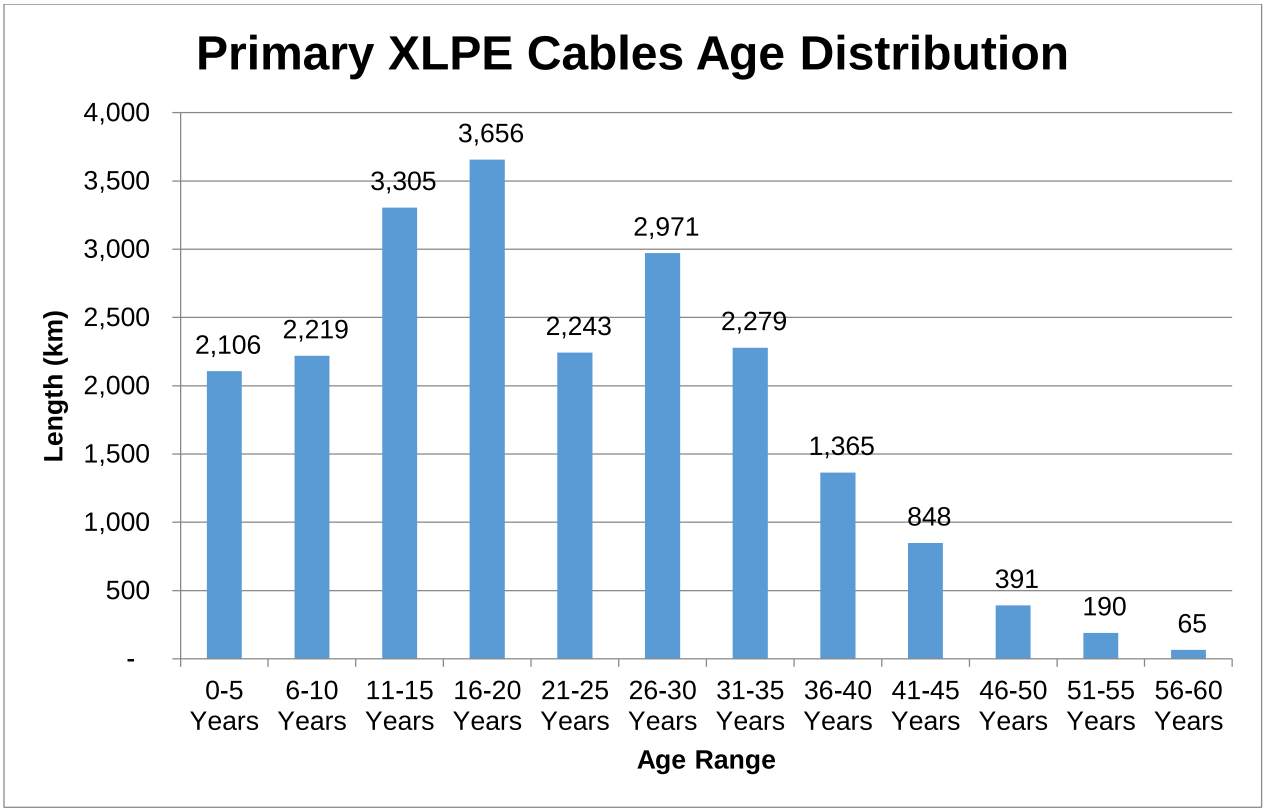

Figure 24 Primary XLPE Cables Age Distribution

5.7.3.2 Health Index Formula and Results

Health index of primary XLPE cables is calculated using age. The TUL and EUL used in the age score for each type are based on industry averages and Alectra's experience. The scoring method is based on the Gompertz-Makeham function where TUL and EUL correspond to 80% and 1% score respectively.

Health index is scored according to the curves shown in Figure 25.

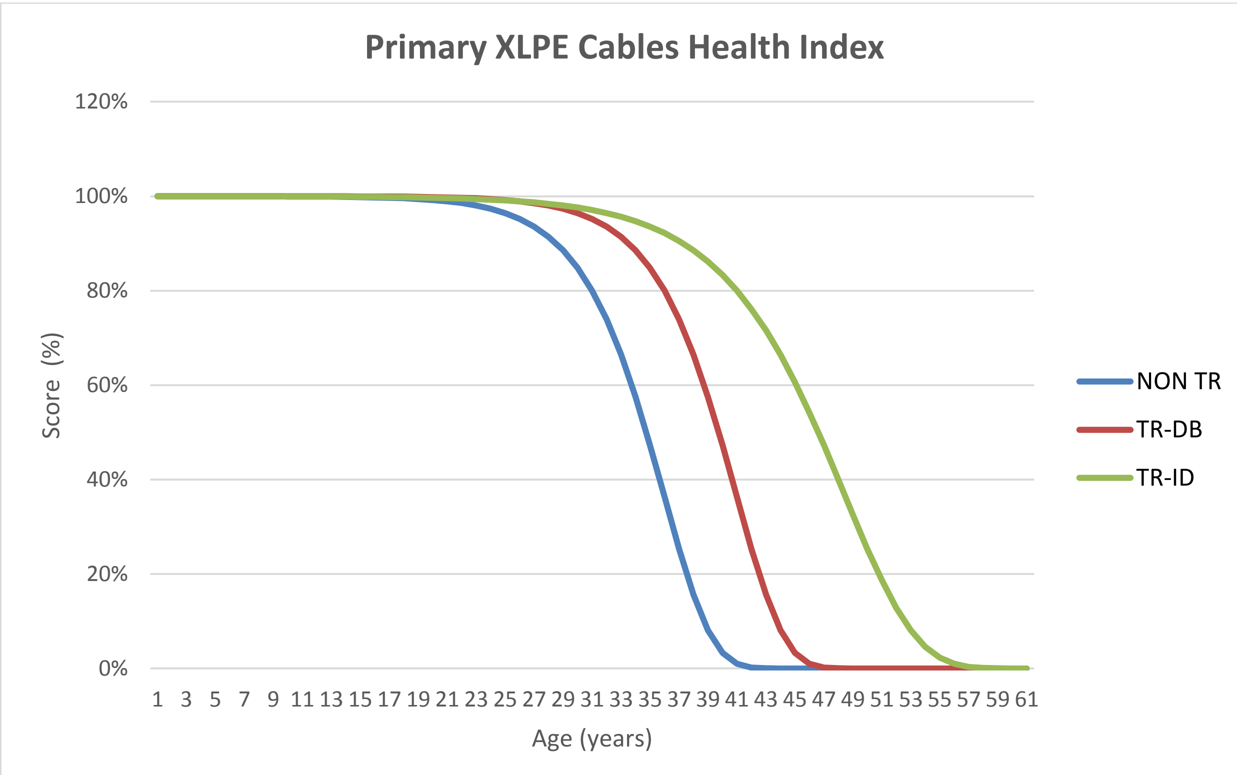

Figure 25 Primary XLPE Cables Health Index as a function of age

Health Index is computed as a function of age (i.e. percentage score) as shown in Table 18.

Table 18 XLPE Cable Health Index Parameters and Weights

Input	Input Weight	Scoring Method
Age	100%	Percentage Score

Figure 26 shows the distribution of Health Index values of primary XLPE cables classified from Very Good to Very Poor.

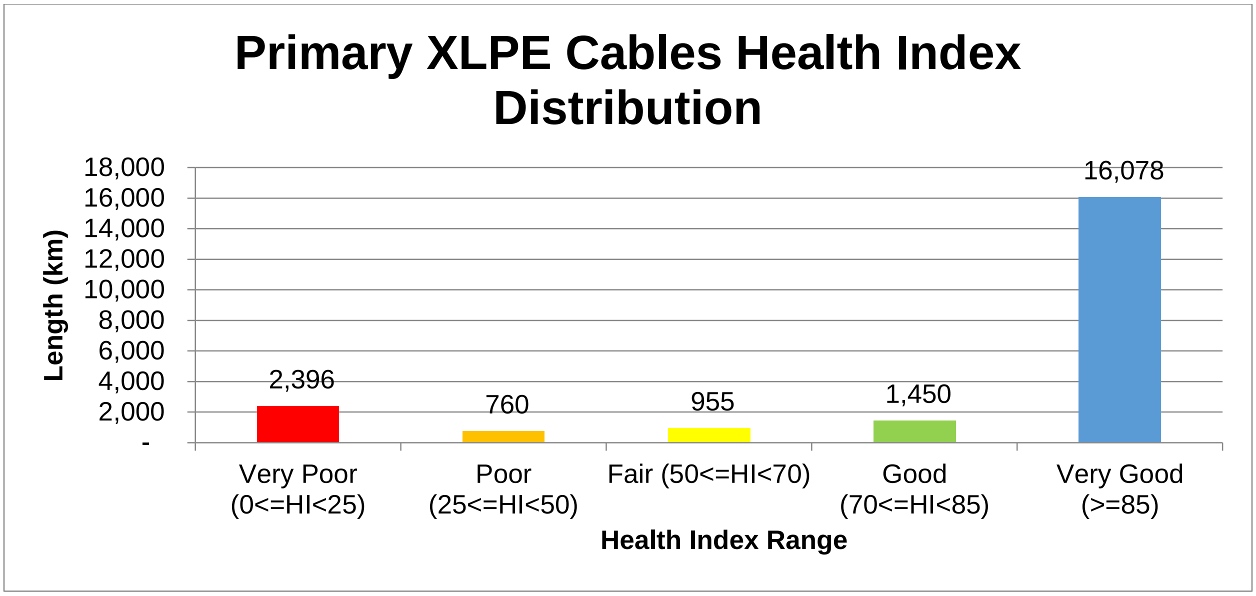

Figure 26 Primary XLPE Cables Health Index Distribution

5.7.3.3 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of XLPE cables is 3,156 km.

Table 19 shows the pacing scenarios, namely, Baseline, Moderate or Slow paces that correspond to sustainment quantities over 5 years, 7.5 years and 10 years, respectively.

It is expected that as the system ages, the Health Index results and quantities in each HI category will change.

Table 19 XLPE Cable Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 631\ km$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 421\ km$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 316\ km$

5.7.4 PILC

5.7.4.1 Asset Class Demographics

Alectra's distribution system has 410 km of primary underground PILC cable. Primary PILC cables have a Typical Useful Life (TUL) of 60 years and are deemed to have reached End of Useful Life (EUL) at 70 years of age. Figure 27 shows the age demographics of PILC cables in Alectra's distribution system.

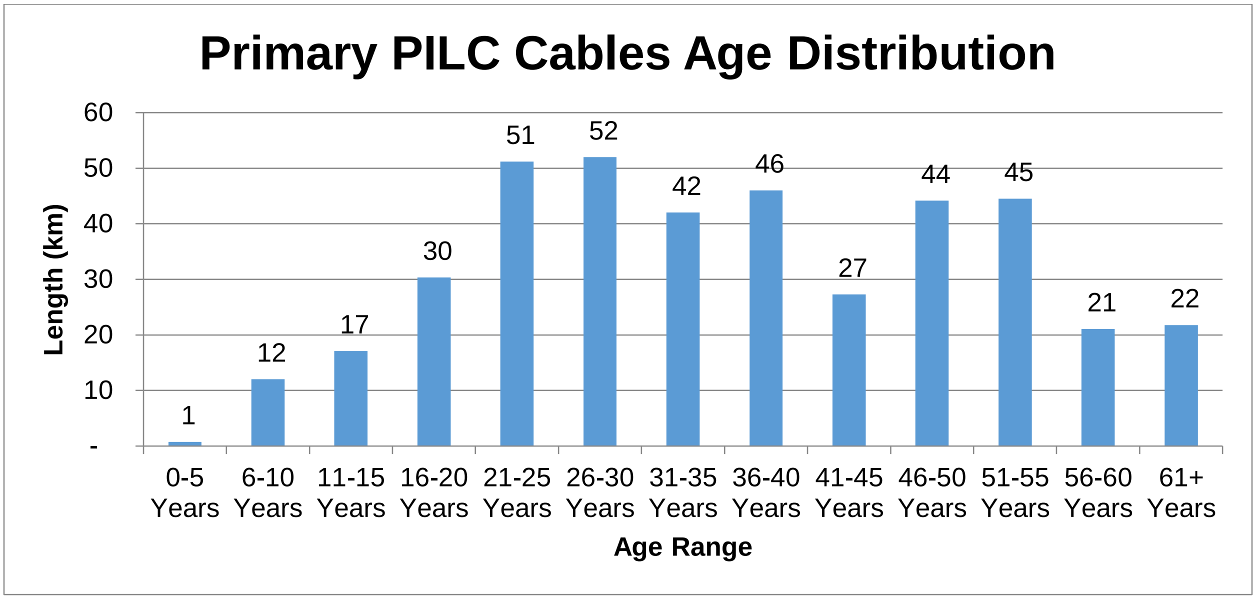

Figure 27 Primary PILC Cables Age Distribution

5.7.4.2 Health Index Formula and Results

Health index of Primary PILC cables is calculated using Age. The TUL of PILC cable is 60 years and EUL is 70 years according to industry averages. The scoring method is based on the Gompertz-Makeham function where TUL and EUL correspond to 80% and 1% score respectively. Health Index is computed as a function of age (i.e. percentage score), as shown in Table 20.

Table 20 PILC Health Index Parameters and Weights

Input	Input Weight	Scoring Method
Age	100%	Percentage Score

Figure 28 shows the distribution of Health Index values of primary PILC cables classified from Very Good to Very Poor.

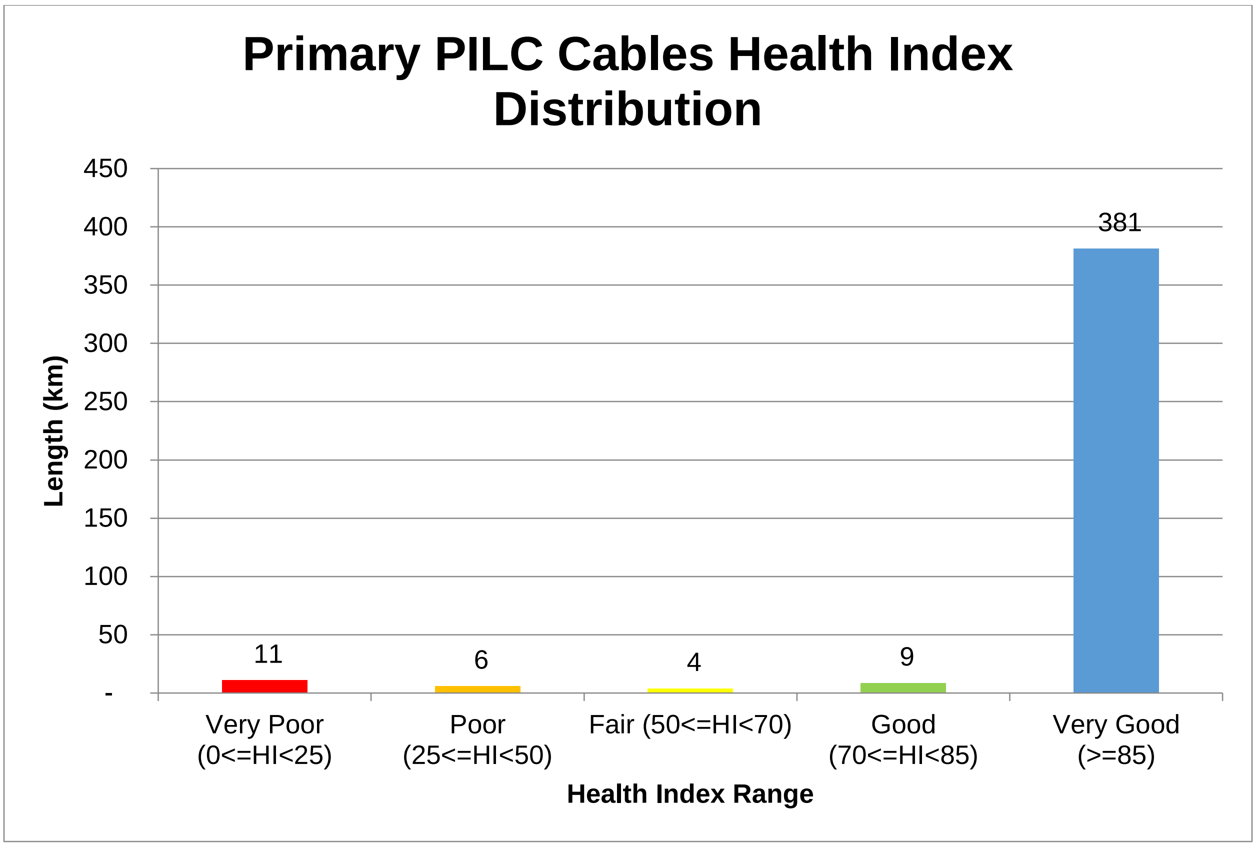

Figure 28 Primary PILC Cables Health Index Distribution

5.7.4.3 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of PILC is 17 km.

It is expected that as the system ages, the Health Index results and quantities in each HI category will change.

Table 21 shows the pacing scenarios, namely, Baseline, Moderate or Slow paces that correspond to sustainment quantities over 5 years, 7.5 years and 10 years, respectively.

It is expected that as the system ages, the Health Index results and quantities in each HI category will change.

Table 21 PILC Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 3\ km$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 2\ km$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 2\ km$

5.7.5 EPR

5.7.5.1 Asset Class Demographics

Alectra's distribution system has 91 km of primary underground EPR cable. EPR cables have a Typical Useful Life (TUL) of 25 years and are deemed to have reached End of Useful Life (EUL) at 45 years of age. Figure 29 shows the age demographics of EPR cables in Alectra's distribution system.

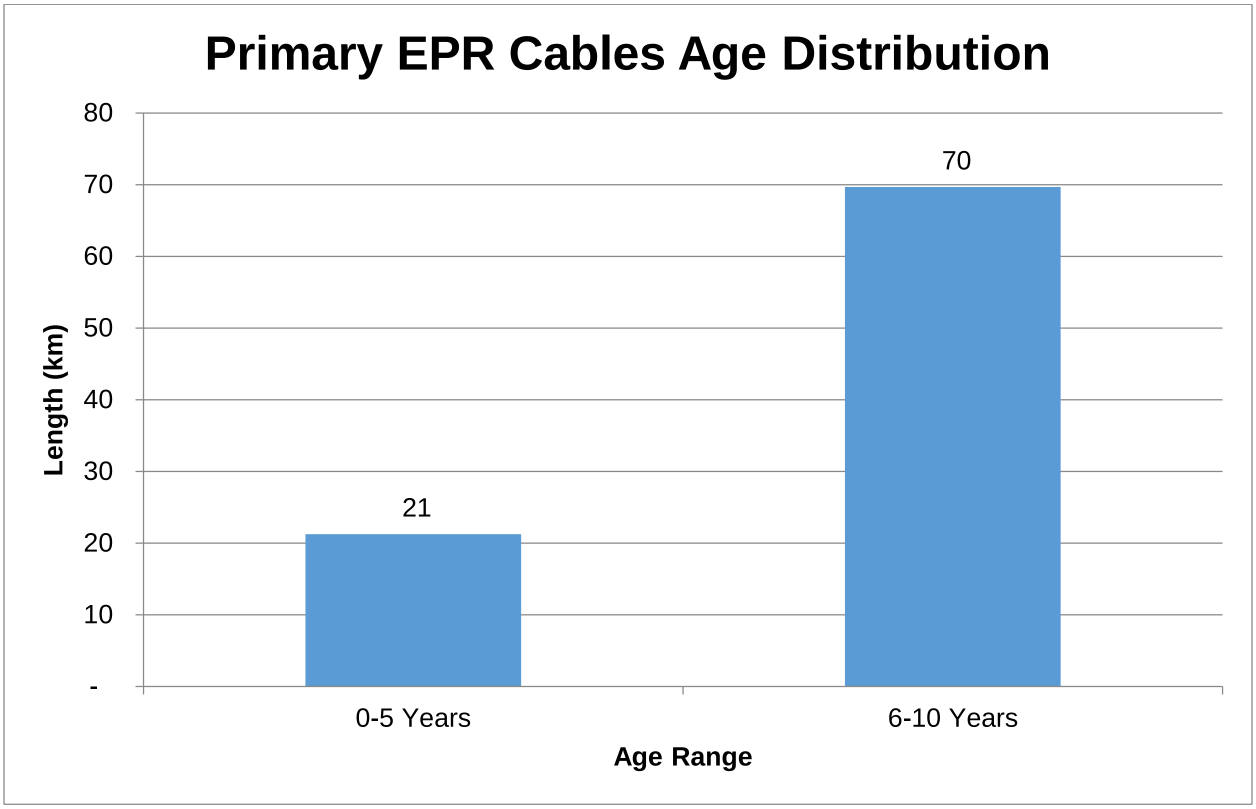

Figure 29 Primary EPR Cables Age Distribution

5.7.5.2 Health Index Formula and Results

Health index of Primary EPR cables is calculated using Age. The TUL of EPR cable is 25 years and EUL is 45 years according to industry averages. The scoring method is based on the Gompertz-Makeham function where TUL and EUL correspond to 80% and 1% score respectively. Health Index is computed as a function of age (i.e. percentage score) as shown in Table 22.

Table 22 EPR Cables Health Index Parameters and Weights

Input	Input Weight	Scoring Method
Age	100%	Percentage Score

Figure 30 shows the distribution of Health Index values of EPR cables classified from Very Good to Very Poor.

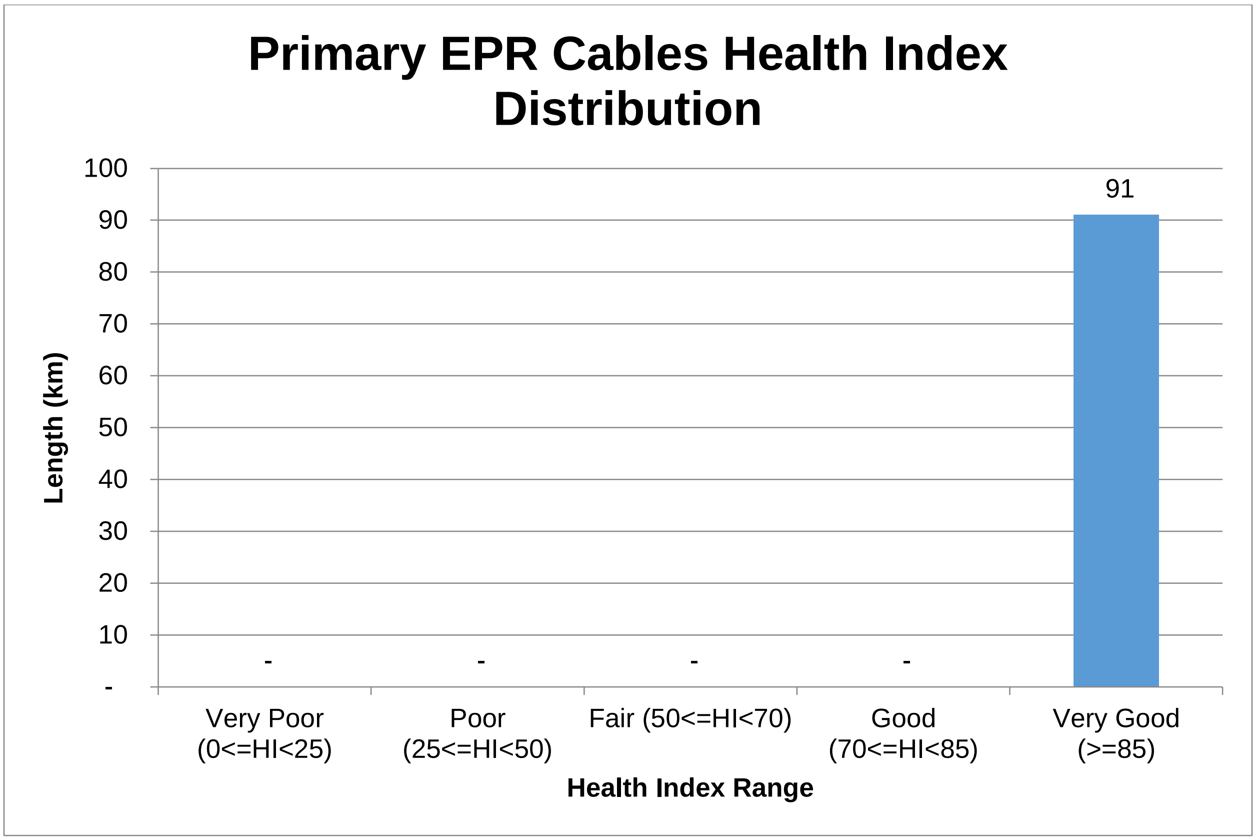

Figure 30 Primary EPR Cables Health Index Distribution

5.7.5.3 Sustainment Pacing

There are no EPR cables in the Very Poor & Poor categories.

Table 23 shows the pacing scenarios, namely, Baseline, Moderate or Slow paces that correspond to sustainment quantities over 5 years, 7.5 years and 10 years, respectively.

It is expected that as the system ages, the Health Index results and quantities in each HI category will change.

Table 23 EPR Cables Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = NONE$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = NONE$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = NONE$

6 Station Assets

The Alectra distribution system includes two classes of stations, transformer (TS) stations and municipal (MS) stations or substations. Alectra transformer stations are supplied from the high-voltage transmission grid at 115 kV or 230 kV. Alectra municipal stations are supplied from the medium-voltage distribution system at 44 kV or 27.6 kV. Alectra's system has 14 transformer stations and 155 municipal stations, owned and operated by Alectra.

Stations may consist of many types of components and subcomponents. Station assets considered in this report include the following.

- Power Transformers
- Circuit Breakers
- Station Switchgear

Station assets follow a different sustainment process compared to distribution assets as discussed in section 3 of this report.

6.1 Power Transformers

6.1.1 Summary of Asset Class

Station power transformers are used to step down transmission or sub-transmission voltage to distribution voltage. The two general classifications of station power transformers are transmission station (TS) transformers and station distribution transformers, also referred to as municipal station (MS) transformers. TS transformers are supplied from the high-voltage transmission grid at either 230 kV or 115 kV and step voltage down to 44 kV, 27.6 kV or 13.8 kV. MS transformers are supplied from the medium-voltage distribution system at 44 kV, 27.6 kV or 13.8 kV and step voltage down to 27.6 kV, 13.8 kV, 8.32 kV or 4.16 kV. TS transformers owned and operated by Alectra have fully cooled ratings of 50 MVA, 83.3 MVA and 125 MVA and MS transformer ratings typically have base Oil Natural Air Natural (ONAN) ratings ranging from 3 MVA to 22 MVA.

Power transformers employ many different design configurations, but they are typically made up of the following main components: Primary and secondary windings, Laminated iron core, Internal insulating mediums, Main tank, Bushings, Cooling system, including radiators, fans and pumps (Optional), Off load tap changer (Optional), On load tap changer (Optional), Instrument transformers, Control mechanism cabinets, Instruments and gauges.

Transformer primary and secondary windings are installed on a laminated iron core. Mineral oil serves as the insulating medium, providing insulation of energized coils, as well as the coolant. The transformer coil insulation is reinforced with different forms of solid insulation that include wood-based paperboard (pressboard), wrapped paper and insulating tapes. The transformer main tank holds the active components of the transformer in an oil volume and maintains a sealed environment through the normal variations of temperature and pressure. Typically, the main tank is designed to withstand a full vacuum for initial and subsequent oil fillings and is able to sustain a positive pressure. The main tank also supports the internal and external components of the transformers. Bushings are used to facilitate the egress of conductors to connect ends of the coils to a power supply system in an insulated, sealed (oil-tight and weather-tight) manner.

The purpose of a cooling system in a power transformer is to efficiently dissipate heat generated due to copper and iron losses and to help maintain the windings and insulation temperature within acceptable range. The utilization of a number of cooling stages allows for an increase in load carrying capability. Loss of any stage or cooling element may result in a forced de-rating of the transformer. Transformer cooling system ratings are typically expressed as:

- Self-cooled (radiators) with designation as ONAN (oil natural, air natural)
- Forced cooling first stage (fans) with designation as ONAF (oil natural, air forced)
- Forced cooling second stage (fans and pumps) with designation as OFAF (oil forced, air forced)

From the view of both financial and operational risk, power transformers are the most important asset installed on the distribution and transmission systems.

6.1.2 Asset Degradation

For a majority of transformers, end of life is typically established as the failure of the insulation system and, more specifically, the failure of pressboard and paper insulation. While the insulating oil can be treated or changed, it is not practical to change the paper and pressboard insulation. The condition and degradation of the insulating oil, however, plays a significant role in aging and deterioration of transformer, as it directly influences the speed of degradation of the paper insulation. The degradation of oil and paper in transformers is essentially an oxidation process. The three important factors that impact the rate of oxidation of oil and paper insulation are presence of oxygen, high temperature and moisture.

Transformer oil is made up of complex hydrocarbon compounds, containing anti-oxidation compounds. Despite the presence of oxidation inhibitors, oxidation occurs slowly under normal operating conditions. The rate of oxidation is a function of internal operating temperature and age. The oxidation rate increases as the oil ages, reflecting both the depletion of the oxidation inhibitors and the catalytic effect of the oxidation products on the oxidation reactions. The products of oxidation of hydrocarbons are moisture, which causes further deterioration of the insulation system, and organic acids, which result in formation of solids in the form of sludge. Increasing acidity and water levels result in the oil being more aggressive with regard to the paper and hence accelerate the ageing of the paper insulation. Formation of sludge adversely impacts the cooling capability of the transformer and adversely impacts its dielectric strength. An indication of the condition of insulating oil can be obtained through measurements of its acidity, moisture content and breakdown strength.

The paper insulation consists of long cellulose chains. As the paper ages through oxidization, these chains are broken. The tensile strength and ductility of insulting paper are determined by the average length of the cellulose chains; therefore, as the paper oxidizes the tensile strength and ductility are significantly reduced and insulating paper becomes brittle.

In addition to the general oxidation of the paper, degradation and failure can also result from partial discharge (PD). PD can be initiated if the level of moisture is allowed to develop in the paper or if there are other minor defects within active areas of the transformer.

The relative levels of carbon dioxide and carbon monoxide dissolved in oil can provide an indication of paper degradation. Detection and measurement of Furans in the oil provides a more direct measure of the paper degradation. Furans are a group of chemicals that are created as a bi-product of the oxidation process of the cellulose chains. The occurrence of partial discharge and other electrical and thermal faults in the transformer can be detected and monitored by measurement of hydrocarbon gases in the oil through Dissolved Gas Analysis (DGA).

6.1.3 Asset Class Demographics

Alectra's system has 295 power transformers, including 26 spare units. These are comprised of 31 TS transformers, three of which are spares, and 264 MS transformers which include 23 spares. Power transformers have a Typical Useful Life (TUL) of 45 years and are deemed to have reached End of Useful Life (EUL) at 60 years of age. Figure 31 shows the age demographics of power transformers in Alectra's distribution system.

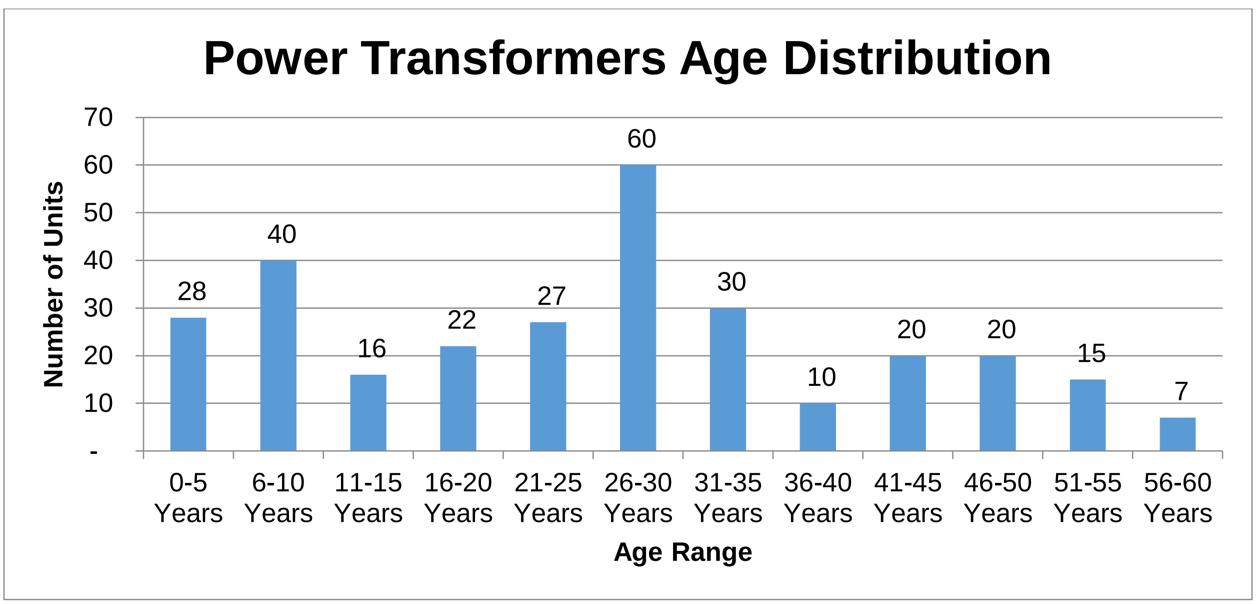

Figure 31 Power Transformers Age Distribution

6.1.4 Health Index Formula & Results

Health index of power transformers assesses the condition of the transformer according to four main components: Insulation, Cooling, Sealing and Connection, and Age. Insulation is considered to be the primary condition indicator and contributes to 70% of the Health Index. Included in insulation condition are oil quality analysis, oil dissolved gas analysis (DGA), and winding Doble, and furan test results.

Age represents deterioration due to other factors not captured by the other components of the model. The TUL of a power transformer is 45 years and the maximum useful life, or EUL, is 60 years based on industry averages. The scoring method for age is based on the Gompertz-Makeham function where TUL and EUL correspond to 80% and 1% score, respectively. Age contributes to only 10% of the Health Index for power transformers.

The Health Index is computed by adding the weighted components of overall condition and age as shown in Table 24.

Table 24 Power Transformers Health Index Parameters and Weights

#	Input	Input Weight	Scoring Method
1	Insulation	70%	Step Score
2	Cooling	5%	Step Score
3	Sealing and Connection	15%	Step Score
4	Age	10%	Percentage Score

DGA Multiplier

If a power transformer's oil sample results indicate a low overall oil DGA score, it will have a maximum Health Index of 50%.

$$DGA\ multiplier = 50\%$$

Explosive Gas Multiplier

A high concentration of one or more explosive gases, specifically hydrogen, acetylene or methane, in a power transformer's oil sample results, indicates that there is a potential for an explosive failure and that the transformer should be removed from service for further diagnostics. A transformer with high concentration of explosive gases will be considered as a candidate for replacement and will have a maximum Health Index of 10%. This multiplier applies to transformers rated at 5 MVA and above.

$$Explosive\ Gas\ multiplier = 10\%$$

Where both multipliers (explosive gas and DGA) are triggered, the lower of the two applies (i.e. explosive gas).

Figure 32 shows the distribution of Health Index values of power transformers classified from Very Good to Very Poor. The average DAI is 77%.

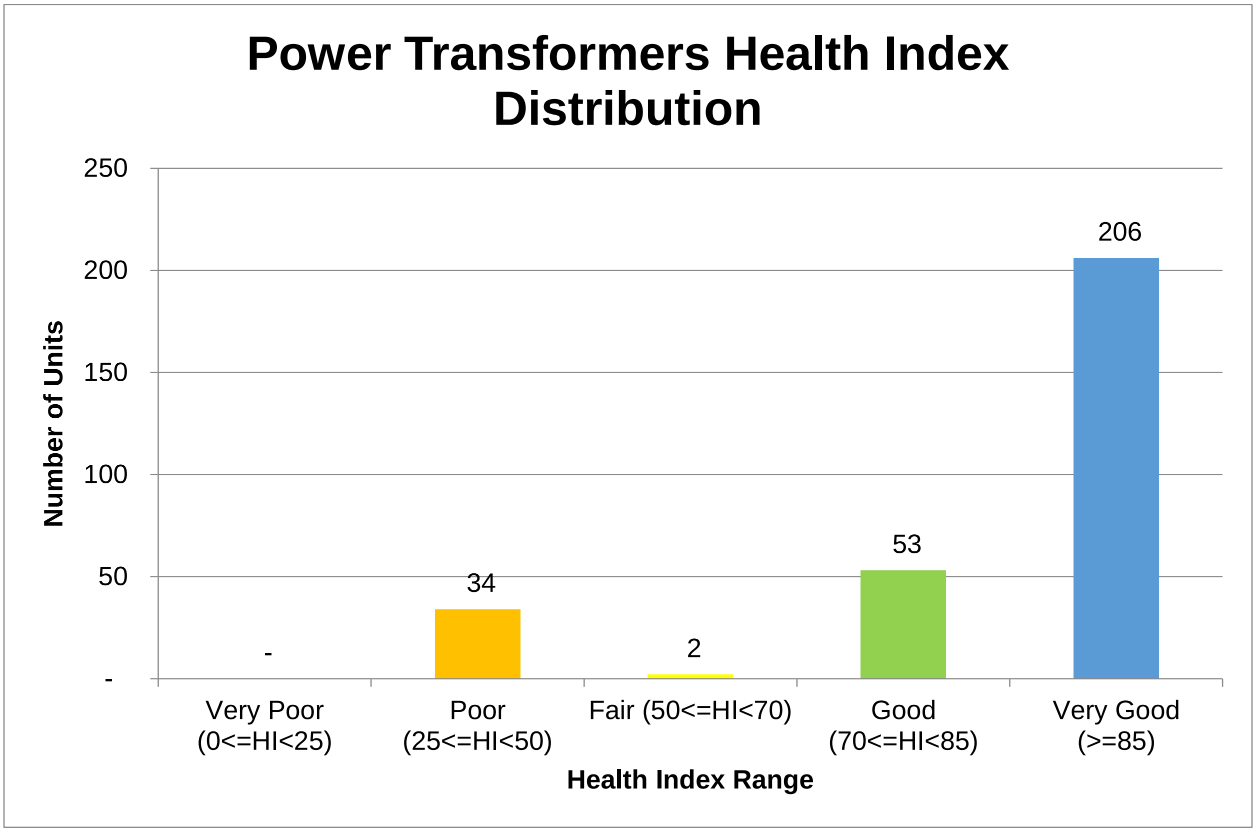

Figure 32 Power Transformers Health Index Distribution

6.2 Circuit Breakers

6.2.1 Summary of Asset Class

Circuit breakers are used to sectionalize and isolate circuits or other assets and are often categorized by the insulation medium used in the breaker and the interruption process. The common breaker types include oil circuit breakers, air circuit breakers, vacuum circuit breakers, and SF_6 circuit breakers.

Oil circuit breakers (OCB) interrupt current under oil and use the gas generated by the decomposition of the oil to assist in arc extinguishing.

Air insulated breakers are generally found at distribution system voltages and below. Air-type circuit breakers fall into two classifications: air-blast and air-magnetic.

Air-blast breakers use compressed air as the quenching, insulating and actuating mechanism. In a typical device, a blast of air carries the arc into an arc chute to be extinguished. Air blast breakers at distribution voltages are often in metal-enclosed switchgear.

Air magnetic breakers use the magnetic effect of the current undergoing interruption to draw an arc into an arc chute for cooling, splitting and extinction. Sometimes, an auxiliary puffer or air blast piston may help interrupt low-level currents. The air magnetic breakers have short duty cycles, require frequent maintenance and approach their end-of-life at much faster rates than either SF_6 or vacuum breakers. They also have limited transient recovery voltage capabilities and can experience re-strike when switching capacitive currents.

In vacuum breakers, the parting contacts are placed in an evacuated chamber (i.e. vacuum bottle). There is generally one fixed and one moving contact in a butting configuration. A bellows attached to the moving contact permits the required short stroke to occur while maintaining the vacuum. Arc interruption occurs at current zero after withdrawal of the moving contact. Vacuum breakers also are safe and protective of the environment.

SF_6 breakers interrupt currents by opening a blast valve and allowing high pressure SF_6 to flow through a nozzle along the arc drawn between fixed and moving contacts. This process rapidly deionizes, cools and interrupts the arc. After interruption, low-pressure gas is compressed for re-use in the next operation.

6.2.2 Asset Degradation

Circuit breakers “make” and “break” high currents and experience erosion caused by the arcing accompanying these operations. All circuit breakers undergo some contact degradation every time they open to interrupt an arc. Also, arcing produces heat and decomposition products that degrade surrounding insulation materials, nozzles, and interrupter chambers. The mechanical energy needed for the high contact velocities of these assets adds mechanical deterioration to their degradation processes.

Outdoor circuit breakers may experience adverse environmental conditions that influence their rate and severity of degradation. For outdoor mounted circuit breakers, the following represent additional degradation factors: Corrosion, Effects of moisture, Bushing/insulator deterioration and Mechanical.

Corrosion and moisture commonly cause degradation of internal insulation, breaker performance mechanisms and major components such as bushings, structural components and oil seals. Another widespread problem involves corrosion of operating mechanism linkages that result in eventual link seizures. Corrosion also causes damage to metal flanges, bushing hardware and support insulators.

Outdoor Circuit Breakers (OCB) experience moisture ingress through defective seals, gaskets, pressure relief and venting devices. Moisture in the interrupter tank can lead to general degradation of internal components.

Mechanical degradation presents greater end-of-life concerns than electrical degradation. Operating mechanisms, bearings, linkages, and drive rods represent components that experience most mechanical degradation problems. Other effects that arise with aging include loose primary and grounding connections, oil contamination and/or leakage (oil circuit breakers only) and deterioration of concrete foundation affecting stability of breaker.

For OCBs, the interruption of load and fault currents involves the reaction of high pressure with large volumes of hydrogen gas and other arc decomposition products. Thus, both contacts and oil degrade more rapidly in OCBs than they do in vacuum designs, especially when the OCB undergoes frequent switching operations. Generally, 4 to 8 fault interruptions with contact erosion and oil carbonization will lead to the need for maintenance, including oil filtration. Oil breakers can also experience restrike when switching low load or line charging currents with high recovery voltage values. Sometimes this can lead to catastrophic breaker failures.

6.2.3 Asset Class Demographics

Alectra's distribution system has 1271 installed circuit breakers at its stations, 231 of which are associated with transformer stations. Circuit breakers have a Typical Useful Life (TUL) of 40 years and are deemed to have reached End of Useful Life (EUL) at 60 years of age. Figure 33 shows the age demographics of circuit breakers at stations in Alectra's distribution system.

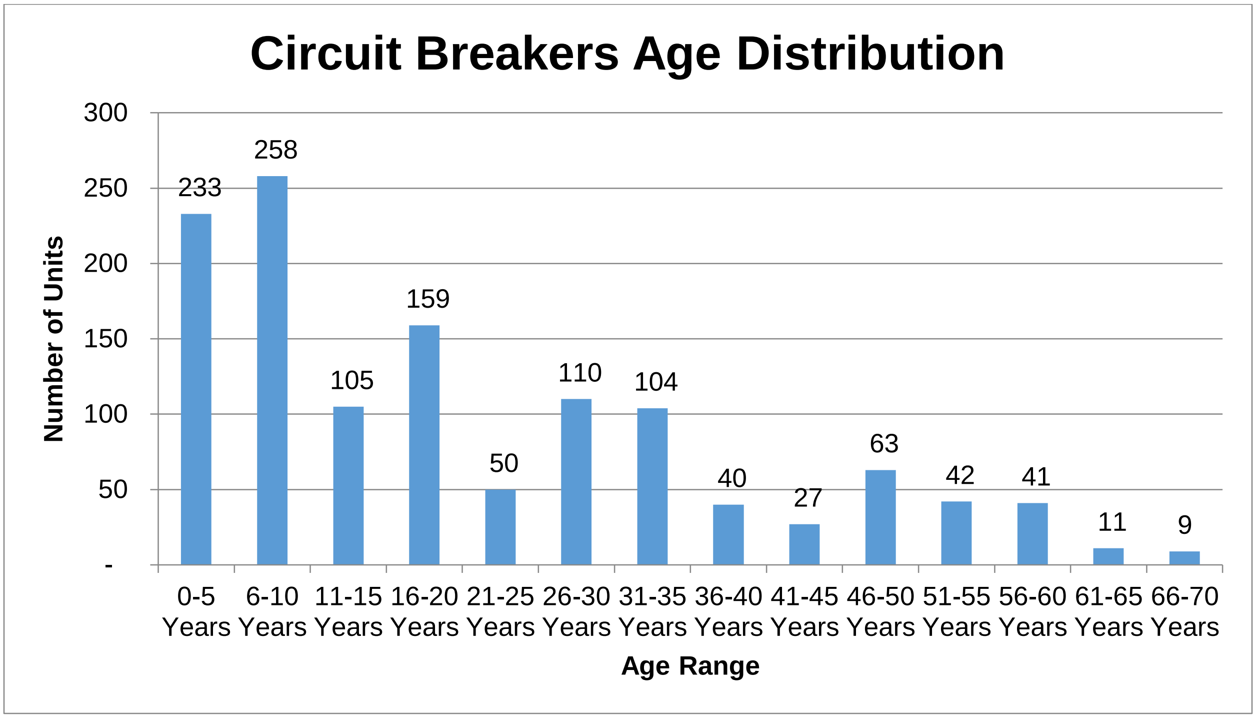

Figure 33 Circuit Breakers Age Distribution

6.2.4 Health Index Formula & Results

Health index of circuit breakers assesses the condition of the circuit breaker according to seven main components: Insulation, Operating mechanism, Contact performance, Arc extinction, Oil leaks (where applicable), overall performance and Age.

Age represents deterioration due to other factors not captured by the other components of the model. The TUL of a circuit breaker is 40 years and the maximum useful life, or EOL, is 60 years based on industry averages. The scoring method for age is based on the Gompertz-Makeham function where TUL and EUL correspond to 80% and 1% score, respectively.

The Health Index is computed by adding the weighted components of overall condition and age as shown in Table 25.

Table 25 Circuit Breakers Health Index Parameters and Weights

#	Input	Input Weight (OIL)	Input Weight (AIR)	Input Weight (Vacuum)	Input Weight (SF6)	Scoring Method
1	Insulation	4.8%	5.6%	7.4%	6.1%	Step Score
2	Operating Mechanism	33.3%	38.9%	25.9%	33.3%	Step Score
3	Contact Performance	16.7%	19.4%	26.0%	21.2%	Step Score
4	Arc Extinction	21.4%	16.7%	14.8%	18.2%	Step Score
5	Oil Leaks	7.1%	0.0%	0.0%	0.0%	Step Score
6	Overall Performance	12.5%	14.6%	19.4%	15.9%	Step Score
7	Age	4.2%	4.8%	6.5%	5.3%	Percentage Score

Obsolescence Multiplier

If a circuit breaker is deemed to be obsolescent in that it is no longer supported by the manufacturer, parts are no longer readily available and/or no longer meet current safety or performance standards, it will have a maximum Health Index of 50%.

$$Obsolescence\ multiplier = 50\%$$

Figure 34 shows the distribution of Health Index values of circuit breakers classified from Very Good to Very Poor. The average DAI is 72.6%.

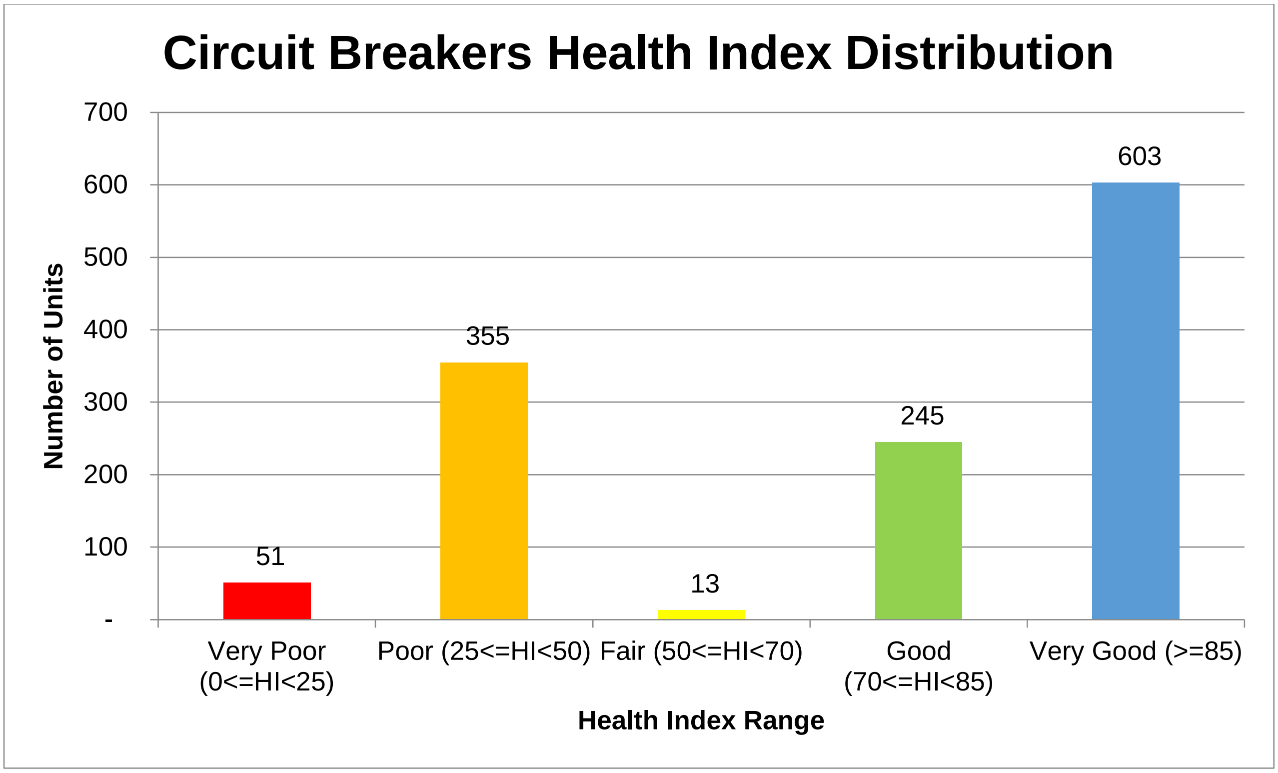

Figure 34 Circuit Breakers Health Index Distribution

6.3 Station Switchgear

6.3.1 Summary of Asset Class

Station Switchgear consists of an assembly of retractable/racked switchgear devices that are totally enclosed in a metal envelope (metal-enclosed). These devices operate in the medium-voltage range, from 4.16 to 34 kV. The switchgear includes breakers, disconnect switches, or fuse gear, current transformers (CTs), potential transformers (PTs) and occasionally some or all of the following: metering, protective relays, internal DC and AC power, battery charger(s), and AC station service transformation. The gear is modular in that each breaker is enclosed in its own metal envelope (cell). The gear also is compartmentalized with separate compartments for breakers, control, incoming/outgoing cables or bus duct, and bus-bars associated with each cell (circuit breakers analyzed separately).

6.3.2 Asset Degradation

Station switchgear degradation is a function of a number of different factors: mechanism operation and performance, degradation of solid insulation, general degradation/corrosion, environmental factors, or post fault maintenance (condition of contacts and arc control devices). Degradation of the breaker used is also a factor. However, the degradation mechanism differs slightly between switchgear types: air insulated and gas insulated.

The greatest cause of mal-operation of switchgear is related to mechanism malfunction. Deterioration due to corrosion or wear due to lubrication failure may compromise mechanical performance by either preventing or slowing down the operation of the breaker. This is a serious issue for all types of switchgear.

In older air-filled equipment, degradation of active solid insulation (for example, drive links) has been a significant problem for some types of switchgear. Some of the materials used in this equipment, particularly those manufactured using cellulose-based materials (pressboard, SRBP, laminated wood) are susceptible to moisture absorption. This results in a degradation of their dielectric properties that can result in thermal runaway or dielectric breakdown. An increasingly significant area of solid insulation degradation relates to the use of more modern polymeric insulation. Polymeric materials, which are now widely used in switchgear, are very susceptible to discharge damage. These electrical stresses must be controlled to prevent any discharge activity in the vicinity of polymeric material. Failures of relatively new switchgear due to discharge damage and breakdown of polymeric insulation have been relatively common over the past 15 years.

Temperature, humidity and air pollution are also significant degradation factors. The safe and efficient operation of switchgear and its longevity may all be significantly compromised if the station environment is not adequately controlled.

6.3.3 Asset Class Demographics

Alectra's distribution system has 356 station switchgear. Station switchgear have a Typical Useful Life (TUL) of 40 years and are deemed to have reached End of Useful Life (EUL) at 60 years of age. Figure 35 shows the age demographics of station switchgear in Alectra's distribution system.

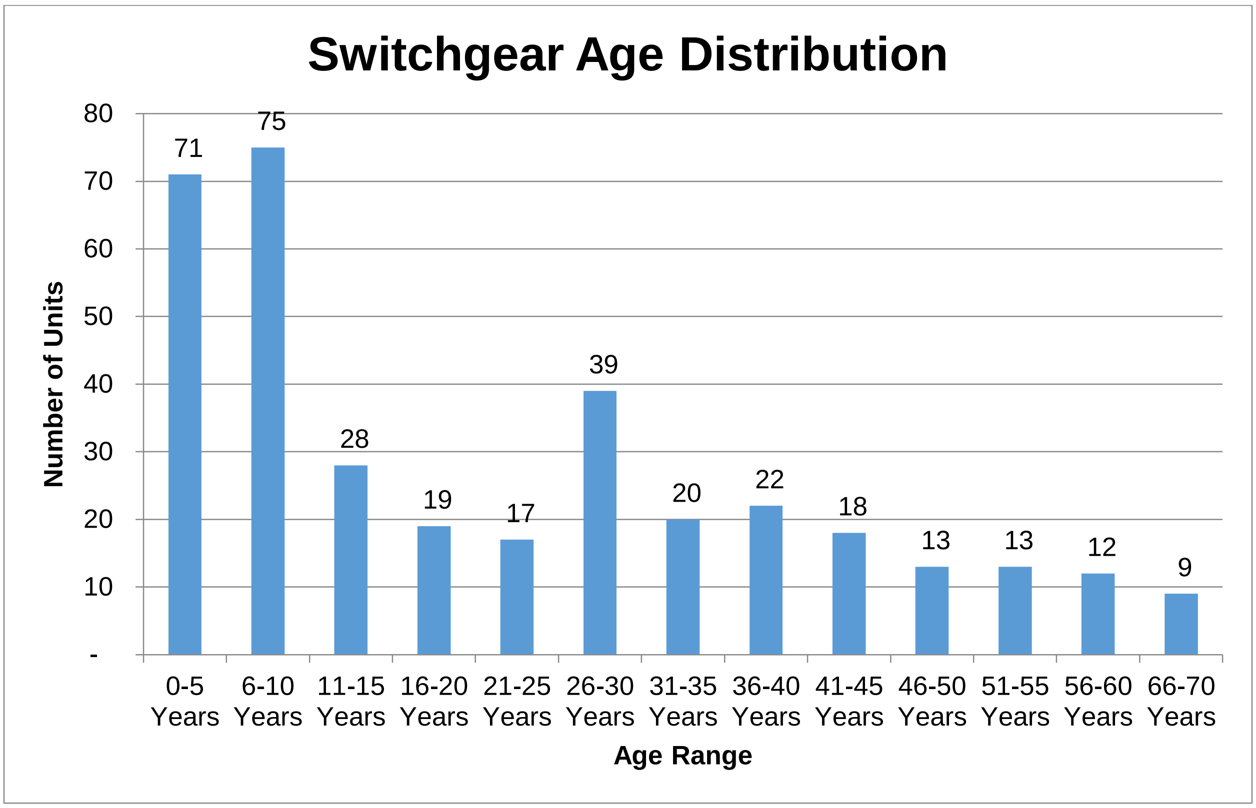

Figure 35 Station Switchgear Age Distribution

6.3.4 Health Index Formula & Results

Health index of station switchgear assesses the condition of the switchgear according to five main components: Enclosure condition, Bus and cable compartment, Low-voltage compartment, Overall Performance and Age (circuit breakers analyzed separately).

Age represents deterioration due to other factors not captured by the other components of the model. The TUL of station switchgear is 40 years and the maximum useful life, or EOL, is 60 years based on industry averages. The scoring method for age is based on the Gompertz-Makeham function where TUL and EUL correspond to 80% and 1% score, respectively.

The Health Index is computed by adding the weighted components of overall condition and age as shown in Table 26.

Table 26 Station Switchgear Health Index Parameters and Weights

#	Input	Input Weight	Scoring Method
1	Enclosure Condition	25%	Step Score
2	Bus & Cable Compartment	37.5%	Step Score
3	Low-Voltage Compartment	12.5%	Step Score
4	Overall Performance	18.75%	Step Score
5	Age	6.25%	Percentage Score

Figure 36 shows the distribution of Health Index values of station switchgear classified from Very Good to Very Poor. The average DAI is 85.2%.

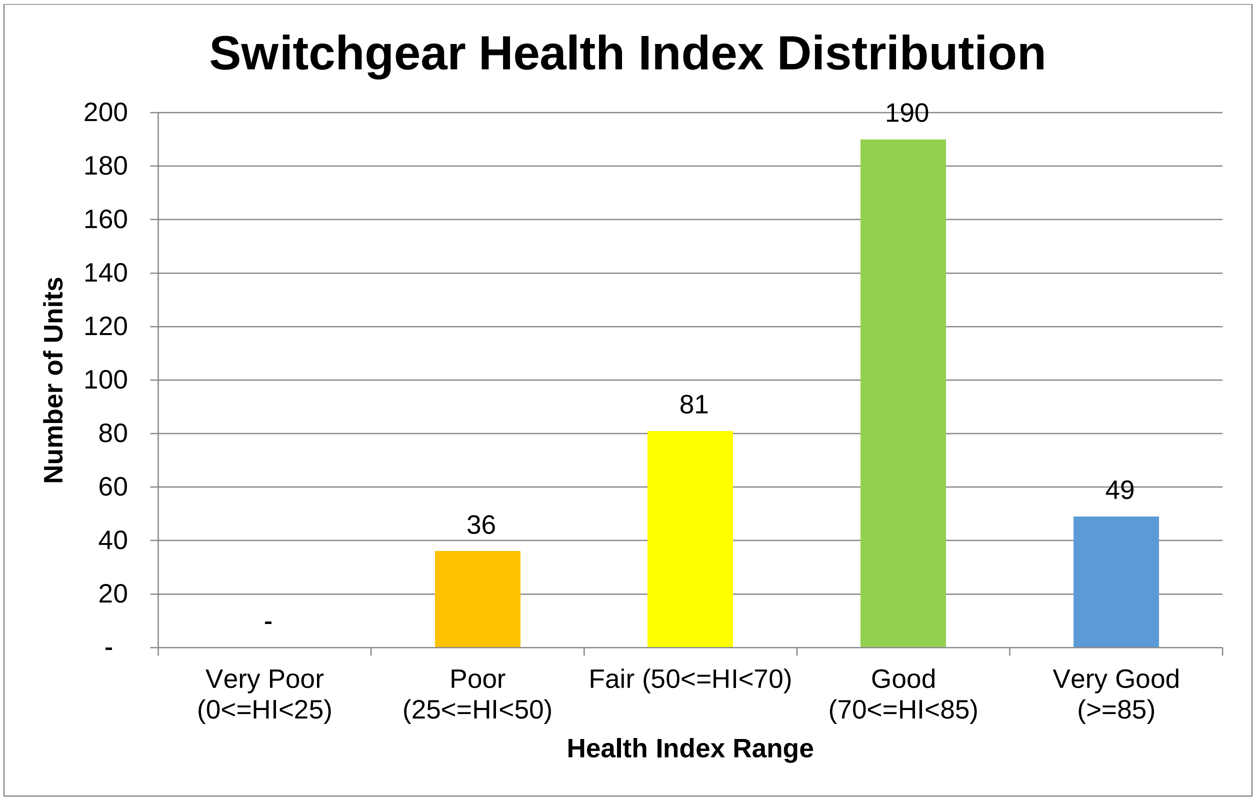

Figure 36 Station Switchgear Health Index Distribution

Appendix E

Kinectrics Inc. ACA Assurance Review

Alectra Utilities

Distribution System Plan (2020-2024)

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November 30, 2018

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Dear Mr. Wasik,

Kinectrics has completed its independent review of Alectra Utilities Corporation's (Alectra's) 2018 ACA. The 'Consultant Report' provided documents Kinectric's observations, findings, and recommendations as an independent industry expert in the area of Asset Management.

Kinectrics concluded that Alectra's ACA is aligned with good utility practices. The processes, methodologies, and results are appropriate in serving as the basis for identifying system sustainment needs.

Should you have any questions or comments regarding this report, please do not hesitate to contact me.

Sincerely,

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1 INTRODUCTION

Alectra Utilities Corporation (Alectra) is an electrical utility and distributor that serves approximately one million customers in several municipalities in Ontario, from the shores of Lake Ontario to the town of Penetanguishene located along the southeastern shores of Georgian Bay. The company was formed in 2017 by the merger of the municipally-owned utilities Enersource (serving Mississauga), Horizon Utilities (serving Hamilton and St. Catharines), and PowerStream (serving portions of York Region and Simcoe County), as well as the acquisition of provincially-owned utility Brampton Hydro (serving Brampton). Alectra manages a multi-billion dollar asset base spanning a significant service territory. In 2019, the municipally-owned Guelph Hydro (serving Guelph and Rockwood) will also merge with Alectra.

Asset Condition Assessment (ACA), a component of Asset Management, is a process that determines asset condition and facilitates identification of a utility's sustainment needs. Each of the five legacy utilities conducted its own ACA prior to the formation of Alectra. Because the legacy utilities had different maintenance and data management practices, each utility had its own ACA methodology. Therefore, Alectra spent considerable efforts harmonizing the ACA processes of the legacy utilities (including Guelph) to develop a single harmonized ACA process for Alectra's major substation and distribution electric assets. The findings of the harmonized ACA are documented in Alectra's 2018 ACA report.

At the request of Alectra, Kinectrics was engaged to conduct a third party review of Alectra's in-house harmonized ACA. Kinectrics is an independent third party engineering firm, whose Asset Management expertise ranges from conducting ACAs, developing investment prioritization methodologies, providing OEB regulatory support, and to acting as a Vendor of Record for the OEB in assessing DSPs of Ontario Local Distribution Companies (LDCs).

This 'Consultant Report' documents Kinectric's observations, findings, and recommendations as an independent industry expert in the area of Asset Management.

2 SCOPE

The following were conducted as part of Kinectrics' assessment:

- Review of Alectra's ACA processes and methodology
- Review of data harmonization methodology and assumptions
- Review of Health Index models and assumptions
- Review of sustainment selection methodology and assumptions
- Review of the proposed paced sustainment plan derived from the ACA
- Comparison of Alectra's in-house ACA with industry Asset Management practices

3 OBSERVATIONS AND EVALUATION

As part of the review process, Kinectrics was provided with Alectra's 2018 ACA report, as well as supporting information, that described the ACA methodology, harmonization process, HI model, sustainment methodologies, and assumptions used.

The 2018 ACA included major electric assets, categorized as substation (within the confines of a transmission or municipal substation) or distribution (outside of the station fence). The assets included in Alectra's 2018 ACA are listed in Table 3-1. The asset inventory is based on Alectra's 2018 data.

Table 3-1 Assets Included in Alectra's 2018 ACA

Distribution Assets	Station Assets
Pole mounted transformers Pad mounted transformers Vault type transformers Distribution switchgear Overhead switches Overhead conductors Wood poles Concrete poles Underground primary cables	Power transformers Circuit breakers Station switchgear

Each of the five legacy utilities conducted its own ACA prior to the formation of Alectra. Because the legacy utilities had different maintenance and data management practices, each utility had its own ACA methodology. This included different data interpretation, HI formulas, and scoring systems. As a result, Alectra evaluated the ACA methods used by legacy utilities and developed a corporate-wide harmonized ACA process. Alectra's 2018 ACA serves as the basis for identifying system sustainment needs, as well as the baseline for future ACAs.

3.1 Intended Use of ACA

This ACA was developed to provide a major input into identifying Alectra's system sustainment needs, as well as to support the regulatory filing requirements as mandated by the OEB.

Specifically, this ACA report determines condition based requirements for each of the asset categories assessed. These requirements could then be combined with other considerations, such as municipal projects (e.g. road widening), obsolescence, maintainability, voltage conversion plans, safety and environmental concerns, customer preference, etc. in order to produce portfolios of investments aimed at sustaining distribution system's asset base.

Once specific assets were identified as needing attention, Alectra used several sustaining strategies on a case by case basis, namely:

- Further Assessment
- Planned replacements
- Maintenance or rehabilitation
- Continue to monitor
- Run to failure

Kinectrics deems these to be acceptable strategies since in many cases replacement is not necessarily the most viable alternative to mitigate the identified issue or problem as mitigating actions could be capital or O&M in nature.

Alectra uses two different approaches in identifying systems sustainment needs:

- For Distribution assets, ACA results are provided to Alectra's SMEs so that they can prepare business cases. The business cases are based on the number of assets in each of the asset category that require action. These business cases are then included in the COPPERLEAF C55 platform for prioritization.

- For Station assets, ACA results for individual assets within each station are first grouped at the station level. Thereafter, SMEs prepare business cases on an individual station basis. These business cases are then included in the COPPERLEAF C55 platform for prioritization, along with the business cases for distribution assets.

The use of identified condition based asset needs in conjunction with other non-condition driven considerations to develop a prioritized portfolio of investments is in alignment with good industry practices. This approach has been extensively used in Ontario by other LDCs in identifying and prioritizing their sustainment needs, and has been used in support of their DSP.

3.2 ACA Methodology

ACA involves the process of determining the asset Health Index (HI), as well as developing a condition-based sustainment plan for each asset group.

3.2.1 Health Index Methodology

In the Alectra ACA process, the HI is used as an analytical model that quantifies asset condition in a consistent manner. The HI formula is structured as a sum-product of input weights and input scores as shown in Equation 1. The HI value ranges from 0% through 100%, which respectively represents worst through best condition.

$$HealthIndex = \frac{\sum_{i=1}^{n}(InputWeight_i \times InputScore_i)}{\sum_{i=1}^{n} InputWeight_i} \times ConditionMultiplier$$

Equation 1

Alectra's selected method for representing asset relative health as a HI is common and widely accepted utility practice. The 0%-100% scoring system provides an intuitive ranking of relative condition.

Input Data

To develop a harmonized HI model, Alectra selected a set of unified 'inputs' for each asset category. Since the legacy utilities had different maintenance and data management practices and therefore different 'inputs', the HI harmonization process involved identifying and using common 'inputs' across all the legacy utilities. The 'inputs' selected for the harmonized model are appropriate indicators of asset degradation, ensuring that Alectra's HI methodology appropriately identifies problematic assets.

The data sources for the 'inputs' to the HI calculation include service record information, GIS data, maintenance and visual inspection records, test results, and subject matter expert (SME) input. These are a common source of asset condition information in electric utilities.

Input Weight

In Alectra's HI formulas, the more impactful an 'input' is in indicating asset degradation, the higher the 'input' weight. This is an appropriate approach to assigning the weight to an 'input'.

Input Score

The ‘input’ is scored in one of two ways: 1) step score and 2) percentage score. The step scoring system uses discrete points that range from 0-5 and 0-4 for distribution and station assets respectively. This scoring approach is reasonable and allows for translation of discrete inputs such as field inspections data. Percentage scoring is continuous scoring of an ‘input’. Examples are pole residual strength (0% through 100% inclusive) and asset age score (which is a function of time). This scoring approach allows for representation of non-discrete measurements or data.

Alectra does not currently have asset degradation curves. Therefore, for the age scoring system of each asset category, Alectra selected a continuous function rooted in the assumption that asset failures increase exponentially with age. Where utility-specific empirically derived asset degradation curves are unavailable, this provides a good representation of service life. This model is commonly used by utilities with limited failure statistics.

The cumulative distribution function that describes Alectra’s asset age score is dictated by the assumption the age score is 80% when an asset age is at the Typical useful Life (TUL) and 1% at the Maximum Useful Life (Max UL). The TUL and Max UL ages for each asset class is taken form the ’Asset Depreciation Study for the Ontario Energy Board’. In the absence of Alectra-specific statistics, use of the OEB TUL and Max UL values is reasonable, given that they are based on surveys of multiple utilities in Ontario, including some of the Alectra legacy utilities.

Condition Multiplier

To account for major degradation or imminent asset failure, Alectra applied a condition multiplier to limit an asset’s maximum HI score. Condition multipliers are reflective of dominant inputs that significantly impact an asset’s health. Examples are wood pole residual strength or a field inspection results indicating that an asset has undergone major degradation.

The use of such multipliers is good practice. Because the HI is a composite of numerous inputs, there is a possibility that an asset that has a low dominant input score has a high overall HI score (i.e. dominant input has a low score while other inputs have high scores). Applying a condition multiplier therefore ensures that inputs representing dominant problematic conditions are appropriately captured.

Data Availability

For assets that have condition-related input (i.e. more than age information), a data availability indicator (DAI), which ranges from 0% - 100%, is calculated. The DAI represents the completeness of 'input' data, relative to the 'inputs' used in the HI formula.

This is a reasonable means of assessing the completeness of current 'input' data in the harmonized models.

HI Categorization

The HI of each asset is expressed as a percentage. To enable identification of groups within an asset class that exhibit similar characteristics, assets are categorized as shown below.

Very Poor	Health Index < 25%
Poor	25 $\leq$ Health Index < 50%
Fair	50 $\leq$ Health Index <70%
Good	70 $\leq$ Health Index <85%
Very Good	Health Index $\geq$ 85%

This categorization is widely used in the industry and provides a good means of visualizing the overall status of an asset category.

HI Implementation

In past ACAs, legacy utilities used Microsoft Excel to perform HI computations. This posed some challenges, including use of large and complex workbooks, speed of computations, and versioning issues. Alectra's harmonized computations are conducted in a Relational Database using of SQL. This resulted in numerous improvements, namely integration of multiple data sources, centralized storage, multiple user access, versioning control, and development agility.

3.2.2 Identifying Sustainment Needs

Identification of asset quantities that require action differs between distribution and station assets. For both asset types, sustainment needs are identified for a 5 year period to allow for levelized pacing over the planning period.

Distribution Assets

From a system sustainment perspective, Alectra aligned its sustainment outlook horizons to match a 5-year cycle of the Ontario Energy Board's Distribution System Plan. Three possible planning terms were introduced as shown in Table 3-2.

Table 3-2 Pacing for Distribution Assets

Pace	Description	Quantity per Year
Baseline pace	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years}$
Moderate pace	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years}$
Slow pace	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years}$

This method is based on the premise that all poor/very poor assets will require attention in the next 5 to 10 years. With this being the first year of Alectra's harmonized ACA, this is an appropriate assumption since assets in poor/very poor condition are typically approaching their end of life.

Station Assets

Station asset sustainment initiatives are identified by means of a risk-based, station centric approach. This means that sustainment levels for individual asset categories are not calculated. Rather, SMEs consider the HI of multiple station assets as well as multiple other factors with the objective of mitigating risk. Evaluation of the sustainment methodology for stations is beyond the scope of this assessment. However, Kinectrics agrees that using a risk-based approach and incorporating multiple considerations into decision making is a prudent industry accepted strategy.

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4 CONCLUSIONS

Below are Kinectrics' conclusions.

1. Kinectrics conducted a review of Alectra's 2018 ACA. The review was based on Alectra's 2018 ACA report, as well as supporting information that described the legacy utility harmonization process and ACA methodology.

2. Alectra's in-house ACA report represents the initial effort to harmonize ACAs from the legacy utilities, including Guelph, and as such will serve as the baseline for future ACAs

3. The focus was to evaluate the methodology used, and the ability of the results to fulfil their main intended purpose, i.e. support sustainment requirements. Kinectrics evaluated the following aspects of ACA methodology:
    - HI structure and general formulas
    - Input scores and weights
    - Input data sources
    - HI implementation process
    - Sustainment process

    The review did not include validation of inputs and auditing of the calculated results.

4. The ACA should fulfill its intended function, as described in Section 3.1. It represents a significant step in establishing corporate-wide, consistent Asset Management processes.

5. ACA methodology utilized in the report is in line with good utility practices. It provides the required input regarding condition based assets needs. ACA results are used in conjunction with other considerations to develop investment portfolios that address Alectra's sustainment needs.

5 RECOMMENDATIONS

Kinectrics recognizes that this is Alectra's harmonized ACA following its formation. Kinectrics recommends that Alectra implement a continuous improvement process that would better align it with the leading Asset Management practices:

1. Models Improvement

    a) Develop Alectra-specific degradation curves based on failure statistics. These degradation curves will provide a more representative age scoring model.

    b) Develop HI models for some asset sub-categories. For example, different models can be developed for wood poles of different treatment and species, different circuit breaker types, etc.

    c) Continue to update HI models to incorporate additional 'inputs', such as test result trends, loading, and Alectra-wide maintenance, inspection, and data collection practices.

    d) The sustainment pacing for distribution assets focuses on addressing poor and very poor units. A future improvement to the pacing strategy would be to consider all HI bands while taking into account the probabilistic nature of failures.

2. Condition Data Improvement - Continue increasing the DAI by collecting more data in each asset category through inspection cycles.

3. Implementation/execution - Alectra's ACA computations are conducted in a Relational Database using SQL. This is a definite improvement over using Microsoft Excel, which is the traditional approach of the vast majority of utilities. Nevertheless, Alectra would benefit from implementing an Asset Management platform. Such a platform will allow for seamless integration of input data from different sources, incorporation of real time information, and reporting on demand.