SEC-1

Reference: General

Please provide a copy of all material provided to the Applicant's Board of Directors or any of its committees regarding cable replacement or injection activities planned for 2023 or 2024, whether part of the ICM projects or otherwise.

Response:

Cable replacement or injection activities planned for 2023 or 2024 were identified in Alectra Utilities' capital investment plan submitted to the Audit Finance & Risk Committee for approval by the Alectra Utilities Board as part of the overall Financial Plan for Alectra Utilities. The Capital Investment Plan portion of the Financial Plan is at Attachment 1 wherein references to cable replacement or injection are highlighted.

SEC-1

Attachment 1
Capital Plan AFRM

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7.0 Capital Plan

7.1 Alectra Utilities Corporation Capital Plan

The AUC CIP for 2022 Plan was developed based on the 2020-2024 DSP and includes certain new investments identified in 2021. The CIP Process is described in Section 1.3 of the 2022-2026 Financial Plan Supplemental Information package.

The 2022-2026 CIP has been adjusted to mitigate the $265.0MM of incremental DSP capital funding requirements that were not approved due to the OEB denial of AUC's "M-Factor" application. The impact of the adjustment was deferral of substantial investment in system renewal and system expansion. The adjusted CIP aligns with AUC's strategy to enhance customer experience, modernize the grid, and enable growth of communities in AUC's service area. Furthermore, the CIP strives to maintain assets in a manner that: (i) delivers sustainable value; (ii) mitigates risks; (iii) complies with regulations, codes, and standards; and (iv) meets corporate performance targets.

This notwithstanding, the OEB invited AUC to consider a multi-year ICM for capital investments that meet its ICM criteria, although the scope of qualifying projects will be a fraction of the $265.0MM identified in the DSP as explained above. AUC plans to file a multi-year ICM application in 2022 for eligible capital investments. AUC has capital investment needs in the PowerStream and Enersource RZ due to declining reliability in these areas that is largely driven by deteriorated assets. AUC requires $15.0MM in each year from 2023-2026 to fund incremental cable renewal capital investments. The cumulative revenue requirement over the Plan period associated with the incremental capital is $11.2MM.

AUC identified the need for cable renewal investment in its 2018 EDR application. In its decision, the OEB stated that ICM funding was not available for typical annual capital programs and denied funding for these projects. In 2019, AUC filed an “M-Factor” application for required distribution rate increases to fund the aggregate of $265.0MM of incremental capital requirements identified in the DSP. This included $35.0MM for incremental cable renewal investments. However, the OEB denied Alectra’s M-Factor request. Due to the uncertainty associated with OEB approvals, the 2022 Plan does not include incremental capital investment, nor the corresponding incremental funding.

2022-2026 Core Capital Expenditure Plan

The five-year capital expenditure plan is organized within four categories corresponding to the OEB’s Renewed Framework for Electricity Distributors. Considering all investment categories and RZ, the total core capital expenditure program is expected to be $1,276.4MM over the 2022-2025 period as outlined in Table 54 below (excluding transition capital and the Kennedy Road South facility capital expenditure).

The priority areas of capital investment for the 2022 Financial Plan are the following:

(i) Enhancing the customer experience;

(ii) Infrastructure renewal to improve reliability (underground cables, storm resiliency);

(iii) Supporting growth and development of communities;

(iv) Optimization of operations, driving productivity and business intelligence; and

(v) Grid modernization through automation, digitization, and system flexibility. Management is seeking approval for 2022 total net capital expenditures of $292.9MM. The table below provides a breakdown of capital expenditures, including the I/ (D) ("increase/ (decrease)") relative to the 2021 Plan. The values provided in the table below are inclusive of transitional capital investments and Kennedy Road Operational Centre.

Table 54: Alectra Utilities Corporation 2022-2026 Net Capital Expenditures ($MMs)

	2021	2022	2023	2024	2025	Total	2026
System access	172.3	150.6	129.1	126.4	126.5	**704.9**	125.5
System renewal	129.7	115.3	120.8	130.8	130.9	**627.5**	133.3
System service	30.8	27.3	28.9	25.6	36.4	**149.0**	39.1
Gross distribution system capital	**332.8**	**293.2**	**278.8**	**282.8**	**293.8**	**1,481.4**	**297.9**
Capital contributions	(99.6)	(87.0)	(71.0)	(68.6)	(63.9)	**(390.1)**	(60.2)
Net distribution system capital	**233.2**	**206.2**	**207.8**	**214.2**	**229.9**	**1,091.3**	**237.7**
General plant - core	33.6	40.9	41.7	37.4	31.5	**185.1**	34.2
Total net core capital	**266.8**	**247.1**	**249.5**	**251.6**	**261.4**	**1,276.4**	**271.9**
Transition capital	10.6	8.6	4.4	—	—	**23.6**	—
Kennedy Road South	3.5	37.2	11.0	—	—	**51.7**	—
2022 Plan	**280.9**	**292.9**	**264.9**	**251.6**	**261.4**	**1,351.7**	**271.9**
2021 Plan	285.3	274.7	256.1	268.1	277.0	**1,361.2**	NA
Variance - I / (D)	**(4.4)**	**18.2**	**8.8**	**(16.5)**	**(15.6)**	**(9.5)**	**NA**

Alectra Utilities Corporation Capital Plan over Plan Analysis

AUC capital expenditures are expected to decrease by $9.5MM relative to the 2021 Plan, primarily attributable to: (i) lower system service ("SS") expenditures ($26.3MM); and (ii) lower SA expenditures ($26.1MM); partially offset by: (iii) higher SA expenditures ($24.1MM); (iv) higher Kennedy Road Operational Centre expenditures ($9.6MM); (v) higher Transition capital ($6.3MM); and (vi) higher General Plant capital ($2.9MM).

The table below provides a breakdown of the expected net capital expenditures for the 2022 plan relative to the 2021 Plan by category.

Table 55: Alectra Utilities Corporation 2022 Plan vs. 2021 Plan Capital Expenditure Variances by Category ($MMs)

	2021	2022	2023	2024	2025	Total
2022 Plan	**280.9**	**292.9**	**264.9**	**251.6**	**261.4**	**1,351.7**
2021 Plan	285.3	274.7	256.1	268.1	277.0	1,361.2
Variance - I / (D)	**(4.4)**	**18.2**	**8.8**	**(16.5)**	**(15.6)**	**(9.5)**
Changes to Capital Expenditures:						
Changes to core capital:						
System service	9.0	(2.7)	(3.0)	(15.0)	(14.6)	**(26.3)**
System renewal	2.8	(11.9)	(6.6)	(10.9)	0.5	**(26.1)**
System access	8.9	6.2	4.0	2.7	2.3	**24.1**
General plant - core	(4.2)	0.9	3.3	6.7	(3.8)	**2.9**
Total net core capital changes	**16.5**	**(7.5)**	**(2.3)**	**(16.5)**	**(15.6)**	**(25.4)**
Kennedy Road South	(18.1)	21.0	6.7	—	—	**9.6**
Transition capital	(2.8)	4.7	4.4	—	—	**6.3**
Variance - I / (D)	**(4.4)**	**18.2**	**8.8**	**(16.5)**	**(15.6)**	**(9.5)**

Plan over plan analysis and key assumptions are detailed below.

System Service

System Service Plan over Plan Analysis

System Service ("SS") net expenditures are expected to decrease by $26.3MM relative to the 2021 Plan, principally attributable to: (i) the deferral of a lines and stations capacity project due to lack of available incremental capital funding and the uncertainty of future developments stemming from the economic slowdown caused by the Pandemic ($19.4MM); and (ii) the lower net investment in automation resulting from Natural Resources Canada (NRCAN) subsidies ($5.2MM). The slower pace of planned system expansion investments requires AUC to manage system expansion through an on-demand basis.

System Service Key Assumptions

SS investments are modifications to the distribution system to ensure the distribution system continues to meet operational objectives while addressing anticipated future service capacity and reliability. SS investments enhance the distribution systems grid flexibility to meet anticipated future customer electricity service requirements, including distributed generation and storage. Investments in SS include: (i) modernization of protection and control systems to ensure the safe and reliable operation of the system; (ii) system station investments necessary to maintain the safe and efficient delivery of electrical service to customers; and (iii) investments in system automation and remote

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operating capabilities to permit expedient restoration of service in times of unforeseen outages. Drivers for SS requirements include requirements to continue to provide safe, reliable, and quality electrical supply to customers as well as expansion or intensification of system capacity into high growth areas.

Over the five-year period of 2022-2026, AUC plans to invest $64.6MM in system connection to support growth of residential, commercial, and industrial customers. These lines capacity projects include redevelopment areas such Port Credit, and intensification in the downtown area of Mississauga. AUC is also expanding the system to support greenfield growth including those in Brampton, Vaughan, and Markham areas. Additional investments will address municipal station upgrades and system automation.

The following table outlines the core capital expenditures in SS, excluding any capital transition and/ or synergies.

Table 56: Alectra Utilities Corporation 2022-2026 Net Capital Expenditure: System Service ($MMs)

	2021	2022	2023	2024	2025	Total	2026
Capacity (lines)	7.5	11.0	12.5	11.1	15.5	**57.6**	15.8
SCADA & automation	8.5	6.5	6.9	7.2	7.7	**36.8**	7.8
System control, communications & performance	4.6	5.6	5.8	3.8	3.1	**22.9**	3.0
Capacity (stations)	6.7	1.2	0.7	0.9	7.4	**16.9**	10.3
Safety & security	2.4	1.7	1.6	1.3	1.5	**8.5**	0.9
DER integration	1.1	1.3	1.4	1.3	1.2	**6.3**	1.3
Total gross system service	**30.8**	**27.3**	**28.9**	**25.6**	**36.4**	**149.0**	**39.1**
Capital contributions	(1.1)	(5.6)	(6.1)	(5.2)	(5.2)	**(23.2)**	(0.2)
2022 Plan	**29.7**	**21.7**	**22.8**	**20.4**	**31.2**	**125.8**	**38.9**
2021 Plan	20.7	24.4	25.8	35.4	45.8	152.1	NA
Variance - I / (D)	**9.0**	**(2.7)**	**(3.0)**	**(15.0)**	**(14.6)**	**(26.3)**	**NA**

In Hamilton, the City and the Hamilton Port Authority is repurposing 1,000 acres of former industrial land to build high and medium density residential and commercial properties. In Mississauga, the former industrial and oil refinery lands by the waterfront are being re-purposed and developed for housing and commercial purposing adding hundreds of acres of residential property to the GTA area. In total, 306 acres of development land is proposed to be redeveloped to provide housing for 31,000 people and provide 14,000 jobs. In the Square One area of Mississauga, construction is currently underway to add high density residential and commercial space. Once completed, the 730 acres of development land is planned to house a population of 22,500 people and provide 12,000 jobs. Similarly, development of the Vaughan Metropolitan Centre will include 1,680 acres of development lands as well as high density residential and commercial developments that are projected to house a population of 25,000 people and provide 32,000 jobs.

System expansion investments in lines and station capacity in AUC's 2022-2026 CIP were reduced from the investment levels identified in the DSP in order to balance capital investment levels to available funding providing by distribution rates and incremental funding provided by eligible ICM projects. As a result, funding will be available to address only the most urgent system connection needs and will increasingly depend on the development of other emerging technologies to offset deferrals of connection projects.

In order to mitigate capacity shortfall risks, AUC has identified investments that will avoid some capacity additions and utilize existing resources more effectively. AUC plans to make targeted investments in establishing additional connections between adjacent legacy systems to assist it in balancing loads more effectively, thereby enabling the deferral of more costly system expansions. To further increase utilization of its assets, AUC plans to focus investment on renewal of key equipment associated with controlling, monitoring, and protecting core system assets. Much of this equipment is deteriorated and obsolete, adversely affecting reliability and/or the ability to transmit key operating information.

In alignment with Strategy 2.0 and the objective of Grid Modernization and Information Digitalization, Alectra Utilities has set a target of 462 net new distributed automated devices to be placed in service from 2022-2026. In order to achieve this target increased funding beyond what was originally forecasted is required. Without these funds AUC will be unable to achieve its target. Project budget is net based on expected subsidy by Natural Resources Canada ("NRCAN") for distribution automation.

System Renewal

System Renewal Plan over Plan Analysis

SR net expenditures are expected to decrease by $26.1MM relative to the 2021 Plan, principally attributable to: (i) the deferral of projects to mitigate the lower available funding including the transfer equipment from rear to front lot ($22.1MM); (ii) station switchgear replacements ($19.8MM); and (iii) overhead asset replacement projects ($7.3MM); partially offset by (iv) the increased pace of underground renewal investments in response to reliability issues discussed below ($23.1MM). The slower pace of planned system renewal investments requires AUC to manage the growing backlog of deteriorated assets in a reactive manner. Without increased investment in system renewals, AUC expects that annual average system duration of outages will worsen over the 2022-2026 period by 22.0%.

System Renewal Key Assumptions

Over the past five years, AUC customers have experienced an increase in the duration and frequency of outages. Excluding major event day ("MED") outages over the 2016-2020 period, AUC customers experienced a 4.5% annual average increase in outage duration, and a 2.5% annual average increase in outage frequency. Examination of outage causes over the five years indicates that defective equipment is the leading cause of both the duration and frequency of outages. To address this trend, the company has identified and established plans to implement urgent and prudent solutions to renew significantly deteriorated and unreliable assets over the five-year planning period of the DSP. SR investments consist of projects that involve replacing or refurbishing system assets which extend the service life of the assets. For underground cables, which are the leading cause of defective

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equipment outages, AUC plans either to replace or, where feasible, to rehabilitate using silicone injection to extend the life of the cable.

The following table outlines the core capital expenditures in SR, excluding any transition expenditures.

Table 57: Alectra Utilities Corporation 2022-2026 Net Capital Expenditure: System Renewal ($MMs)

	2021	2022	2023	2024	2025	Total	2026
Underground asset renewal	56.7	47.9	49.6	52.9	57.3	**264.4**	62.5
Overhead asset renewal	37.6	35.7	38.8	44.9	40.8	**197.8**	36.2
Reactive capital	21.3	20.1	20.6	20.8	21.2	**104.0**	21.7
Transformer renewal	6.7	6.2	6.6	6.8	5.9	**32.2**	6.1
Substation renewal	7.2	4.4	4.7	4.4	5.2	**25.9**	3.9
Rear lot conversion	0.2	1.0	0.5	1.0	0.5	**3.2**	2.9
Total gross system renewal	**129.7**	**115.3**	**120.8**	**130.8**	**130.9**	**627.5**	**133.3**
Capital contributions	—	—	(0.7)	—	—	(0.7)	—
2022 Plan	**129.7**	**115.3**	**120.1**	**130.8**	**130.9**	**626.8**	**133.3**
2021 Plan	126.9	127.2	126.7	141.7	130.4	652.9	NA
Variance - I / (D)	**2.8**	**(11.9)**	**(6.6)**	**(10.9)**	**0.5**	**(26.1)**	**NA**

SR projects are identified and planned in a manner consistent with AUC investment principles. They represent investments in reactive repairs and replacements to the distribution system in response to failures or other damage, as well as investments in distribution system renewal in targeted asset categories to mitigate declining reliability due to asset failures and outages. Approximately 43.0% of the capital to be invested in SR projects are focused on underground asset renewal, which is the primary contributor to declining reliability performance on the system.

In developing the DSP, AUC examined the leading causes of controllable outages. Defective equipment, or equipment failure, and foreign interference (i.e. animal contacts, vehicle accidents, contractor dig-ins etc.) accounted for 57.0% of all customer outages. Defective equipment accounts for 42.0% of the controllable outages in the distribution system. Most of these outages are caused by failing cable, switching assets, and overhead equipment such as poles. A closer look at the asset condition health index for these assets identifies many assets in poor and very poor condition with an urgent requirement to be renewed. AUC has entered a critical juncture as it plans to deal with a period of heightened capital asset renewal, as a large population of deteriorating assets are reaching their end-of-life. The first generation of underground cable technology was installed in the early 1960s, coincident with the start of large scale municipal growth and expansion. AUC and predecessors have been renewing the oldest cables on its system for some time now, but a significant population of older underground cable assets are still currently in operation that are aged 40-60 years. These assets are first generation cable technology, also known as Cross Linked Polyethylene Cable ("XLPE"), most of which are beyond their useful life and in very poor condition. This first generation cable was buried directly in the ground which has led to early degradation. Removal and replacement of this cable is costly and disruptive and requires lengthy outages during the repair process. These cables must be dealt with as a matter of priority and urgency and cannot be deferred.

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Municipal growth and expansion continued at an exponential rate during the 1970s and accelerated during the 1980s. This growth was abruptly curtailed in the early 1990s due to an economic recession. The expansions during this period were mostly all installed with underground assets. This was, and continues to be, the standard for greenfield expansion. This period of high growth resulted in an asset bubble that is proving to be challenging on our available capital resources to effectively renew these assets under the current funding structure. For several years, AUC and its predecessor companies have been increasing capital investment in underground cable replacement, but it has proven to be challenging and insufficient to keep pace with the continual aging of the assets.

The DSP addresses the replacement of cable in poor or very poor condition in, largely, XLPE cables. The DSP also addresses some of the remaining population of cable installed between 1980-1990 that are eligible candidates for cable insulation injection to extend the life of the cable in this category. The cable injection technology is a viable mitigation opportunity; however, it must be performed prior to the point that insulation has not deteriorated beyond rehabilitation, or else injection will not be effective and the only solution is a complete replacement of the cable.

Underground system renewal investments in AUC's 2022-2026 CIP were reduced from the renewal investment levels identified in the DSP for AUC to balance capital investment levels to funding available through distribution rates and incremental funding provided by eligible ICM projects. As a result, AUC will prioritize available funding to address only the most deteriorated underground cable, maximize the opportunity to refurbish deteriorating cable with injection technology, and increase monitoring of failures to manage the risk of increasing cable failures that could lead to prolonged outages for customers. The planned 2022 CIP investment includes $270.2MM in underground equipment which includes cable replacement, cable injection and switchgear renewal.

Over the last five years, AUC has experienced increasing severity and duration of overhead system outages. Coupled with the fact that the company operates a large population of poles and associated hardware in poor and very poor conditions, these assets are susceptible to fail under severe adverse weather events. In order to address public and worker safety concerns, and reliability needs, AUC plans to invest in the replacement and remediation of overhead assets that are deteriorated or otherwise prone to failure from adverse weather conditions. A focus will be on renewing deteriorated poles that have been identified through AUC's Asset Condition Assessment process as being in poor or very poor condition, either through reinforcement or replacement. Reinforced replacement poles are more resilient to ice and wind loading standards. AUC plans to target a population of wood poles in circumstances where they carry four circuits as failure impacts a substantial number of customers. This investment is essential to mitigate the risk of frequent failures, and energized downed lines. The planned investment in overhead renewal over the five-year period 2022-2026 is $195.7MM.

System Access

System Access Plan over Plan Analysis

SA net expenditures are expected to increase by $24.1MM relative to the 2021 Plan, principally attributable to: (i) the increase in demand for the new customer connections including customer initiated projects such as the Urbacon Data Centre Expansions and McMaster Innovation Park ($16.7MM) and (ii) the increase in commercial subdivision demand largely in the East ($7.8MM).

System Access Key Assumptions

SA investments are comprised of projects that are considered mandatory and include investments pursuant to AUC's distribution license that are necessary to connect new customers and accommodate other infrastructure projects. Additionally, SA investments include the installation of metering assets pursuant to Measurement Canada and IESO requirements, the relocation of distribution system assets in accordance with requirements under the *Public Service Works on Highway Act*, as well as transmitter related upgrades driven by transmission system renewals and upgrades identified as part of regional planning initiatives.

The five-year SA investment plan for 2022-2026 is driven by the requirement to connect new residential and GS customers. The 2022 Plan includes net capital expenditures of $194.6MM, focused on connecting new customers. Significant investments in SA over the next five years are required to support road widening, and transit infrastructure projects, including the Hurontario Light Rail Transit and GO Electrification projects. The five-year planned investment in road authority work is $74.8MM net of capital contributions. The capital plan includes metering expenditures of $58.4MM necessary to install and maintain metering equipment pursuant to regulations as well as upgrades of specific commercial meters that currently do not support remote communication capability.

The following table outlines the core capital expenditures in SA, excluding any capital transition and/ or synergies.

Table 58: Alectra Utilities Corporation 2022-2026 Net Capital Expenditure: System Access ($MMs)

	2021	2022	2023	2024	2025	Total	2026
Customer connections	79.8	66.6	68.9	70.1	76.0	**361.4**	76.6
Road authority	30.5	25.9	25.5	22.3	22.7	**126.9**	21.2
Customer initiated projects	26.7	24.3	16.3	15.3	15.6	**98.2**	16.0
Network metering	13.9	11.2	11.6	11.7	12.2	**60.6**	11.7
Transit projects	19.9	21.3	5.6	5.8	—	**52.6**	—
Transmitter related upgrades	1.5	1.3	1.2	1.2	—	**5.2**	—
Total gross system access	**172.3**	**150.6**	**129.1**	**126.4**	**126.5**	**704.9**	**125.5**
Capital contributions	(98.5)	(81.4)	(64.2)	(63.4)	(58.7)	**(366.2)**	(60.0)
2022 Plan	**73.8**	**69.2**	**64.9**	**63.0**	**67.8**	**338.7**	**65.5**
2021 Plan	64.9	63.0	60.9	60.3	65.5	314.6	NA
Variance - I / (D)	**8.9**	**6.2**	**4.0**	**2.7**	**2.3**	**24.1**	**NA**

AUC's planned SA investments enable it to fulfill its responsibility meet its service obligations, including the safe, reliable, and prompt connection of customers, and the accurate metering and billing of customers. The pacing of SA investments in the CIP is primarily driven by the Company's projected connection and road authority demands. Individual projects have been identified and planned in a manner consistent with the guiding investment principles, particularly with respect to the objective of investing in system additions, and modifications where necessary to connect new customers and to ensure compliance with distribution license obligations.

General Plant

General Plant Plan over Plan analysis

Core General Plant

Core GP expenditures are expected to increase by $2.9MM relative to the 2021 Plan, principally attributable to timing of investments related to IT initiatives to support the CX enhancements.

Kennedy Road South

Kennedy Road South expenditures are expected to increase by $9.6MM relative to the 2021 Plan, principally attributable to a scope change to include solar panels, more efficient HVAC units, and a retaining wall requested by the city of Brampton.

Transition Capital

Transition capital expenditures are expected to increase by $6.3MM relative to the 2021 Plan, primarily attributable to: (i) increase Guelph ERP integration project costs ($3.6MM); (ii) higher than planned OMS convergence project costs for additional quality testing ($2.1MM); and (iii) delay in Alectra Phone System consolidation project from 2020 to 2021 ($0.5MM).

General Plant Key Assumptions

Core General Plant

Core GP investments support the day-to-day operation of the utility and involve assets that are not a direct part of the distribution system. GP assets principally include: (i) computer systems and software such as billing, ERP, and GIS; (ii) land, buildings, and furniture; and (iii) transportation equipment and tools necessary to perform operational and administrative business activities.

The 2022-2026 expenditure plan for GP is primarily driven by the need to enhance information systems to improve efficiency, advance innovative technology into practice, and renew aged and obsolete computing assets.

Over the five-year period, the GP plan includes:

(i) $107.7MM in computer hardware and software solutions, including $12.3MM for a CC&B upgrade in 2022-2023, five-year investments of $8.8MM, and $8.3MM to enhance the customer experience and to implement a work force management and mobile dispatch system, respectively;

(ii) $43.2MM in updated transportation equipment to support the ability of AUC crews to respond to the needs of the distribution system in an efficient and safe manner; and

(iii) $24.0MM in facility investments not including the Kennedy Road South project.

The following table outlines the core capital expenditures in GP, excluding transition capital.

Table 59: Alectra Utilities Corporation 2022-2026 Capital Expenditure: General Plant ($MMs)

	2021	2022	2023	2024	2025	Total	2026
Information technology	15.8	28.8	28.2	20.4	16.0	**109.2**	14.2
Fleet renewal	8.1	7.3	6.9	9.3	9.5	**41.1**	10.1
Facilities management	2.6	3.3	4.2	5.9	4.5	**20.5**	6.1
Tools, shop, and garage equipment	1.4	1.5	1.9	1.8	1.5	**8.1**	2.0
Connection Cost Recovery Agreement ("CCRAs")	5.7	—	0.5	—	—	**6.2**	1.8
2022 Plan	**33.6**	**40.9**	**41.7**	**37.4**	**31.5**	**185.1**	**34.2**
2021 Plan	37.8	40.0	38.4	30.7	35.3	182.2	NA
Variance - I / (D)	**(4.2)**	**0.9**	**3.3**	**6.7**	**(3.8)**	**2.9**	**NA**

Facilities management investments are focused on improvements that are integral to the proper functioning of assets and ongoing business operations. During the CIP period, AUC's focus is to: (i) to renew security cameras and access control equipment that have reached end-of-life and are technically obsolete; (ii) to renew elevator and generator systems; (iii) to renew HVAC systems for specific buildings; (iv) address issues affecting the building envelope which includes building foundation, walls, window, doors and roof; (v) address issues affecting outdoor walkways and driveways; and (vi) optimize work spaces and install new or refurbished workstations to meet AUC standards and accessibility requirements.

IT investments over the 2022-2026 planning period include the implementation of customer experience applications and processes, enhancement to systems to enable business optimization, necessary upgrades in IT security systems, and investments in ongoing IT infrastructure hardware to support efficient business operations and communications.

The CIP includes investment of $107.7MM over the planning period, of which $62.5MM is focused on applications and IT infrastructure to enable the implementation of the CX strategy as outlined in Strategy 2.0. Over the 2022-2023 period, AUC plans to upgrade the CC&B system platform ($12.3MM) to ensure that AUC maintains pace with vendor application versions releases and maintains eligibility for vendor support. Over the five-year planning period, AUC plans to invest $12.8MM to enhance and modify the CC&B system to drive operational productivity, reduce billing estimates, improve customer response effectiveness, and align with expected regulatory requirements to billing and collection practices. Other investments in the Customer Service IT systems include the planned purchase of additional application licenses ($2.3MM) and implementation of Robotic Process Automation ("RPA") to advance artificial intelligence technology onto high volume, and repeatable tasks ($1.3MM).

In addition to investment in CX applications, AUC plans to invest $9.3MM in the ERP system to support streamlined business process, ensure accurate reporting, and maintain pace of vendor releases for support eligibility. Continuous enhancement to the ERP system are expected to provide user experience improvements, resulting in expedient management, and reporting of financial processes and results.

CIP includes $19.8MM of investments in IT business optimization systems and platforms. Over the 2022-2026 planning period, AUC plans to implement a Workforce Management/ Mobile Dispatch system ("WFM") ($8.3MM) to digitize job scheduling, resource crew allocations, and computerize the dispatch of grid work to field crews. The system will enable increased granularity, tracking, and reporting of field crew schedules and performance. WFM is also expected to provide route optimization, and improve response time to short-duration field work which includes capital, maintenance, and reactive work. Additional IT business optimization investments includes enhancement to AUC's investment portfolio planning system ($5.2MM), and Copperleaf to align investment planning, optimization, and resource allocation to Strategy 2.0. Copperleaf is an industry leading investment planning application used by AUC to develop and optimize five-year investment plans. Investment to the Copperleaf application includes addition of complementary modules to enhance decision-making processes (including an enterprise asset management platform to manage assets throughout the operational lifecycle), enhanced data capture and user experience flow, updating of the investment value criteria model to ensure traditional and emerging investments are appropriately evaluated and incorporated into future CIPs, and other analytic, reporting, and forecasting capabilities to support decision making capabilities.

Over the 2022-2026 period, Alectra plans to invest $20.8MM to renew the IT hardware and communication infrastructure which includes refresh of laptops, desktops, servers, and networking equipment in order to support the organization requirements. With increased data storage requirements stemming from digitization and mobility of the workforce, Alectra plans to invest in upgrading data storage, and network equipment infrastructure ($3.1MM) over five-year planning period. In addition to on-going investments in IT infrastructure, CIP includes plans to invest $4.5MM in IT security systems and processes. The investment in IT security will mitigate the risk of data breaches, unauthorized system accesses, and protect the privacy of customer information.

The planned fleet renewal investments are necessary to manage the existing approximately 560 vehicles, 156 trailers, and other miscellaneous equipment used by AUC to perform daily activities and projects. Vehicle renewals that are either in poor condition, have high mileage/ engine usage, or have surpassed their end of life will be prioritized. AUC does not propose to increase the size of its fleet pool in the 2022 Plan.

Both the fleet and facility investment strategies are currently being reviewed in order to help Alectra meet our greenhouse gas reduction targets. Once the studies are complete the investment requirements will be revised in next year's Financial Plan accordingly to meet the objectives.

Investments in CCRAs refer to the contributions required to be made to Hydro One Networks Inc. ("HONI") to meet the revenue shortfall for the expansion of the Transformer Station ("TS") facilities that serve AUC RZs. Over the 2022-2026 CIP period, approximately $2.3MM will be required for stations where the incremental load forecasted in the CCRA document will be greater than the actual demand thereby creating a revenue shortfall for HONI, and triggering the requirement for a capital contribution from AUC. These capital contributions are included within GP as they are intangible assets and therefore do not fall within the other investment categories.

Smart Meter Renewal

Over the 2022-2026 CIP period, AUC is required to design, procure, and begin the replacement of the first generation of smart meter systems with the next-generation smart meter systems. The legacy distributors of AUC were part of the first wave of Ontario distributors to deploy smart meters starting in 2007. First-generation smart meter systems to enabled time-of-use billing and encouraged customers to shift their electricity usage to low peak periods. These first-generation smart meters are now approaching their end of useful life.

Smart meters are the base infrastructure for the development of a smart grid, leveraging information and communication technology to enhance the operation and utilization of the distribution system. Smart meter systems enable AUC to provide electricity customers with hourly consumption, time-of-use pricing, and the support for applying emerging and innovative energy management. Next-generation smart meters systems support and enable the Company's strategic pillars of evolving the grid, meeting growth, and enhancing customer experience. Over the 2022-2026 planning period, AUC will coordinate an effort with other LDC utilities to design, procure, and plan the deployment of the next-generation smart meter system. This initiative is at the early stages of exploration and design; thus, the regulatory recovery framework for the initiative has not yet been defined. The 2022 Plan does not include any capital costs related to the renewal of smart meters.

Transition Capital

The transition capital expenditures of $13.0MM are required to provide for the integration and consolidation of IT systems and processes and other integration initiatives. Over 2022-2026, capital related transition cost is primarily driven by: (i) delay in the start of the Guelph ERP integration project and an increase in costs as a result of increased complexity of the final solution ($5.1MM); (ii) delays of Guelph CIS integration costs from 2021 to 2023 ($4.1MM); (iii) delay of Alectra OMS convergence project from 2021 to 2022 due to additional quality testing ($3.4MM); (iv) delay of the Guelph IT integration project from 2021 to 2022 ($2.6MM); and (v) delay of the Guelph GIS/OMS integration project from 2021 to 2023 ($1.6MM); partially offset by (vi) advancement of the Derry 2nd Floor renovation project from 2022 to 2021 ($3.5MM).

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Reference: General

Please provide a copy of all internal business cases related to cable replacement or injection activities planned in 2023 or 2024 in any of the Applicant's rate zones.

Response:

The business cases for the non-ICM projects are provided at Attachment 1. The business cases for the ICM projects are provided in Exhibit 3, Tab 1, Schedule 4. Please note that some projects span multiple years and may appear in both the 2023 and 2024 budget years.

Table 1 – 2023 Non-ICM Cable Projects

Project Number	Project Name	Rate Zone
151181	Cable Replacement Project - Left Behind Cable, Brampton	BRZ
151290	Cable Replacement Project - (I3) - Bovaird - Dixie - Queen - Hwy 410, Brampton	BRZ
151318	Cable Injection Project - (I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton	BRZ
151408	Cable and Transformer Replacement Project - (AREA24) - Burnhamthorpe & Miss. Road, Mississauga	ERZ
151424	Cable and Transformer Replacement Project - (AREA21) - Miss. Valley & Bloor, Mississauga	ERZ
151428	Cable Injection - (AREA30) - Eglinton Ave W & Miss Rd, Mississauga	ERZ
151433	Cable Injection - (AREA46) - Glen Erin & Aquitane, Mississauga	ERZ
151465	Cable Replacement - Mississauga Left Behind Cable	ERZ
151516	Cable Replacement Project - (AREA46)- Millcreek Dr & Erin Mills Pkway, Mississauga	ERZ
151855	Cable Replacement and Switchgear Removal - (AREA19) - Fieldgate and Ponytrail Dr, Mississauga	ERZ
151374	Cable and Transformer Replacement - (893) - 176 - 224 Janefield Ave Subdivision, Guelph	GRZ
151275	Cable Injection Project - (SCH) - QEW - Highway 406 - Martindale Road	HRZ
151277	Cable Injection Project - (SCH) - Barbican Trail	HRZ
151278	Cable Injection Project - (SCH) - Bunting	HRZ
151281	Cable and Transformer Replacement Project - (SCH) - Lake - Linwell - Geneva - Scott	HRZ
151296	Cable Injection Project - (SCH) - Welland - Bunting - Carlton - Cushman	HRZ
151299	Cable and Transformer Replacement Project - (HAM) - Millen - Barton - Fruitland	HRZ
151300	Cable Injection Project - (HAM) - Millen - Barton - Fruitland	HRZ
151303	Cable and Transformer Replacement Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	HRZ

151304	Cable Injection Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	HRZ
150263	Cable Replacement Project - East - Left Behind Cable	PRZ
151336	Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie	PRZ
151360	Cable Injection Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham	PRZ
151362	Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham	PRZ
151363	Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham	PRZ
151364	Cable Injection Project - (V23) - Hwy 7 - Keele - Langstaff - Jane, Vaughan	PRZ
151366	Cable Injection Project - (M19) - Markham - Steeles - McCowan - 14th, Markham	PRZ
151457	Cable Injection Project - (V25) - Major Mackenzie - Keele - Rutherford - Jane, Vaughan	PRZ
151458	Cable Injection Project - (V31) - Langstaff - Weston - Rutherford - Jane, Vaughan	PRZ
151911	Cable Replacement Project - (A05) - Golf Links, Aurora	PRZ
152281	Cable Replacement Project - (M31) - Denison and Birchmount, Markham	PRZ

Table 2 – 2024 Non-ICM Cable Projects

Project Number	Project Name	Rate Zone
151181	Cable Replacement Project - Left Behind Cable, Brampton	BRZ
151290	Cable Replacement Project - (I3) - Bovaird - Dixie - Queen - Hwy 410, Brampton	BRZ
151314	Cable Injection Project - (G2) -Wanless - Kennedy - Bovaird - Main, Brampton	BRZ
151315	Cable Injection Project - (G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton	BRZ
151318	Cable Injection Project - (I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton	BRZ
151462	Cable Injection Project - (G1) - Hwy 410 - Kennedy - Wanless - Main, Brampton	BRZ
151424	Cable and Transformer Replacement Project - (AREA21) - Miss. Valley & Bloor, Mississauga	ERZ
151430	Cable Injection- (AREA 38) - Bristol & Creditview, Mississauga	ERZ
151465	Cable Replacement - Mississauga Left Behind Cable	ERZ
151904	Cable Replacement Project - (AREA54) - Copenhagen Rd, Mississauga	ERZ
152383	Cable Injection - (AREA 39) - Erin Mills Pkway & Thomas St, Mississauga	ERZ
151385	Cable and Transformer Replacement - (892) - 74 - 176 Janefield Ave Subdivision, Guelph	GRZ
151275	Cable Injection Project - (SCH) - QEW - Highway 406 - Martindale Road	HRZ
151299	Cable and Transformer Replacement Project - (HAM) - Millen - Barton - Fruitland	HRZ
151300	Cable Injection Project - (HAM) - Millen - Barton - Fruitland	HRZ
151307	Cable Injection Project - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal	HRZ
151308	Cable Injection Project - (HAM) - Hollybush - Parkside - Dundas - Spring Creek	HRZ
151556	Cable and Transformer Replacement - (HAM) - Hollybush - Parkside - Dundas - Spring Creek	HRZ

151879	Cable and Transformer Replacement - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal	HRZ
150255	Cable Replacement Project - (B23) - Cundles Rd and Janine St, Barrie	PRZ
150262	Cable Replacement Project - (M33) - 16th Avenue and Village Parkway, Markham	PRZ
150263	Cable Replacement Project - East - Left Behind Cable	PRZ
151336	Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie	PRZ
151360	Cable Injection Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham	PRZ
151362	Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham	PRZ
151363	Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham	PRZ
151911	Cable Replacement Project - (A05) - Golf Links, Aurora	PRZ
152385	Cable Injection Project - (R23) - Bathurst - Weldrick - Yonge - Carville, Richmond Hill	PRZ
152388	Cable Injection Project - (V17) - Langstaff - Railway - Rutherford - Dufferin, Vaughan	PRZ

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Attachment 1
Non ICM Business Cases

C55#	Project Name	2023	2024
150255	Cable Replacement Project - (B23) - Cundles Rd and Janine St, Barrie	0	1,165,911
150262	Cable Replacement Project - (M33) - 16th Avenue and Village Parkway, Markham	0	556,789
150263	Cable Replacement Project - East - Left Behind Cable	2,125,721	3,009,117
151181	Cable Replacement Project - Left Behind Cable, Brampton	227,983	230,684
151275	Cable Injection Project - (SCH) - QEW - Highway 406 - Martindale Road	630,616	813,306
151277	Cable Injection Project - (SCH) - Barbican Trail	332,564	0
151278	Cable Injection Project - (SCH) - Bunting	278,152	0
151281	Cable and Transformer Replacement Project - (SCH) - Lake - Linwell - Geneva - Scott	43,581	0
151290	Cable Replacement Project - (I3) - Bovaird - Dixie - Queen - Hwy 410, Brampton	2,362,994	2,398,863
151296	Cable Injection Project - (SCH) - Welland - Bunting - Carlton - Cushman	263,149	0
151299	Cable and Transformer Replacement Project - (HAM) - Millen - Barton - Fruitland	3,283,872	2,220,483
151300	Cable Injection Project - (HAM) - Millen - Barton - Fruitland	767,764	3,093
151303	Cable and Transformer Replacement Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	2,015,504	0
151304	Cable Injection Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	596,630	0
151307	Cable Injection Project - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal	0	635,616
151308	Cable Injection Project - (HAM) - Hollybush - Parkside - Dundas - Spring Creek	0	128,884
151314	Cable Injection Project - (G2) -Wanless - Kennedy - Bovaird - Main, Brampton	0	500,609
151315	Cable Injection Project - (G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton	0	975,702
151318	Cable Injection Project - (I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton	881,595	733,272
151336	Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie	1,575,462	2,037,411
151360	Cable Injection Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham	1,369,927	1,431,488
151362	Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham	1,209,939	2,081,567
151363	Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham	1,323,882	1,357,723
151364	Cable Injection Project - (V23) - Hwy 7 - Keele - Langstaff - Jane, Vaughan	1,174,782	0
151366	Cable Injection Project - (M19) - Markham - Steeles - McCowan - 14th, Markham	2,075,754	0
151374	Cable and Transformer Replacement - (893) - 176 - 224 Janefield Ave Subdivision, Guelph	471,148	0
151385	Cable and Transformer Replacement - (892) - 74 - 176 Janefield Ave Subdivision, Guelph	0	432,669
151408	Cable and Transformer Replacement Project - (AREA24) - Burnhamthorpe & Miss. Road, Mississauga	1,604,334	0
151424	Cable and Transformer Replacement Project - (AREA21) - Miss. Valley & Bloor, Mississauga	402,056	2,429,925
151428	Cable Injection - (AREA30) - Eglinton Ave W & Miss Rd, Mississauga	598,536	0
151430	Cable Injection- (AREA 38) - Bristol & Creditview, Mississauga	0	830,180
151433	Cable Injection - (AREA46) - Glen Erin & Aquitane, Mississauga	1,002,185	0
151457	Cable Injection Project - (V25) - Major Mackenzie - Keele - Rutherford - Jane, Vaughan	571,046	0
151458	Cable Injection Project - (V31) - Langstaff - Weston - Rutherford - Jane, Vaughan	1,068,316	0
151462	Cable Injection Project - (G1) - Hwy 410 - Kennedy - Wanless - Main, Brampton	0	497,787
151465	Cable Replacement - Mississauga Left Behind Cable	21,122	605,382
151516	Cable Replacement Project - (AREA46)- Millcreek Dr & Erin Mills Pkway, Mississauga	1,542,622	0
151556	Cable and Transformer Replacement - (HAM) - Hollybush - Parkside - Dundas - Spring Creek	0	3,213,432
151855	Cable Replacement and Switchgear Removal - (AREA19) - Fieldgate and Ponytrail Dr, Mississauga	1,558,623	0
151879	Cable and Transformer Replacement - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal	0	2,234,926
151904	Cable Replacement Project - (AREA54) - Copenhagen Rd, Mississauga	0	2,219,760
151911	Cable Replacement Project - (A05) - Golf Links, Aurora	1,954,352	1,959,524
152281	Cable Replacement Project - (M31) - Denison and Birchmount, Markham	1,750,812	0
152383	Cable Injection - (AREA 39) - Erin Mills Pkway & Thomas St, Mississauga	0	917,018
152385	Cable Injection Project - (R23) - Bathurst - Weldrick - Yonge - Carville, Richmond Hill	0	1,636,476
152388	Cable Injection Project - (V17) - Langstaff - Railway - Rutherford - Dufferin, Vaughan	0	1,728,353
Total		**35,085,022**	**38,985,950**

Name	Code
Cable Replacement Project - (B23) - Cundles Rd and Janine St, Barrie	150255
Cable Replacement Project - (M33) - 16th Avenue and Village Parkway, Markham	150262
Cable Replacement Project - East - Left Behind Cable	150263
Cable Replacement Project - Left Behind Cable, Brampton	151181
Cable Injection Project - (SCH) - QEW - Highway 406 - Martindale Road	151275
Cable Injection Project - (SCH) - Barbican Trail	151277
Cable Injection Project - (SCH) - Bunting	151278
Cable and Transformer Replacement Project - (SCH) - Lake - Linwell - Geneva - Scott	151281
Cable Replacement Project - (I3) - Bovaird - Dixie - Queen - Hwy 410, Brampton	151290
Cable Injection Project - (SCH) - Welland - Bunting - Carlton - Cushman	151296
Cable and Transformer Replacement Project - (HAM) - Millen - Barton - Fruitland	151299
Cable Injection Project - (HAM) - Millen - Barton - Fruitland	151300
Cable and Transformer Replacement Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	151303
Cable Injection Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	151304
Cable Injection Project - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal	151307
Cable Injection Project - (HAM) - Hollybush - Parkside - Dundas - Spring Creek	151308
Cable Injection Project - (G2) -Wanless - Kennedy - Bovaird - Main, Brampton	151314
Cable Injection Project - (G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton	151315
Cable Injection Project - (I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton	151318
Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie	151336
Cable Injection Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham	151360
Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham	151362
Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham	151363
Cable Injection Project - (V23) - Hwy 7 - Keele - Langstaff - Jane, Vaughan	151364
Cable Injection Project - (M19) - Markham - Steeles - McCowan - 14th, Markham	151366
Cable and Transformer Replacement - (893) - 176 - 224 Janefield Ave Subdivision, Guelph	151374
Cable and Transformer Replacement - (892) - 74 - 176 Janefield Ave Subdivision, Guelph	151385
Cable and Transformer Replacement Project - (AREA24) - Burnhamthorpe & Miss. Road, Mississauga	151408
Cable and Transformer Replacement Project - (AREA21) - Miss. Valley & Bloor, Mississauga	151424
Cable Injection - (AREA30) - Eglinton Ave W & Miss Rd, Mississauga	151428
Cable Injection- (AREA 38) - Bristol & Creditview, Mississauga	151430
Cable Injection - (AREA46) - Glen Erin & Aquitane, Mississauga	151433
Cable Injection Project - (V25) - Major Mackenzie - Keele - Rutherford - Jane, Vaughan	151457
Cable Injection Project - (V31) - Langstaff - Weston - Rutherford - Jane, Vaughan	151458
Cable Injection Project - (G1) - Hwy 410 - Kennedy - Wanless - Main, Brampton	151462
Cable Replacement - Mississauga Left Behind Cable	151465
Cable Replacement Project - (AREA46)- Millcreek Dr & Erin Mills Pkway, Mississauga	151516
Cable and Transformer Replacement - (HAM) - Hollybush - Parkside - Dundas - Spring Creek	151556
Cable Replacement and Switchgear Removal - (AREA19) - Fieldgate and Ponytrail Dr, Mississauga	151855
Cable and Transformer Replacement - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal	151879
Cable Replacement Project - (AREA54) - Copenhagen Rd, Mississauga	151904
Cable Replacement Project - (A05) - Golf Links, Aurora	151911
Cable Replacement Project - (M31) - Denison and Birchmount, Markham	152281
Cable Injection - (AREA 39) - Erin Mills Pkwy & Thomas St, Mississauga	152383
Cable Injection Project - (R23) - Bathurst - Weldrick - Yonge - Carville, Richmond Hill	152385
Cable Injection Project - (V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan	152388

Project Report

Project Code	150255	
Project Name	Cable Replacement Project - (B23) - Cundles Rd and Janine St, Barrie	
Project Description	This investment is for replacing 1,389 m (2024) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Barrie) B23 grid – Cundles Rd and Janine St area. Due to the age of the cable in the project scope area , we can predict that we will start to experience outages in the future starting with 1 outage in 2023, up to 3 outages in 2027. It is expected that completion of this project will avoid 3 failures per year as of 2027 and 233523 potential CMI. Installing the new cables in conduit will make future cable replacements easier to implement. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Cost of Investment**
	Please provide additional justification for what has changed	**Project is re-estimated and re-submitted.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**Not Applicable**
02. Additional Information	**Branch Plant**	**825 Patterson Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**1389**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**Yes**
	Project Estimator	**Bowman, Todd (Todd.Bowman)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	150255	
Project Name	Cable Replacement Project - (B23) - Cundles Rd and Janine St, Barrie	
Project Description	This investment is for replacing 1,389 m (2024) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Barrie) B23 grid – Cundles Rd and Janine St area. Due to the age of the cable in the project scope area , we can predict that we will start to experience outages in the future starting with 1 outage in 2023, up to 3 outages in 2027. It is expected that completion of this project will avoid 3 failures per year as of 2027 and 233523 potential CMI. Installing the new cables in conduit will make future cable replacements easier to implement. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. 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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers. Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the next 2 years to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further. Deteriorated cables fail at greater rates, and Alectra Utilities forecast that if the investment is not made, that the rate of cable failures per year will increase to 0.3 in 2021 and 2 failures per year starting 2025.**
	Customer Attachment / Load (KVA)	**325 Customers (Mixed) / 1,458 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable**
06. 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 responding to outages under reactive capital. Given that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**

Project Report

Project Code	150255	
Project Name	Cable Replacement Project - (B23) - Cundles Rd and Janine St, Barrie	
Project Description	This investment is for replacing 1,389 m (2024) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Barrie) B23 grid – Cundles Rd and Janine St area. Due to the age of the cable in the project scope area , we can predict that we will start to experience outages in the future starting with 1 outage in 2023, up to 3 outages in 2027. It is expected that completion of this project will avoid 3 failures per year as of 2027 and 233523 potential CMI. Installing the new cables in conduit will make future cable replacements easier to implement. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Alternative #1	**Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a preferred alternative.**
	Alternative #2	**Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.** **The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail.** **This is the recommended alternative.**
	Justification for Recommended Alternative	**The cables in this area are at end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.** **To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.** **Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories.** **One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria.** **Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.**
07. 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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable replacement projects since 2010.**

Project Report

Project Code	150255	
Project Name	Cable Replacement Project - (B23) - Cundles Rd and Janine St, Barrie	
Project Description	This investment is for replacing 1,389 m (2024) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Barrie) B23 grid – Cundles Rd and Janine St area. Due to the age of the cable in the project scope area , we can predict that we will start to experience outages in the future starting with 1 outage in 2023, up to 3 outages in 2027. It is expected that completion of this project will avoid 3 failures per year as of 2027 and 233523 potential CMI. Installing the new cables in conduit will make future cable replacements easier to implement. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:**	**Due to the age of the cable in the project scope area , we can predict that we will start to experience outages in the future starting with 1 outage in 2023, up to 3 outages in 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**The cable in this area is 48 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	**277**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 0 failures in this project area since 2017. Since the cables at this location are nearing end of life, it is estimated that failures will happen starting with 1 failure in 2023, escalating to 2 failures by 2025, up to 3 failures by 2027. Assuming the failure impact is similar to other areas in the region: Impact of 1 failure: 277 customers affected, 77,841 CMI, and average outage duration is 104 minutes per customer per 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	**Not Applicable**
	Reliability and Safety Factors	**This project is part of the long-term cable rehabilitation program. This project will help avoid 3 failures per year as of 2027 and 233523 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	**Cable Remediation**
	Location Description	**(Barrie) - Cundles Rd and Janine St**

Project Report

Project Code	150262
Project Name	Cable Replacement Project - (M33) - 16th Avenue and Village Parkway, Markham
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (M33) - 16th Avenue and Village Parkway area in Markham to maintain system reliability and customer service. Cable in this area is 45 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. In the project scope area, there were 4 cable/splice failure(s) since 2015. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 3,781m. It is proposed to complete 925m in 2024 and 2856m in 2025. This investment will help avoid a total of 3 potential cable failure and 60453 potential CMI.
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Cost of Investment**
	Please provide additional justification for what has changed	**Project is re-estimated and re-submitted.**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	**Not Applicable**
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**3781**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**Yes**
	Project Estimator	**Tenorlas, Reynaldo (Reynaldo.Tenorlas)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	150262
Project Name	Cable Replacement Project - (M33) - 16th Avenue and Village Parkway, Markham
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (M33) - 16th Avenue and Village Parkway area in Markham to maintain system reliability and customer service. Cable in this area is 45 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. In the project scope area, there were 4 cable/splice failure(s) since 2015. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 3,781m. It is proposed to complete 925m in 2024 and 2856m in 2025. This investment will help avoid a total of 3 potential cable failure and 60453 potential CMI.
Major Category	System Renewal
Scenario	Submitted

Urgency and Reasons for Urgency	**Alectra Utilities' service area has a population of underground cables totaling approximately 21 million linear meters of cable. 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. 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 Cross-Linked Polyethylene (XLPE) cable and related accessories that are either in poor or very poor condition. This investment will replace failing direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is expected that completion of this project will avoid customer outage frequency and duration. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.** **Cable manufacturers introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems of having impurities due to the nature of the manufacturing processes. Utilities installed these cables directly in the ground. These led to breakdown of insulation over time and are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period.** **When failed, 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. In addition, it does not solve the underlying issue, since the older direct-buried cable remains installed and likelihood of failing again increases over time. 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. In the project scope area, there were 4 cable/splice failure(s) since 2015.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must not only halt the increasing trend, but also 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. Future failures are predicted at an escalating rate as cables deteriorate.**
Customer Attachment / Load (KVA)	**1996 Customer (Mixed - Customer/Residential) / 1,458 KVA**
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**

Project Report

Project Code	150262
Project Name	Cable Replacement Project - (M33) - 16th Avenue and Village Parkway, Markham
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (M33) - 16th Avenue and Village Parkway area in Markham to maintain system reliability and customer service. Cable in this area is 45 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. In the project scope area, there were 4 cable/splice failure(s) since 2015. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 3,781m. It is proposed to complete 925m in 2024 and 2856m in 2025. This investment will help avoid a total of 3 potential cable failure and 60453 potential CMI.
Major Category	System Renewal
Scenario	Submitted

06. 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. In the project scope area, there were 4 cable/splice failure(s) since 2015. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.**
Alternative #1	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**
Alternative #2	**Replace only the cable segments that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**
Justification for Recommended Alternative	**The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.** **Alternative #2 is not recommended because replacing only the segments that failed will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories.** **One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. While this is a lower cost solution it will not negate the impact of outages and therefore not drive the greatest amount of benefit for customers.** **Therefore, the recommended Alternative is Alternative #1. It will decrease the outage impacts due to deteriorating underground system assets within the (M33) - 16th Avenue and Village Parkway area in Markham, thereby maintaining system reliability and customer service is a key theme for customers during customer engagement. Cable in this area is 45 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. In the project scope area, there were 4 cable/splice failure(s) since 2015.** **If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.** **The total cable quantity for replacement is approximately 3,781m. It is proposed to complete 925m in 2024 and 2856m in 2025. This investment will help avoid a total of 3 potential cable failure and 60453 potential CMI.** **To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by rehabilitating all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.**

Project Report

Project Code	150262	
Project Name	Cable Replacement Project - (M33) - 16th Avenue and Village Parkway, Markham	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (M33) - 16th Avenue and Village Parkway area in Markham to maintain system reliability and customer service. Cable in this area is 45 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. In the project scope area, there were 4 cable/splice failure(s) since 2015. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 3,781m. It is proposed to complete 925m in 2024 and 2856m in 2025. This investment will help avoid a total of 3 potential cable failure and 60453 potential CMI.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable replacement projects since 2010.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 the project scope area, there were 4 cable/splice failure(s) since 2015.. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cable in this area is 45 years old (installed in 1977), which exceeds the Typical Useful Life of non-tree retardant XLPE of 30 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)	**There were 4 failures in this project scope area since 2015.** **7 year average of failures is 4 failures / 7 years = 0.6 failure(s) per year** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failures in 2023, up to 3 failures by 2027.** **Impact of 1 failure: 132 customers affected, 20,151 CMI, and average outage duration is 167 minutes per customer per 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	**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 failure and 60453 potential CMI.**

Project Report

Project Code	150262	
Project Name	Cable Replacement Project - (M33) - 16th Avenue and Village Parkway, Markham	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (M33) - 16th Avenue and Village Parkway area in Markham to maintain system reliability and customer service. Cable in this area is 45 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. In the project scope area, there were 4 cable/splice failure(s) since 2015. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 3,781m. It is proposed to complete 925m in 2024 and 2856m in 2025. This investment will help avoid a total of 3 potential cable failure and 60453 potential CMI.	
Major Category	System Renewal	
Scenario	Submitted	
	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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	Phase Code	**11 / Alectra Initiated Capital**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	**Cable Remediation**
	Location Description	**(M33) - 16th Avenue and Village Parkway (Markham)**

Project Report

Project Code	150263	
Project Name	Cable Replacement Project - East - Left Behind Cable	
Project Description	This investment is for replacing approximately 30,000m (4500m in 2022, 5000m in 2023, 5000m in 2024, 5000m in 2025, 5000m in 2026, 5000m in 2027) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East region in various areas and over multiple years. ""Left-behind"" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. It is expected that completion of this project will avoid 9 failures and 700569 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**10 Alectra**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**1**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tenorlas, Reynaldo (Reynaldo.Tenorlas)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**Yes**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**453742**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	150263
Project Name	Cable Replacement Project - East - Left Behind Cable
Project Description	This investment is for replacing approximately 30,000m (4500m in 2022, 5000m in 2023, 5000m in 2024, 5000m in 2025, 5000m in 2026, 5000m in 2027) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East region in various areas and over multiple years. ""Left-behind"" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. It is expected that completion of this project will avoid 9 failures and 700569 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers.** **Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the next 2 years to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further. Deteriorated cables fail at greater rates, and Alectra Utilities forecast that if the investment is not made, that the rate of cable failures per year will increase to 0.3 in 2021 and 2 failures per year starting 2025.**
Customer Attachment / Load (KVA)	**307 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
Environmental Benefits	**Not Applicable**

Project Report

Project Code	150263
Project Name	Cable Replacement Project - East - Left Behind Cable
Project Description	This investment is for replacing approximately 30,000m (4500m in 2022, 5000m in 2023, 5000m in 2024, 5000m in 2025, 5000m in 2026, 5000m in 2027) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East region in various areas and over multiple years. ""Left-behind"" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. It is expected that completion of this project will avoid 9 failures and 700569 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

06. 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 responding to outages under reactive capital.

Given that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.

This is not a viable alternative.

Alternative #1

Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area.

This alternative is costly, disruptive to customers and does not address the failure situation adequately.

This is not a preferred alternative.

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.

This is the recommended alternative.

Justification for Recommended Alternative

The cables in this area are at end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

If not rehabilitated these cables will get older and will fail more often to a level that is not tolerable by customers.

Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories.

These cables did not meet Alectra Utilities' cable injection criteria, having already undergone attempts at cable injection and been deemed unable to have successful cable injection performed.

Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.

Project Report

Project Code	150263	
Project Name	Cable Replacement Project - East - Left Behind Cable	
Project Description	This investment is for replacing approximately 30,000m (4500m in 2022, 5000m in 2023, 5000m in 2024, 5000m in 2025, 5000m in 2026, 5000m in 2027) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East region in various areas and over multiple years. ""Left-behind"" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. It is expected that completion of this project will avoid 9 failures and 700569 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 avoid 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 avoidance 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 (0 if not applicable)	**0**
08. 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 an average of 162 Cable and Splice failures per year since 2017. 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 Typical Useful Life of non-tree retardant XLPE of 30 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 30000 m of cable in the whole area:** **Frequency of Failure is: 0.25 x 30000 /1000 = 7.5 failure(s)** **In Alectra East, there were an average of 162 Cable and Splice failures per year since 2017.** **Annually on average there were 162 Cable and Splice failures affecting 44,874 customers and 12,610,242 CMI** **Impact of 1 failure: 277 customers affected and 77,841CMI** **Impact of 7.5 failures: 277 x 7.5 = 2078 customers affected and 77,841 x 7.5 = 583807.5 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**

Project Report

Project Code	150263	
Project Name	Cable Replacement Project - East - Left Behind Cable	
Project Description	This investment is for replacing approximately 30,000m (4500m in 2022, 5000m in 2023, 5000m in 2024, 5000m in 2025, 5000m in 2026, 5000m in 2027) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East region in various areas and over multiple years. ""Left-behind"" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. It is expected that completion of this project will avoid 9 failures and 700569 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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 9 failures and 700569 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	**1a / Lines Replacement Program/Projects**
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	**Sustainment Capital (1)**
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	**Cable Remediation**
	Location Description	**Various locations in Alectra East (legacy PowerStream)**

Project Report

Project Code	151181	
Project Name	Cable Replacement Project - Left Behind Cable, Brampton	
Project Description	This investment is for replacing “Left-Behind” underground Cross-Linked Polyethylene (XLPE) cables in the Central North region. "Left-behind" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure. In 2020 ACA, these cables were determined to be beyond typical useful life and in poor condition. This investment will replace the direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. If this project is not implemented, Central North would experience 3 failures per year, due to "Left Behind" cables, by 2027. It is expected that each year this project is executed, 1 failure, impacting 495 customers for 69 minutes, will be avoided. Installing the new cables in conduit will make future cable replacements easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**805 Sandalwood Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**1000**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Agostini, Robert (Robert.Agostini)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**Yes**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**632073**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151181	
Project Name	Cable Replacement Project - Left Behind Cable, Brampton	
Project Description	This investment is for replacing “Left-Behind” underground Cross-Linked Polyethylene (XLPE) cables in the Central North region. "Left-behind" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure. In 2020 ACA, these cables were determined to be beyond typical useful life and in poor condition. This investment will replace the direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. If this project is not implemented, Central North would experience 3 failures per year, due to "Left Behind" cables, by 2027. It is expected that each year this project is executed, 1 failure, impacting 495 customers for 69 minutes, will be avoided. Installing the new cables in conduit will make future cable replacements easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	**This project is driven by failure risks on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities’ system. Cable and cable accessory failures account for 50% of all equipment-related outages.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable replacements within the year following the completion of cable injection project where the "Left Behind" cables were identified, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 1 cable failure per year starting in 2022 and 3 failures per year starting 2027.**
	Customer Attachment / Load (KVA)	**1639 Residential and 44 Commercial customers / 22034 KVA**
	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**
06. 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	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**
	Alternative #2	**Replace only the cable segments that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**

Project Report

Project Code	151181
Project Name	Cable Replacement Project - Left Behind Cable, Brampton
Project Description	This investment is for replacing “Left-Behind” underground Cross-Linked Polyethylene (XLPE) cables in the Central North region. "Left-behind" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure. In 2020 ACA, these cables were determined to be beyond typical useful life and in poor condition. This investment will replace the direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. If this project is not implemented, Central North would experience 3 failures per year, due to "Left Behind" cables, by 2027. It is expected that each year this project is executed, 1 failure, impacting 495 customers for 69 minutes, will be avoided. Installing the new cables in conduit will make future cable replacements easier to implement.
Major Category	System Renewal
Scenario	Submitted

	Justification for Recommended Alternative	**The cables in this area are at end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers. Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories. One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.**
07. 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 avoid 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 prevention strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra Brampton 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 (0 if not applicable)	**0**

Project Report

Project Code	151181
Project Name	Cable Replacement Project - Left Behind Cable, Brampton
Project Description	This investment is for replacing “Left-Behind” underground Cross-Linked Polyethylene (XLPE) cables in the Central North region. "Left-behind" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure. In 2020 ACA, these cables were determined to be beyond typical useful life and in poor condition. This investment will replace the direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. If this project is not implemented, Central North would experience 3 failures per year, due to "Left Behind" cables, by 2027. It is expected that each year this project is executed, 1 failure, impacting 495 customers for 69 minutes, will be avoided. Installing the new cables in conduit will make future cable replacements easier to implement.
Major Category	System Renewal
Scenario	Submitted

08. 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 41, 62, 38, 40, and 49 primary cable failures from 2017 to 2021 (5-year average is 46 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 Alectra Utilities' Typical Useful Life of 30 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**1683**
	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 13500 m of cable in the whole area: Frequency of Failure is: 0.25 x 13500 /1000 = 3.4 failure(s) According to Alectra Central North Control Room data, there were 41, 62, 38, 40, and 49 Cable failures in 2017 to 2021, respectively (5-year average is 46 failures per year). Annually on average there were 46 Cable failures affecting 22753.4 customers and 1562758 CMI. Impact of 1 failure: 22753.4/46 = 495 customers affected and 1562758/46 = 33973 CMI. Impact of 3.4 failures: 495 x 3.4 = 1683 customers affected and 33973 x 3.4 = 115508 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 3.4 potential cable failures and 115508 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Various locations in Alectra Brampton**

Project Report

Project Code	151275	
Project Name	Cable Injection Project - (SCH) - QEW - Highway 406 - Martindale Road	
Project Description	This investment is to perform remediation of underground cable in the northwest area of St.Catharines near the QEW and Martindale Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 26,342m. It is mostly Residential/Commercial with 2205 customers. This area has seen 7 failures as a result of cable faults for a failure rate of 26.6 failures/100km. The failures with 5 failures in the last 3 years. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**Not applicable.**
02. Additional Information	**Branch Plant**	**830 St. Catharines Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**26342**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the short term, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the short term, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed investment, 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)	**2205 customers and 13,475 kVA**

Project Report

Project Code	151275	
Project Name	Cable Injection Project - (SCH) - QEW - Highway 406 - Martindale Road	
Project Description	This investment is to perform remediation of underground cable in the northwest area of St.Catharines near the QEW and Martindale Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 26,342m. It is mostly Residential/Commercial with 2205 customers. This area has seen 7 failures as a result of cable faults for a failure rate of 26.6 failures/100km. The failures with 5 failures in the last 3 years. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	

	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as described in the project description.** **This is the preferred alternative.**

Project Report

Project Code: 151275

Project Name: Cable Injection Project - (SCH) - QEW - Highway 406 - Martindale Road

Project Description:

This investment is to perform remediation of underground cable in the northwest area of St.Catharines near the QEW and Martindale Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 26,342m. It is mostly Residential/Commercial with 2205 customers.

This area has seen 7 failures as a result of cable faults for a failure rate of 26.6 failures/100km. The failures with 5 failures in the last 3 years. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category: System Renewal

Scenario: Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area exceed the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Alternative #2 is the recommended alternative because the cables are eligible for cable injection, this alternative has a lower cost than replacement and it will extend the cable life up to 20 years.

Project Report

Project Code	151275	
Project Name	Cable Injection Project - (SCH) - QEW - Highway 406 - Martindale Road	
Project Description	This investment is to perform remediation of underground cable in the northwest area of St.Catharines near the QEW and Martindale Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 26,342m. It is mostly Residential/Commercial with 2205 customers. This area has seen 7 failures as a result of cable faults for a failure rate of 26.6 failures/100km. The failures with 5 failures in the last 3 years. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	

07. 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:** **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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**This project is forecasted to be $100/m, based on similar cable injection projects previously completed. There is an assumption that the unit cost increases with inflation at 2% each year.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record**	**There are 7 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 26.6 failures/100km. Five failures occurring in the last 3 years. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **Cable in this area ranges from 26 to 34 years old (installed in 1993 and 1985 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	**2208**

Project Report

Project Code: 151275

Project Name: Cable Injection Project - (SCH) - QEW - Highway 406 - Martindale Road

Project Description: This investment is to perform remediation of underground cable in the northwest area of St.Catharines near the QEW and Martindale Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 26,342m. It is mostly Residential/Commercial with 2205 customers.

This area has seen 7 failures as a result of cable faults for a failure rate of 26.6 failures/100km. The failures with 5 failures in the last 3 years. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category: System Renewal

Scenario: Submitted

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 26,342m of cable in the whole area:
Frequency of Failure is: 0.25 x 26,342 /1000 = 6.59 failures

Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI

Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI
Impact of 6.59 failures: 598 x 6.59 = 3,941 customers affected and 52,945 x 6.59 = 348,908 CMI

Since this area will be implemented in phases over a period of three years, the estimated quantity is 9,351m in Year 1, 9,671m in Year 2, and 7,320m in Year 3. In addition, the total number of transformers in the area is approximately 215 totalling 13,475 KVA.

For the purpose of Reliability Benefits:

Year 1
Frequency of Failure is: 0.25 x 9,351 /1000 = 2.34 failures
Impact of 2.34 failure: 598 x 2.34 = 1,399 customers affected and 52,945 x 2.34 = 123,891 CMI
Peak KVA = 13,475 / 26,342 x 9,351 = 4,783 KVA
The benefit from this year onward is based on 2.34 failures

Year 2
Frequency of Failure is: 0.25 x (9,351+9,671) /1000 = 4.76 failures
Impact of 4.76 failure: 598 x 4.76 = 2,846 customers affected and 52,945 x 4.76 = 252,018 CMI
Peak KVA = 13,475 / 26,342 x (9,351+9,671) = 9,731
The benefit from this year onward is based on 4.76 failures

Year 3
Frequency of Failure is: 0.25 x (9,351+9,671+7,320) /1000 = 6.59 failures
Impact of 6.59 failures: 598 x 6.59 = 3,941 customers affected and 52,945 x 6.59 = 348,908 CMI
Peak KVA = 13,475 / 26,342 x (9,351+9,671+7,320) = 13,475

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 remediation program. The project will help avoid a total of 6.59 potential cable failures and 348,908 potential CMI.

Analysis for "Like for Like" Renewal Project: Not applicable.

10. Obsolete

Budget Type: B) Capital Works

PowerStream Old Sub-Category:

PowerStream Plan Category:

Phase Code: 11 / Alectra Initiated Capital

Rates Category:

Job Cost Chart Type: Master Chart

PowerStream Plan Sub Category:

Location Description: QEW - Highway 406 - Martindale Road (St. Catharines)

Project Report

Project Code	151277	
Project Name	Cable Injection Project - (SCH) - Barbican Trail	
Project Description	This investment is to perform remediation of underground cable in the south area of St.Catharines along Barbican Trail. This project covers the area that meets the criteria for cable injection candidates for a total of 4,203m. It is mostly Residential/Commercial with 352 customers. The cable is between 33-35 years of age, without injection the insulation on these cables could degrade to a point where replacement is required, which is 6 times the cost of injection. It is prudent to inject these cables to prevent future outages This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**Not applicable.**
02. Additional Information	**Branch Plant**	**830 St. Catharines Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**4203**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**1**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the short term, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the short term, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed investment, 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)	**352 customers and 900kVA**

Project Report

Project Code	151277	
Project Name	Cable Injection Project - (SCH) - Barbican Trail	
Project Description	This investment is to perform remediation of underground cable in the south area of St.Catharines along Barbican Trail. This project covers the area that meets the criteria for cable injection candidates for a total of 4,203m. It is mostly Residential/Commercial with 352 customers. The cable is between 33-35 years of age, without injection the insulation on these cables could degrade to a point where replacement is required, which is 6 times the cost of injection. It is prudent to inject these cables to prevent future outages This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as described in the project description.** **This is the preferred alternative.**

Project Report

Project Code	151277
Project Name	Cable Injection Project - (SCH) - Barbican Trail
Project Description	This investment is to perform remediation of underground cable in the south area of St.Catharines along Barbican Trail. This project covers the area that meets the criteria for cable injection candidates for a total of 4,203m. It is mostly Residential/Commercial with 352 customers. The cable is between 33-35 years of age, without injection the insulation on these cables could degrade to a point where replacement is required, which is 6 times the cost of injection. It is prudent to inject these cables to prevent future outages This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area exceed the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Alternative #2 is the recommended alternative because the cables are eligible for cable injection, this alternative has a lower cost than replacement and it will extend the cable life up to 20 years.

Project Report

Project Code	151277	
Project Name	Cable Injection Project - (SCH) - Barbican Trail	
Project Description	This investment is to perform remediation of underground cable in the south area of St.Catharines along Barbican Trail. This project covers the area that meets the criteria for cable injection candidates for a total of 4,203m. It is mostly Residential/Commercial with 352 customers. The cable is between 33-35 years of age, without injection the insulation on these cables could degrade to a point where replacement is required, which is 6 times the cost of injection. It is prudent to inject these cables to prevent future outages This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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:** **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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**This project is forecasted to be $100/m, based on similar cable injection projects previously completed. There is an assumption that the unit cost increases with inflation at 2% each year.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 0 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 0 failures/100km.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cable in this area ranges from 33 to 35 years old (installed in 1986 and 1984 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	**352**

alectra utilities

Project Report

Project Code	151277
Project Name	Cable Injection Project - (SCH) - Barbican Trail
Project Description	This investment is to perform remediation of underground cable in the south area of St.Catharines along Barbican Trail. This project covers the area that meets the criteria for cable injection candidates for a total of 4,203m. It is mostly Residential/Commercial with 352 customers. The cable is between 33-35 years of age, without injection the insulation on these cables could degrade to a point where replacement is required, which is 6 times the cost of injection. It is prudent to inject these cables to prevent future outages This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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 4203m of cable in the whole area:** **Frequency of Failure is: 0.25 x 4203 /1000 = 1.05 failures** **Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI** **Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI** **Impact of 1.05 failures: 598 x 1.05 = 628 customers affected and 52,945 x 1.05 = 55,592 CMI** **Since this area will be implemented in phases over 1 year the estimated quantity is 4203m . In addition, the total number of transformers in the area is approximately 18 totalling 900 KVA.** **For the purpose of Reliability Benefits:** **Year 1** **Frequency of Failure is: 0.25 x 4203 /1000 = 1.05 failures** **Impact of 1.05 failures: 598 x 1.05 = 628 customers affected and 52,945 x 1.05 = 55,592 CMI** **Peak Load = 900 KVA** **The benefit from this year onwards is based on 1.05 failures**
	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 remediation program. The project will help avoid a total of 1.05 potential cable failures and 55,592 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Barbican Trail (St. Catharines)**

Project Report

Project Code	151278	
Project Name	Cable Injection Project - (SCH) - Bunting	
Project Description	This investment is to perform remediation of underground cable in the east end of St.Catharines near Bunting Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 3,592m. It is mostly Residential/Commercial with 302 customers. The cable is 28 years old and nearing it's typical useful life. The project area is situated in a location where bordering locations have begun to experience failures. Injection is warrented to avoid any future failures that may occur This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**Not applicable.**
02. Additional Information	**Branch Plant**	**830 St. Catharines Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**3592**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**1**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the short term, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the short term, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed investment, 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)	**302 customers and 650 kVA**

Project Report

Project Code	151278	
Project Name	Cable Injection Project - (SCH) - Bunting	
Project Description	This investment is to perform remediation of underground cable in the east end of St.Catharines near Bunting Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 3,592m. It is mostly Residential/Commercial with 302 customers. The cable is 28 years old and nearing it's typical useful life. The project area is situated in a location where bordering locations have begun to experience failures. Injection is warrented to avoid any future failures that may occur This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as described in the project description.** **This is the preferred alternative.**

Project Report

Project Code	151278
Project Name	Cable Injection Project - (SCH) - Bunting
Project Description	This investment is to perform remediation of underground cable in the east end of St.Catharines near Bunting Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 3,592m. It is mostly Residential/Commercial with 302 customers. The cable is 28 years old and nearing it's typical useful life. The project area is situated in a location where bordering locations have begun to experience failures. Injection is warrented to avoid any future failures that may occur This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area exceed the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Alternative #2 is the recommended alternative because the cables are eligible for cable injection, this alternative has a lower cost than replacement and it will extend the cable life up to 20 years.

Project Report

Project Code	151278
Project Name	Cable Injection Project - (SCH) - Bunting
Project Description	This investment is to perform remediation of underground cable in the east end of St.Catharines near Bunting Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 3,592m. It is mostly Residential/Commercial with 302 customers. The cable is 28 years old and nearing it's typical useful life. The project area is situated in a location where bordering locations have begun to experience failures. Injection is warrented to avoid any future failures that may occur This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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:** **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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**This project is forecasted to be $100/m, based on similar cable injection projects previously completed. There is an assumption that the unit cost increases with inflation at 2% each year.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 0 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 0 failures/100km.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cable in this area is 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	**302**

Project Report

Project Code	151278
Project Name	Cable Injection Project - (SCH) - Bunting
Project Description	This investment is to perform remediation of underground cable in the east end of St.Catharines near Bunting Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 3,592m. It is mostly Residential/Commercial with 302 customers. The cable is 28 years old and nearing it's typical useful life. The project area is situated in a location where bordering locations have begun to experience failures. Injection is warrented to avoid any future failures that may occur This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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 3592m of cable in the whole area:** **Frequency of Failure is: 0.25 x 3592 /1000 = 0.9 failures** **Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI** **Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI** **Impact of 0.9 failures: 598 x 0.9 = 538 customers affected and 52,945 x 0.9 = 47,651 CMI** **Since this area will be implemented in one year, the estimated quantity is 3592m in Year 1. In addition, the total number of transformers in the area is approximately 13 totalling 650 KVA.** **For the purpose of Reliability Benefits:** **Year 1** **Frequency of Failure is: 0.25 x 3592 /1000 = 0.9 failures** **Impact of 0.9 failures: 598 x 0.9 = 538 customers affected and 52,945 x 0.9 = 47,651 CMI** **The benefit from this year onwards is based on 0.9 failures** **Peak KVA = 650 KVA**
	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 remediation program. The project will help avoid a total of 0.90 potential cable failures and 47,651 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Caw Retiree Village (St. Catharines)**

Project Report

Project Code	151281	
Project Name	Cable and Transformer Replacement Project - (SCH) - Lake - Linwell - Geneva - Scott	
Project Description	This investment is to perform remediation of underground cable in the North area of St.Catharines bounded by Lake, Linwell, Geneva and Scott St. This project covers the area that meets the criteria for cable replacement candidates for a total of 3,176m. It is mostly Residential/Commercial with 267 customers. Along with the cable remediation, 17 transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 189 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**No applicable.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**No applicable.**
02. Additional Information	**Branch Plant**	**830 St. Catharines Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**No applicable.**
	Units	**3176**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151281
Project Name	Cable and Transformer Replacement Project - (SCH) - Lake - Linwell - Geneva - Scott
Project Description	This investment is to perform remediation of underground cable in the North area of St.Catharines bounded by Lake, Linwell, Geneva and Scott St. This project covers the area that meets the criteria for cable replacement candidates for a total of 3,176m. It is mostly Residential/Commercial with 267 customers. Along with the cable remediation, 17 transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 189 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. 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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers. Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the near term to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, 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)	**267 customers and 2675 kVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**

Project Report

Project Code	151281
Project Name	Cable and Transformer Replacement Project - (SCH) - Lake - Linwell - Geneva - Scott
Project Description	This investment is to perform remediation of underground cable in the North area of St.Catharines bounded by Lake, Linwell, Geneva and Scott St. This project covers the area that meets the criteria for cable replacement candidates for a total of 3,176m. It is mostly Residential/Commercial with 267 customers. Along with the cable remediation, 17 transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 189 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Alternative #1

Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.

This alternative is costly, disruptive to customers and does not address the failure situation adequately.

This is not a preferred alternative.

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.

The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail.

This is the recommended alternative.

Justification for Recommended Alternative

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.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Segments that do meet the criteria for cable injection are covered under a separate project.

Therefore, planned cable replacement within the area is selected as the preferred alternative. While it is a costly alternative, the added benefit of installing new conduit which will help with future cable issues as well as avoiding future outages on other cable segments that have been subjected to previous high stress fault conditions. The benefits to the customer include reducing the likelihood of unplanned disruptions and new underground equipment which should provide reliable, continuous service for many more years. Furthermore, the replacement of several transformers that are at risk of failing allows for an opportunistic renewal of assets while work crews are already in the area performing cable replacement, minimizing the outage impacts for customers who would otherwise eventually experience an unplanned outage once the transformer fails. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Project Report

Project Code	151281
Project Name	Cable and Transformer Replacement Project - (SCH) - Lake - Linwell - Geneva - Scott
Project Description	This investment is to perform remediation of underground cable in the North area of St.Catharines bounded by Lake, Linwell, Geneva and Scott St. This project covers the area that meets the criteria for cable replacement candidates for a total of 3,176m. It is mostly Residential/Commercial with 267 customers. Along with the cable remediation, 17 transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 189 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 utilized coordination with third parties to avoid 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 avoidance 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. 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 (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record**	**There are 6 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 189 failures/100km. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **Cable in this area ranges from 36 to 46 years old (installed in 1983 and 1973 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	**265**
	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 3176m of cable in the whole area:** **Frequency of Failure is: 0.25 x 3176 /1000 = 0.79 failures** **Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI** **Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI** **Impact of 0.79 failures: 598 x 0.79 = 472 customers affected and 52,945 x 0.79 = 41,827 CMI** **Since this area will be implemented in one year, the estimated quantity is 3176m in Year 1.** **In addition, the total number of transformers in the area is approximately 34 totalling 2,675 KVA.** **For the purpose of Reliability Benefits:** **Year 1** **Frequency of Failure is: 0.25 x 3176 /1000 = 0.79 failures** **Impact of 0.79 failures: 598 x 0.79 = 472 customers affected and 52,945 x 0.79 = 41,827 CMI** **The benefit from this year onwards is based on 0.79 failures** **Peak KVA = 2,675 KVA**
	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.**

Project Report

Project Code	151281	
Project Name	Cable and Transformer Replacement Project - (SCH) - Lake - Linwell - Geneva - Scott	
Project Description	This investment is to perform remediation of underground cable in the North area of St.Catharines bounded by Lake, Linwell, Geneva and Scott St. This project covers the area that meets the criteria for cable replacement candidates for a total of 3,176m. It is mostly Residential/Commercial with 267 customers. Along with the cable remediation, 17 transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 189 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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 0.79 potential cable failures and 41,827 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Lake - Linwell - Geneva - Scott (St. Catharines)**

Project Report

Project Code	151290	
Project Name	Cable Replacement Project - (I3) - Bovaird - Dixie - Queen - Hwy 410, Brampton	
Project Description	This investment is for replacing 7,227 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central North (Brampton) I3 grid – Bovaird – Dixie – Queen – Hwy 410 area (the project will be paced to replace 1067.5 m in 2021, 1067.5 m in 2022, 2000 m in 2023, 2000 m in 2024 and 1092 m in 2025). It is expected that completion of this project will avoid 1.8 failures per year impacting 891 customers for 69 minutes based on Regional reliability data. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**805 Sandalwood Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Agostini, Robert (Robert.Agostini)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**639114**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151290	
Project Name	Cable Replacement Project - (I3) - Bovaird - Dixie - Queen - Hwy 410, Brampton	
Project Description	This investment is for replacing 7,227 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central North (Brampton) I3 grid – Bovaird – Dixie – Queen – Hwy 410 area (the project will be paced to replace 1067.5 m in 2021, 1067.5 m in 2022, 2000 m in 2023, 2000 m in 2024 and 1092 m in 2025). It is expected that completion of this project will avoid 1.8 failures per year impacting 891 customers for 69 minutes based on Regional reliability data. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	This investment is driven by numerous cable failures in the area prior to 2019 and this location continues to have cable failure in 2021 which impacts reliability on the distribution system in the area. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. 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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers. Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the next 2 years to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further. Deteriorated cables fail at greater rates, and Alectra Utilities forecast that if the investment is not made, that the rate of cable failures per year will increase to 0.3 in 2021 and 1.8 failures per year starting 2026.
	Customer Attachment / Load (KVA)	887 Residential and 4 Commercial customers / 1795 KVA
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.
	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	An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.
	Environmental Benefits	Not Applicable.
06. 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 responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.

Project Report

Project Code	151290
Project Name	Cable Replacement Project - (I3) - Bovaird - Dixie - Queen - Hwy 410, Brampton
Project Description	This investment is for replacing 7,227 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central North (Brampton) I3 grid – Bovaird – Dixie – Queen – Hwy 410 area (the project will be paced to replace 1067.5 m in 2021, 1067.5 m in 2022, 2000 m in 2023, 2000 m in 2024 and 1092 m in 2025). It is expected that completion of this project will avoid 1.8 failures per year impacting 891 customers for 69 minutes based on Regional reliability data. Installing the new cables in conduit will make future cable remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

	Alternative #1	**Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively. This alternative is costly, disruptive to customers and does not address the failure situation adequately. This is not a preferred alternative.**
	Alternative #2	**Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place. The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail. This is the recommended alternative.**
	Justification for Recommended Alternative	**The cables in this area are at end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers. Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories. One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.**
07. 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 avoid having 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 prevention strategies.**

Project Report

Project Code	151290	
Project Name	Cable Replacement Project - (I3) - Bovaird - Dixie - Queen - Hwy 410, Brampton	
Project Description	This investment is for replacing 7,227 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central North (Brampton) I3 grid – Bovaird – Dixie – Queen – Hwy 410 area (the project will be paced to replace 1067.5 m in 2021, 1067.5 m in 2022, 2000 m in 2023, 2000 m in 2024 and 1092 m in 2025). It is expected that completion of this project will avoid 1.8 failures per year impacting 891 customers for 69 minutes based on Regional reliability data. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
	Comparative Information on Equivalent Historical Projects (if any)	**Similar cable replacement projects over the past 3 years in the Brampton area were $550/m. This project is forecasted to be $550/m.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 2018. 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	**The cable in this area is 46 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	**891**
	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 7227 m of cable in the whole area: Frequency of Failure is: 0.25 x 7227 /1000 = 1.8 failure(s) According to Alectra Central North Control Room data, there were 41, 62, 38, 40, and 49 Cable failures in 2017 to 2021, respectively (5-year average is 46 failures per year). Annually on average there were 46 Cable failures affecting 22753 customers and 1562780 CMI. Impact of 1 failure: 22753/46 = 495 customers affected and 1562780/46 = 33973 CMI. Impact of 1.8 failures: 495 x 1.8 = 891 customers affected and 33973 x 1.8 = 61151 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 1.8 potential cable failures and 61151 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**When direct buried cable is replaced, the new cable is installed according to new Standards which require installation 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(I3) - Bovaird - Dixie - Queen - Hwy 410, Brampton**

Project Report

Project Code	151296	
Project Name	Cable Injection Project - (SCH) - Welland - Bunting - Carlton - Cushman	
Project Description	This investment is to perform remediation of underground cable in the East area of St.Catharines bounded by Welland, Bunting, Carlton and Cushman. This project covers the area that meets the criteria for cable injection candidates for a total of 3,406m, while a separate project covers the cable replacement portion (C55 project #151295). It is mostly Residential/Commercial with 285 customers. This area has seen 1 recent failure as a result of cable faults for a failure rate of 29.3 failures/100km. Cables are between 26 to 45 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Deferred due to M-Factor decision results.**
	Why has it changed	**Adjustments required due to rate case results**
	Please provide additional justification for why the project has changed	**Deferred due to M-Factor decision results.**
02. Additional Information	**Branch Plant**	**830 St. Catharines Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**3406**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**634199**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the short term, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the short term, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed investment, 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.**

Project Report

Project Code	151296	
Project Name	Cable Injection Project - (SCH) - Welland - Bunting - Carlton - Cushman	
Project Description	This investment is to perform remediation of underground cable in the East area of St.Catharines bounded by Welland, Bunting, Carlton and Cushman. This project covers the area that meets the criteria for cable injection candidates for a total of 3,406m, while a separate project covers the cable replacement portion (C55 project #151295). It is mostly Residential/Commercial with 285 customers. This area has seen 1 recent failure as a result of cable faults for a failure rate of 29.3 failures/100km. Cables are between 26 to 45 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Customer Attachment / Load (KVA)	**285 customers and 4700kVA.**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as described in the project description.** **This is the preferred alternative.**

Project Report

Project Code 151296

Project Name [Cable Injection Project - (SCH) - Welland - Bunting - Carlton - Cushman]

Project Description This investment is to perform remediation of underground cable in the East area of St.Catharines bounded by Welland, Bunting, Carlton and Cushman. This project covers the area that meets the criteria for cable injection candidates for a total of 3,406m, while a separate project covers the cable replacement portion (C55 project #151295). It is mostly Residential/Commercial with 285 customers.

This area has seen 1 recent failure as a result of cable faults for a failure rate of 29.3 failures/100km. Cables are between 26 to 45 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category System Renewal

Scenario Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area exceed the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Alternative #2 is the recommended alternative because the cables are eligible for cable injection, this alternative has a lower cost than replacement and it will extend the cable life up to 20 years.

Project Report

Project Code	151296	
Project Name	Cable Injection Project - (SCH) - Welland - Bunting - Carlton - Cushman	
Project Description	This investment is to perform remediation of underground cable in the East area of St.Catharines bounded by Welland, Bunting, Carlton and Cushman. This project covers the area that meets the criteria for cable injection candidates for a total of 3,406m, while a separate project covers the cable replacement portion (C55 project #151295). It is mostly Residential/Commercial with 285 customers. This area has seen 1 recent failure as a result of cable faults for a failure rate of 29.3 failures/100km. Cables are between 26 to 45 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	

07. 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:** **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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**This project is forecasted to be $100/m, based on similar cable injection projects previously completed. There is an assumption that the unit cost increases with inflation at 2% each year.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record**	**There is 1 failure in this project scope within the 2016 - 2021 timeframe, for a failure rate of 29.3 failures/100km. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **Cable in this area ranges from 26 to 45 years old (installed in 1993 and 1974 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	**285**

Project Report

Project Code	151296
Project Name	Cable Injection Project - (SCH) - Welland - Bunting - Carlton - Cushman
Project Description	This investment is to perform remediation of underground cable in the East area of St.Catharines bounded by Welland, Bunting, Carlton and Cushman. This project covers the area that meets the criteria for cable injection candidates for a total of 3,406m, while a separate project covers the cable replacement portion (C55 project #151295). It is mostly Residential/Commercial with 285 customers. This area has seen 1 recent failure as a result of cable faults for a failure rate of 29.3 failures/100km. Cables are between 26 to 45 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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 3406m of cable in the whole area: Frequency of Failure is: 0.25 x 3406 /1000 = 0.85 failures Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI Impact of 0.85 failures: 598 x 0.85 = 508 customers affected and 52,945 x 0.85 = 45,003 CMI Since this area will be implemented in one year, the estimated quantity is 3406m in Year 1. In addition, the total number of transformers in the area is approximately 52 totalling 4700 KVA. For the purpose of Reliability Benefits: Year 1 Frequency of Failure is: 0.25 x 3406 /1000 = 0.85 failures Impact of 0.85 failures: 598 x 0.85 = 508 customers affected and 52,945 x 0.85 = 45,003 CMI The benefit from this year onwards is based on 0.85 failures Peak KVA = 4700 KVA**
	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 remediation program. The project will help avoid a total of 0.85 potential cable failures and 45,003 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Welland - Bunting - Carlton - Cushman (St. Catharines)**

Project Report

Project Code	151299	
Project Name	Cable and Transformer Replacement Project - (HAM) - Millen - Barton - Fruitland	
Project Description	This investment is for replacing 12,708m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Barton St, Millen Rd and Fruitland Rd. (while project #151300 covers the cable injection portion). It is mostly Residential/Commercial with 1065 customers. This area has seen 10 failures as a result of cable faults for a failure rate of 78.7 failures/100km. Along with the cable remediation, 91 transformers will also be replaced as part of the project. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**Not applicable.**
02. Additional Information	**Branch Plant**	**820 Nebo Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**12708**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**643846**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151299	
Project Name	Cable and Transformer Replacement Project - (HAM) - Millen - Barton - Fruitland	
Project Description	This investment is for replacing 12,708m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Barton St, Millen Rd and Fruitland Rd. (while project #151300 covers the cable injection portion). It is mostly Residential/Commercial with 1065 customers. This area has seen 10 failures as a result of cable faults for a failure rate of 78.7 failures/100km. Along with the cable remediation, 91 transformers will also be replaced as part of the project. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers.** **Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the near term to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, 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)	**1065 customers and 6800 kVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**

Project Report

Project Code	151299
Project Name	Cable and Transformer Replacement Project - (HAM) - Millen - Barton - Fruitland
Project Description	This investment is for replacing 12,708m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Barton St, Millen Rd and Fruitland Rd. (while project #151300 covers the cable injection portion). It is mostly Residential/Commercial with 1065 customers. This area has seen 10 failures as a result of cable faults for a failure rate of 78.7 failures/100km. Along with the cable remediation, 91 transformers will also be replaced as part of the project. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Alternative #1

Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.

This alternative is costly, disruptive to customers and does not address the failure situation adequately.

This is not a preferred alternative.

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.

The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail.

This is the recommended alternative.

Justification for Recommended Alternative

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.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Segments that do meet the criteria for cable injection are covered under a separate project.

Therefore, planned cable replacement within the area is selected as the preferred alternative. While it is a costly alternative, the added benefit of installing new conduit which will help with future cable issues as well as avoiding future outages on other cable segments that have been subjected to previous high stress fault conditions. The benefits to the customer include reducing the likelihood of unplanned disruptions and new underground equipment which should provide reliable, continuous service for many more years. Furthermore, the replacement of several transformers that are at risk of failing allows for an opportunistic renewal of assets while work crews are already in the area performing cable replacement, minimizing the outage impacts for customers who would otherwise eventually experience an unplanned outage once the transformer fails. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Project Report

Project Code	151299
Project Name	Cable and Transformer Replacement Project - (HAM) - Millen - Barton - Fruitland
Project Description	This investment is for replacing 12,708m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Barton St, Millen Rd and Fruitland Rd. (while project #151300 covers the cable injection portion). It is mostly Residential/Commercial with 1065 customers. This area has seen 10 failures as a result of cable faults for a failure rate of 78.7 failures/100km. Along with the cable remediation, 91 transformers will also be replaced as part of the project. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 utilized coordination with third parties to avoid 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 avoidance 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 (0 if not applicable)	**0**
08. 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 10 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 78.7 failures/100km. 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**

Project Report

Project Code	151299
Project Name	Cable and Transformer Replacement Project - (HAM) - Millen - Barton - Fruitland
Project Description	This investment is for replacing 12,708m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Barton St, Millen Rd and Fruitland Rd. (while project #151300 covers the cable injection portion). It is mostly Residential/Commercial with 1065 customers. This area has seen 10 failures as a result of cable faults for a failure rate of 78.7 failures/100km. Along with the cable remediation, 91 transformers will also be replaced as part of the project. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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 12708m of cable in the whole area: Frequency of Failure is: 0.25 x 12708 /1000 = 3.18 failures Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI Impact of 3.18 failures: 598 x 3.18 = 1902 customers affected and 52,945 x 3.18 = 168,365 CMI Since this area will be implemented in phases over a period of three years, the estimated quantity is 4419m in Year 1, 4145m in Year 2, and 4144m in Year 3. In addition, the total number of transformers in the area is approximately 91 totalling 6880 KVA. For the purpose of Reliability Benefits: Year 1 Frequency of Failure is: 0.25 x 4419 /1000 = 1.1 failures Impact of 1.1 failure: 598 x 1.1 = 658 customers affected and 52,945 x 1.1 = 58,240 CMI The benefit from this year onwards is based on 1.1 failures Peak KVA = 2,393 KVA Year 2 Frequency of Failure is: 0.25 x (4419+4145) /1000 = 2.14 failures Impact of 2.14 failure: 598 x 2.14 = 1280 customers affected and 52,945 x 2.14 = 113,302 CMI The benefit from this year onwards is based on 2.14 failures Peak KVA = 4,637 KVA Year 3 Frequency of Failure is: 0.25 x (4419+4145+4144) /1000 = 3.18 failures Impact of 3.18 failures: 598 x 3.18 = 1902 customers affected and 52,945 x 3.18 = 168,365 CMI The benefit from this year onwards is based on 3.18 failures
	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 168,365 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).
10. Obsolete	Budget Type	B) Capital Works
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	11 / Alectra Initiated Capital
	Rates Category	
	Job Cost Chart Type	Master Chart
	PowerStream Plan Sub Category	
	Location Description	Millen - Barton - Fruitland (Hamilton)

Project Report

Project Code	151300	
Project Name	Cable Injection Project - (HAM) - Millen - Barton - Fruitland	
Project Description	This investment is to perform remediation of underground cable in the Stoney Creek area bounded by Barton St, Millen Rd and Fruitland Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 23,477m, while a separate project covers the cable replacement portion (C55 project #151299). It is mostly Residential/Commercial with 1963 customers. This area has seen 1 recent failures as a result of cable faults for a failure rate of 4.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Timing**
	Please provide additional justification for what has changed	**De-funding in 2020 and deferring work until 2023. Funds being re-allocated to work in Central South and to West Voltage conversion project for Central MS (150352). De-funding amount was originally $910,300 in 2020, after re-estimate in early 2020, total amount being deferred into 2023 is $1,069,352.**
	Why has it changed	**Significant unforeseen external factors (e.g. pandemic, natural disaster)**
	Please provide additional justification for why the project has changed	**West cable injection projects for 2020 were not going to be able to be completed due to challenges related to coronavirus. Money is being re-allocated from 2020 to 2023 and project will continue as planned in 2021. Funding for 2022 has been re-assigned to 2024.**
02. Additional Information	**Branch Plant**	**820 Nebo Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**23447**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	**Approved**
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**3**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**634190**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the short term, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the short term, the only option left would be cable replacement which would cost 5 times that for cable injection.** **Without this proposed investment, 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)	**1963 customers and 6,900 kVA**

Project Report

Project Code	151300	
Project Name	Cable Injection Project - (HAM) - Millen - Barton - Fruitland	
Project Description	This investment is to perform remediation of underground cable in the Stoney Creek area bounded by Barton St, Millen Rd and Fruitland Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 23,477m, while a separate project covers the cable replacement portion (C55 project #151299). It is mostly Residential/Commercial with 1963 customers. This area has seen 1 recent failures as a result of cable faults for a failure rate of 4.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	

06. Qualitative and Quantitative Analysis of Project and Project Alternatives (OEB)	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
	Status Quo	**The status quo is to do nothing, allowing the end-of-life cable to run to failure and responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area). This alternative is costly, disruptive to customers and does not address the failure situation adequately. This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as described in the project description. This is the preferred alternative.**

Project Report

Project Code	151300
Project Name	Cable Injection Project - (HAM) - Millen - Barton - Fruitland
Project Description	This investment is to perform remediation of underground cable in the Stoney Creek area bounded by Barton St, Millen Rd and Fruitland Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 23,477m, while a separate project covers the cable replacement portion (C55 project #151299). It is mostly Residential/Commercial with 1963 customers. This area has seen 1 recent failures as a result of cable faults for a failure rate of 4.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area exceed the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Alternative #2 is the recommended alternative because the cables are eligible for cable injection, this alternative has a lower cost than replacement and it will extend the cable life up to 20 years.

Project Report

Project Code	151300	
Project Name	Cable Injection Project - (HAM) - Millen - Barton - Fruitland	
Project Description	This investment is to perform remediation of underground cable in the Stoney Creek area bounded by Barton St, Millen Rd and Fruitland Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 23,477m, while a separate project covers the cable replacement portion (C55 project #151299). It is mostly Residential/Commercial with 1963 customers. This area has seen 1 recent failures as a result of cable faults for a failure rate of 4.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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:** **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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**This project is forecasted to be $100/m, based on similar cable injection projects previously completed. There is an assumption that the unit cost increases with inflation at 2% each year.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record**	**There is 1 failure in this project scope within the 2016 - 2021 timeframe, for a failure rate of 4.3 failures/100km. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **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	**1963**

Project Report

Project Code: 151300

Project Name: Cable Injection Project - (HAM) - Millen - Barton - Fruitland

Project Description: This investment is to perform remediation of underground cable in the Stoney Creek area bounded by Barton St, Millen Rd and Fruitland Rd. This project covers the area that meets the criteria for cable injection candidates for a total of 23,477m, while a separate project covers the cable replacement portion (C55 project #151299). It is mostly Residential/Commercial with 1963 customers.

This area has seen 1 recent failures as a result of cable faults for a failure rate of 4.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category: System Renewal

Scenario: Submitted

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 23447m of cable in the whole area:
Frequency of Failure is: 0.25 x 23447 /1000 = 5.86 failures

Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI

Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI
Impact of 5.86 failures: 598 x 5.86 = 3504 customers affected and 52,945 x 5.86 = 310,258 CMI

Since this area will be implemented in phases over a period of three years, the estimated quantity is 2644m in Year 1, 11724m in Year 2, and 9080m in Year 3. In addition, the total number of transformers in the area is approximately 259 totalling 19,575 KVA.

For the purpose of Reliability Benefits:

Year 1
Frequency of Failure is: 0.25 x 2644 /1000 = 0.66 failures
Impact of 0.66 failure: 598 x 0.66 = 395 customers affected and 52,945 x 0.66 = 34,944 CMI
Peak KVA = 1432 KVA
The benefit for 2020 is based on 0.66 failures

Year 2
Frequency of Failure is: 0.25 x (2644+11724) /1000 = 3.59 failures
Impact of 3.59 failure: 598 x 3.59 = 2147 customers affected and 52,945 x 3.59 = 190,073 CMI
Peak KVA = 7779 KVA
The benefit for 2021 is based on 3.59 failures

Year 3
Frequency of Failure is: 0.25 x (2644+11724+9080) /1000 = 5.86 failures
Impact of 5.86 failures: 598 x 5.86 = 3504 customers affected and 52,945 x 5.86 = 310,258 CMI
Peak KVA = 12695 KVA

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 remediation program. The project will help avoid a total of 5.86 potential cable failures and 310,258 potential CMI.**

Analysis for "Like for Like" Renewal Project: **Not applicable.**

10. Obsolete

Budget Type: **B) Capital Works**

PowerStream Old Sub-Category:

PowerStream Plan Category:

Phase Code: **11 / Alectra Initiated Capital**

Rates Category:

Job Cost Chart Type: **Master Chart**

PowerStream Plan Sub Category:

Location Description: **Millen - Barton - Fruitland – Ridge (Hamilton)**

Project Report

Project Code	151303	
Project Name	Cable and Transformer Replacement Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	
Project Description	This investment is for replacing 20,304m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Stone Church, Garth and the Lincoln Alexander Parkway. (while project #151304 covers the cable injection portion). It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, 124 submersible transformers will also be replaced as part of the project. This area has seen 5 failures as a result of cable faults for a failure rate of 24.6 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**Not applicable.**
02. Additional Information	**Branch Plant**	**820 Nebo Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**20343**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**639116**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151303
Project Name	Cable and Transformer Replacement Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander
Project Description	This investment is for replacing 20,304m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Stone Church, Garth and the Lincoln Alexander Parkway. (while project #151304 covers the cable injection portion). It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, 124 submersible transformers will also be replaced as part of the project. This area has seen 5 failures as a result of cable faults for a failure rate of 24.6 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	These investments are driven by a failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. 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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers. Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the near term to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, 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)	1705 customers and 9,500 kVA
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.
	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	An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.
	Environmental Benefits	Not applicable.
06. 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 responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.

Project Report

Project Code	151303
Project Name	Cable and Transformer Replacement Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander
Project Description	This investment is for replacing 20,304m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Stone Church, Garth and the Lincoln Alexander Parkway. (while project #151304 covers the cable injection portion). It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, 124 submersible transformers will also be replaced as part of the project. This area has seen 5 failures as a result of cable faults for a failure rate of 24.6 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Alternative #1

Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.

This alternative is costly, disruptive to customers and does not address the failure situation adequately.

This is not a preferred alternative.

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.

The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail.

This is the recommended alternative.

Justification for Recommended Alternative

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.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Segments that do meet the criteria for cable injection are covered under a separate project.

Therefore, planned cable replacement within the area is selected as the preferred alternative. While it is a costly alternative, the added benefit of installing new conduit which will help with future cable issues as well as avoiding future outages on other cable segments that have been subjected to previous high stress fault conditions. The benefits to the customer include reducing the likelihood of unplanned disruptions and new underground equipment which should provide reliable, continuous service for many more years. Furthermore, the replacement of several transformers that are at risk of failing allows for an opportunistic renewal of assets while work crews are already in the area performing cable replacement, minimizing the outage impacts for customers who would otherwise eventually experience an unplanned outage once the transformer fails. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Project Report

Project Code	151303	
Project Name	Cable and Transformer Replacement Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	
Project Description	This investment is for replacing 20,304m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Stone Church, Garth and the Lincoln Alexander Parkway. (while project #151304 covers the cable injection portion). It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, 124 submersible transformers will also be replaced as part of the project. This area has seen 5 failures as a result of cable faults for a failure rate of 24.6 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 utilized coordination with third parties to avoid 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 avoidance 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 (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record**	**There are 5 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 24.6 failures/100km. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers. 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**

Project Report

Project Code	151303	
Project Name	Cable and Transformer Replacement Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	
Project Description	This investment is for replacing 20,304m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Stone Church, Garth and the Lincoln Alexander Parkway. (while project #151304 covers the cable injection portion). It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, 124 submersible transformers will also be replaced as part of the project. This area has seen 5 failures as a result of cable faults for a failure rate of 24.6 failures/100km. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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 20343m of cable in the whole area: Frequency of Failure is: 0.25 x 20343 /1000 = 5.09 failures Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI Impact of 5.09 failures: 598 x 5.09 = 3044 customers affected and 52,945 x 5.09 = 269,490 CMI Since this area will be implemented in phases over a period of three years, the estimated quantity is 7627m in Year 1, 9868m in Year 2, and 2848m in Year 3. In addition, the total number of transformers in the area is approximately 188 totalling 12,854 KVA. For the purpose of Reliability Benefits: Year 1 Frequency of Failure is: 0.25 x 7627 /1000 = 1.91 failures Impact of 1.91 failure: 598 x 1.91 = 1142 customers affected and 52,945 x 1.91 = 101,125 CMI The benefit from this year onwards is based on 1.91 failures Peak KVA = 3,543 KVA Year 2 Frequency of Failure is: 0.25 x (7627+9868) /1000 = 4.37 failures Impact of 4.37 failure: 598 x 4.37 = 2613 customers affected and 52,945 x 4.37 = 231,370 CMI The benefit from this year onwards is based on 4.37 failures Peak KVA = 8,128 KVA Year 3 Frequency of Failure is: 0.25 x (7627+9868+2848) /1000 = 5.09 failures Impact of 5.09 failures: 598 x 5.09 = 3044 customers affected and 52,945 x 5.09 = 269,490 CMI The benefit from this year onwards is based on 5.09 failures Peak KVA = 9,451 KVA**
	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 269,490 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).**
10. Obsolete	Budget Type	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Stone Church - Garth - Lincoln M. Alexander (Hamilton)**

Project Report

Project Code	151304	
Project Name	Cable Injection Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	
Project Description	This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Garth, Stonechurch and the Lincoln Alexander Pkwy. This project covers the area that meets the criteria for cable injection candidates for a total of 7,325m, while a separate project covers the cable replacement portion (C55 project #151303). It is mostly Residential/Commercial with 613 customers. This area has seen 2 recent failures as a result of cable faults for a failure rate of 27.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**Timing**
	Please provide additional justification for what has changed	**Project being defunded in 2020 due to project execution issues for West Cable Injection projects. Original 2020 budget was $568,768. Budget was revised by Design, and the project start date has been shifted to 2025 to match 3.1 Optimization timing. New 2025 budget number is $668,146 ('current year $' in C55). Money has been re-allocated to other projects, per July 17th 2020 email.**
	Why has it changed	**Significant unforeseen external factors (e.g. pandemic, natural disaster)**
	Please provide additional justification for why the project has changed	**Delayed due to coronavirus.**
02. Additional Information	**Branch Plant**	**820 Nebo Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**7325**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	**Approved**
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**3**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**634193**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the short term, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the short term, the only option left would be cable replacement which would cost 5 times that for cable injection.** **Without this proposed investment, 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)	**613 customers and 2200 kVA**

Project Report

Project Code	151304	
Project Name	Cable Injection Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	
Project Description	This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Garth, Stonechurch and the Lincoln Alexander Pkwy. This project covers the area that meets the criteria for cable injection candidates for a total of 7,325m, while a separate project covers the cable replacement portion (C55 project #151303). It is mostly Residential/Commercial with 613 customers. This area has seen 2 recent failures as a result of cable faults for a failure rate of 27.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as described in the project description.** **This is the preferred alternative.**

Project Report

Project Code	151304
Project Name	Cable Injection Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander
Project Description	This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Garth, Stonechurch and the Lincoln Alexander Pkwy. This project covers the area that meets the criteria for cable injection candidates for a total of 7,325m, while a separate project covers the cable replacement portion (C55 project #151303). It is mostly Residential/Commercial with 613 customers. This area has seen 2 recent failures as a result of cable faults for a failure rate of 27.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area exceed the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Alternative #2 is the recommended alternative because the cables are eligible for cable injection, this alternative has a lower cost than replacement and it will extend the cable life up to 20 years.

Project Report

Project Code	151304	
Project Name	Cable Injection Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	
Project Description	This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Garth, Stonechurch and the Lincoln Alexander Pkwy. This project covers the area that meets the criteria for cable injection candidates for a total of 7,325m, while a separate project covers the cable replacement portion (C55 project #151303). It is mostly Residential/Commercial with 613 customers. This area has seen 2 recent failures as a result of cable faults for a failure rate of 27.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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:** **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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**This project is forecasted to be $100/m, based on similar cable injection projects previously completed. There is an assumption that the unit cost increases with inflation at 2% each year.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 2 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 27.3 failures/100km. 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	**613**

Project Report

Project Code	151304	
Project Name	Cable Injection Project - (HAM) - Stone Church - Garth - Lincoln M. Alexander	
Project Description	This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Garth, Stonechurch and the Lincoln Alexander Pkwy. This project covers the area that meets the criteria for cable injection candidates for a total of 7,325m, while a separate project covers the cable replacement portion (C55 project #151303). It is mostly Residential/Commercial with 613 customers. This area has seen 2 recent failures as a result of cable faults for a failure rate of 27.3 failures/100km. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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 7325m of cable in the whole area:** **Frequency of Failure is: 0.25 x 7325 /1000 = 1.83 failures** **Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI** **Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI** **Impact of 1.83 failures: 598 x 1.83 = 1094 customers affected and 52,945 x 1.83 = 96,889 CMI** **Since this area will be implemented in one year, the estimated quantity is 7,325m in Year 1. In addition, the total number of transformers in the area is approximately 188 totalling 12,854 KVA.** **For the purpose of Reliability Benefits:** **Year 1** **Frequency of Failure is: 0.25 x 7325 /1000 = 1.83 failures** **Impact of 1.83 failures: 598 x 1.83 = 1094 customers affected and 52,945 x 1.83 = 96,889 CMI** **Peak KVA = 12,854 KVA** **The benefit from this year onwards is based on 1.83 failures**
	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 remediation program. The project will help avoid a total of 1.83 potential cable failures and 96,889 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Stone Church - Garth - Lincoln M. Alexander (Hamilton)**

Project Report

Project Code	151307	
Project Name	Cable Injection Project - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal	
Project Description	This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Upper Sherman, Stonechurch, Nebo and Rymal Rds. This project covers the area that meets the criteria for cable injection candidates for a total of 21,244m, while a separate project covers the cable replacement portion (C55 project #151879). It is mostly Residential/Commercial with 1779 customers. Cables are between 27 to 69 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**Not applicable.**
02. Additional Information	**Branch Plant**	**820 Nebo Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**21244**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the short term, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the short term, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed investment, 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)	**1779 customers and 6,500 kVA**

Project Report

Project Code	151307	
Project Name	Cable Injection Project - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal	
Project Description	This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Upper Sherman, Stonechurch, Nebo and Rymal Rds. This project covers the area that meets the criteria for cable injection candidates for a total of 21,244m, while a separate project covers the cable replacement portion (C55 project #151879). It is mostly Residential/Commercial with 1779 customers. Cables are between 27 to 69 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as described in the project description.** **This is the preferred alternative.**

Project Report

Project Code: 151307

Project Name: Cable Injection Project - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal

Project Description:

This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Upper Sherman, Stonechurch, Nebo and Rymal Rds. This project covers the area that meets the criteria for cable injection candidates for a total of 21,244m, while a separate project covers the cable replacement portion (C55 project #151879). It is mostly Residential/Commercial with 1779 customers.

Cables are between 27 to 69 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category: System Renewal

Scenario: Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area exceed the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Alternative #2 is the recommended alternative because the cables are eligible for cable injection, this alternative has a lower cost than replacement and it will extend the cable life up to 20 years.

Project Report

Project Code	151307
Project Name	Cable Injection Project - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal
Project Description	This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Upper Sherman, Stonechurch, Nebo and Rymal Rds. This project covers the area that meets the criteria for cable injection candidates for a total of 21,244m, while a separate project covers the cable replacement portion (C55 project #151879). It is mostly Residential/Commercial with 1779 customers. Cables are between 27 to 69 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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:** **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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**This project is forecasted to be $100/m, based on similar cable injection projects previously completed. There is an assumption that the unit cost increases with inflation at 2% each year.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record**	**There are 0 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 0 failures/100km. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **Cable in this area ranges from 27 to 69 years old (installed in 1992 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	**1779**

Project Report

Project Code: 151307

Project Name: Cable Injection Project - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal

Project Description: This investment is to perform remediation of underground cable in the south Mountain area of Hamilton bounded by Upper Sherman, Stonechurch, Nebo and Rymal Rds. This project covers the area that meets the criteria for cable injection candidates for a total of 21,244m, while a separate project covers the cable replacement portion (C55 project #151879). It is mostly Residential/Commercial with 1779 customers.

Cables are between 27 to 69 years old. This investment would target the cables suitable for injection that are the most vulnerable first. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category: System Renewal

Scenario: Submitted

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 21244m of cable in the whole area:
Frequency of Failure is: 0.25 x 21244 /1000 = 5.31 failures

Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI

Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI
Impact of 5.31 failures: 598 x 5.31 = 3175 customers affected and 52,945 x 5.31 = 281,138 CMI

Since this area will be implemented in phases over a period of three years, the estimated quantity is 7650m in Year 1, 8898m in Year 2, and 4696m in Year 3. In addition, the total number of transformers in the area is approximately 227 totalling 25,974 KVA.

For the purpose of Reliability Benefits:

Year 1
Frequency of Failure is: 0.25 x 7650 /1000 = 1.91 failures
Impact of 1.91 failure: 598 x 1.91 = 1142 customers affected and 52,945 x 1.91 = 101,125 CMI
Peak KVA = 25,974 / 21,244 * 7650 = 9,353 KVA
The benefit from this year onwards is based on 1.91 failures

Year 2
Frequency of Failure is: 0.25 x (7650+8898) /1000 = 4.14 failures
Impact of 4.14 failure: 598 x 4.14 = 2476 customers affected and 52,945 x 4.14 = 219,192 CMI
Peak KVA = 25,974 / 21,244 x (7650+8898) = 20,232 KVA
The benefit from this year onwards is based on 4.14 failures

Year 3
Frequency of Failure is: 0.25 x (7650+8898+4696) /1000 = 5.31 failures
Impact of 5.31 failures: 598 x 5.31 = 3175 customers affected and 52,945 x 5.31 = 281,138 CMI
Peak KVA = 25,974 / 21,244 x (7650+8898+4696) = 25,974 KVA
[illegible]

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 remediation program. The project will help avoid a total of 5.31 potential cable failures and 281,138 potential CMI.**

Analysis for "Like for Like" Renewal Project: **Not applicable.**

10. Obsolete

Budget Type: **B) Capital Works**

PowerStream Old Sub-Category:

PowerStream Plan Category:

Phase Code: **11 / Alectra Initiated Capital**

Rates Category:

Job Cost Chart Type: **Master Chart**

PowerStream Plan Sub Category:

Location Description: **Upper Sherman - Stone Church - Nebo - Rymal (Hamilton)**

Project Report

Project Code	151308
Project Name	Cable Injection Project - (HAM) - Hollybush - Parkside - Dundas - Spring Creek
Project Description	This investment is to perform remediation of underground cable in the Waterdown area of Hamilton between Dundas St and Parkside Dr. This project covers the area that meets the criteria for cable injection candidates for a total of 1,372m, while a separate project covers the cable replacement portion (C55 project #151556). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 114 customers. This area has seen 1 recent failure as a result of cable faults for a failure rate of 72.9 failures/100km. Cables in this area are between 26 and 72 years old. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**Not applicable.**
02. Additional Information	**Branch Plant**	**820 Nebo Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable.**
	Units	**1372**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the short term, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the short term, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed investment, 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)	**114 customers and 500kVA.**

Project Report

Project Code	151308	
Project Name	Cable Injection Project - (HAM) - Hollybush - Parkside - Dundas - Spring Creek	
Project Description	This investment is to perform remediation of underground cable in the Waterdown area of Hamilton between Dundas St and Parkside Dr. This project covers the area that meets the criteria for cable injection candidates for a total of 1,372m, while a separate project covers the cable replacement portion (C55 project #151556). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 114 customers. This area has seen 1 recent failure as a result of cable faults for a failure rate of 72.9 failures/100km. Cables in this area are between 26 and 72 years old. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as described in the project description.** **This is the preferred alternative.**

Project Report

Project Code: 151308

Project Name: Cable Injection Project - (HAM) - Hollybush - Parkside - Dundas - Spring Creek

Project Description: This investment is to perform remediation of underground cable in the Waterdown area of Hamilton between Dundas St and Parkside Dr. This project covers the area that meets the criteria for cable injection candidates for a total of 1,372m, while a separate project covers the cable replacement portion (C55 project #151556). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 114 customers.

This area has seen 1 recent failure as a result of cable faults for a failure rate of 72.9 failures/100km. Cables in this area are between 26 and 72 years old. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category: System Renewal

Scenario: Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area exceed the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Alternative #2 is the recommended alternative because the cables are eligible for cable injection, this alternative has a lower cost than replacement and it will extend the cable life up to 20 years.

Project Report

Project Code	151308	
Project Name	Cable Injection Project - (HAM) - Hollybush - Parkside - Dundas - Spring Creek	
Project Description	This investment is to perform remediation of underground cable in the Waterdown area of Hamilton between Dundas St and Parkside Dr. This project covers the area that meets the criteria for cable injection candidates for a total of 1,372m, while a separate project covers the cable replacement portion (C55 project #151556). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 114 customers. This area has seen 1 recent failure as a result of cable faults for a failure rate of 72.9 failures/100km. Cables in this area are between 26 and 72 years old. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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:** **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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**This project is forecasted to be $100/m, based on similar cable injection projects previously completed. There is an assumption that the unit cost increases with inflation at 2% each year.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record**	**There is 1 failure in this project scope within the 2016 - 2021 timeframe, for a failure rate of 72.9 failures/100km. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **Cable in this area ranges from 26 to 72 years old (installed in 1993 and 1947 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	**114**

Project Report

Project Code	151308
Project Name	Cable Injection Project - (HAM) - Hollybush - Parkside - Dundas - Spring Creek
Project Description	This investment is to perform remediation of underground cable in the Waterdown area of Hamilton between Dundas St and Parkside Dr. This project covers the area that meets the criteria for cable injection candidates for a total of 1,372m, while a separate project covers the cable replacement portion (C55 project #151556). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 114 customers. This area has seen 1 recent failure as a result of cable faults for a failure rate of 72.9 failures/100km. Cables in this area are between 26 and 72 years old. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**Area is served by 2D13X, which is on the Worst Performing Feeder list. For 1000 m of cable: Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 1372m of cable in the whole area: Frequency of Failure is: 0.25 x 1372 /1000 = 0.34 failures Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI Impact of 0.34 failures: 598 x 0.34 = 203 customers affected and 52,945 x 0.34 = 18,001 CMI Since this area will be implemented in one year, the estimated quantity is 1372m in Year 1. In addition, the total number of transformers in the area is approximately 10 totaling 500 KVA. For the purpose of Reliability Benefits: Year 1 Frequency of Failure is: 0.25 x 1372 /1000 = 0.34 failures Impact of 0.34 failures: 598 x 0.34 = 203 customers affected and 52,945 x 0.34 = 18,001 CMI Peak KVA = 500 KVA The benefit from this year onwards is based on 0.34 failures**
	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 remediation program. The project will help avoid a total of 0.34 potential cable failures and 18,001 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Hollybush - Parkside - Dundas - Spring Creek (Hamilton)**

Project Report

Project Code	151314	
Project Name	Cable Injection Project - (G2) -Wanless - Kennedy - Bovaird - Main, Brampton	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Wanless - Kennedy - Bovaird - Main area (Grid G2) to maintain system reliability and customer service. This area has experienced 1 cable failure since 2017 impacting 40 customers for 107 minutes, less than once a year. There were 2 failures prior to 2016. On one sub-event in 2017, the outage lasted more than 3 hours. Alectra considers this below the standard the customers should expect. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 38994 m of direct-buried XLPE cables. It is proposed to replace 13000 m in 2024, and 25994 m in 2025 based on work that can be executed within these years. It is expected that completion of this project will avoid 3 failures per year impacting 120 customers for 107 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**805 Sandalwood Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**38944**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Agostini, Robert (Robert.Agostini)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**639126**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151314	
Project Name	Cable Injection Project - (G2) -Wanless - Kennedy - Bovaird - Main, Brampton	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Wanless - Kennedy - Bovaird - Main area (Grid G2) to maintain system reliability and customer service. This area has experienced 1 cable failure since 2017 impacting 40 customers for 107 minutes, less than once a year. There were 2 failures prior to 2016. On one sub-event in 2017, the outage lasted more than 3 hours. Alectra considers this below the standard the customers should expect. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 38994 m of direct-buried XLPE cables. It is proposed to replace 13000 m in 2024, and 25994 m in 2025 based on work that can be executed within these years. It is expected that completion of this project will avoid 3 failures per year impacting 120 customers for 107 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	**This project is driven by the cable failure risks impacting the reliability of the distribution system in this area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable remediation within the next 2 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 1 cable failures per year in 2025 and will increase to 3 failures per year starting 2026.**
	Customer Attachment / Load (KVA)	**114 Residential and 6 Commercial customers / 2991 KVA**
	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.**
06. 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	**Inject all the cables in this area that are of the same vintage as those that experienced cable faults.**
	Alternative #2	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**

Project Report

Project Code	151314
Project Name	Cable Injection Project - (G2) -Wanless - Kennedy - Bovaird - Main, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Wanless - Kennedy - Bovaird - Main area (Grid G2) to maintain system reliability and customer service. This area has experienced 1 cable failure since 2017 impacting 40 customers for 107 minutes, less than once a year. There were 2 failures prior to 2016. On one sub-event in 2017, the outage lasted more than 3 hours. Alectra considers this below the standard the customers should expect. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 38994 m of direct-buried XLPE cables. It is proposed to replace 13000 m in 2024, and 25994 m in 2025 based on work that can be executed within these years. It is expected that completion of this project will avoid 3 failures per year impacting 120 customers for 107 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 1 cable failures since 2016. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are over 31 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #2 is not recommended because on average, cable replacement is 5 times more expensive than cable injection, and cables at this location are feasible for cable injection.

Project Report

Project Code: 151314

Project Name: Cable Injection Project - (G2) -Wanless - Kennedy - Bovaird - Main, Brampton

Project Description:

This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Wanless - Kennedy - Bovaird - Main area (Grid G2) to maintain system reliability and customer service.

This area has experienced 1 cable failure since 2017 impacting 40 customers for 107 minutes, less than once a year. There were 2 failures prior to 2016. On one sub-event in 2017, the outage lasted more than 3 hours. Alectra considers this below the standard the customers should expect. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 38994 m of direct-buried XLPE cables. It is proposed to replace 13000 m in 2024, and 25994 m in 2025 based on work that can be executed within these years.

It is expected that completion of this project will avoid 3 failures per year impacting 120 customers for 107 minutes.

This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category: System Renewal

Scenario: Submitted

07. 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 avoid 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 prevention strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Similar cable injection projects over the past three years were $75/m. This project is estimated at $80/m.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:** **Condition of Asset vs. Typical Life Cycle and Performance Record** **Number of Customers in Each Customer Class Potentially Affected by Asset Failure** **Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)**	**In this area, there was 1 cable failure since 2017. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **Cable in this area is over 31 years old, 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.** **2525** **For 1000 m of cable:** **Frequency of Failure is: 0.08 failures per 1000 m of cable per year** **For 38994 m of cable in the whole area:** **Frequency of Failure is: 0.08 x 38994 /1000 = 3 failure(s)** **According to Alectra Central North Control Room data, there were , 1, 0, 0, 0,and 0 Cable failures in 2016 to 2021, respectively (6-year average is 0.167 failures per year).** **Annually on average there were 0.167 Cable failures affecting 8 customers and 717 CMI.** **Impact of 1 failure: 8/0.167 = 40 customers affected and 717/0.167 = 4294 CMI.** **Impact of 3 failures: 40 x 3 = 120 customers affected and 4294 x 3 = 12882 CMI**

Project Report

Project Code	151314
Project Name	Cable Injection Project - (G2) -Wanless - Kennedy - Bovaird - Main, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Wanless - Kennedy - Bovaird - Main area (Grid G2) to maintain system reliability and customer service. This area has experienced 1 cable failure since 2017 impacting 40 customers for 107 minutes, less than once a year. There were 2 failures prior to 2016. On one sub-event in 2017, the outage lasted more than 3 hours. Alectra considers this below the standard the customers should expect. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 38994 m of direct-buried XLPE cables. It is proposed to replace 13000 m in 2024, and 25994 m in 2025 based on work that can be executed within these years. It is expected that completion of this project will avoid 3 failures per year impacting 120 customers for 107 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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 faults and 12882 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(G2) -Wanless - Kennedy - Bovaird - Main, Brampton**

Project Report

Project Code	151315	
Project Name	Cable Injection Project - (G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Steeles - Kennedy - Hwy 407 - Main area (Grid G5) to maintain system reliability and customer service. This area has experienced 1 cable failure from 2016 to 2018 and 2 failures from 2019 to 2021 impacting 231 customers for 74 minutes, less than once a year. Alectra sees an increase on cable failures in last three years. This area comprises residential customers and 13 commercial customers including the courthouse. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 24923 m of direct-buried XLPE cables. It is proposed to replace 8307 m each year in 2023, 2024 and 2025 based on work that can be executed within these years. It is expected that completion of this project will avoid 4 failures per year impacting 308 customers for 74 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**805 Sandalwood Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**26849**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Agostini, Robert (Robert.Agostini)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151315
Project Name	Cable Injection Project - (G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Steeles - Kennedy - Hwy 407 - Main area (Grid G5) to maintain system reliability and customer service. This area has experienced 1 cable failure from 2016 to 2018 and 2 failures from 2019 to 2021 impacting 231 customers for 74 minutes, less than once a year. Alectra sees an increase on cable failures in last three years. This area comprises residential customers and 13 commercial customers including the courthouse. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 24923 m of direct-buried XLPE cables. It is proposed to replace 8307 m each year in 2023, 2024 and 2025 based on work that can be executed within these years. It is expected that completion of this project will avoid 4 failures per year impacting 308 customers for 74 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**This project is driven by the cable failure risks impacting the reliability of the distribution system in this area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable remediation within the next 2 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 2 cable failures per year in 2024 and will increase to 4 failures per year starting 2026.**
	Customer Attachment / Load (KVA)	**260 Residential and 48 Commercial customers / 23928 KVA**
	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.**
06. 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	**Inject all the cables in this area that are of the same vintage as those that experienced cable faults.**
	Alternative #2	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**

Project Report

Project Code	151315
Project Name	Cable Injection Project - (G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Steeles - Kennedy - Hwy 407 - Main area (Grid G5) to maintain system reliability and customer service. This area has experienced 1 cable failure from 2016 to 2018 and 2 failures from 2019 to 2021 impacting 231 customers for 74 minutes, less than once a year. Alectra sees an increase on cable failures in last three years. This area comprises residential customers and 13 commercial customers including the courthouse. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 24923 m of direct-buried XLPE cables. It is proposed to replace 8307 m each year in 2023, 2024 and 2025 based on work that can be executed within these years. It is expected that completion of this project will avoid 4 failures per year impacting 308 customers for 74 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 3 cable failures since 2016. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 31 to 35 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #2 is not recommended because on average, cable replacement is 5 times more expensive than cable injection, and cables at this location are feasible for cable injection.

Project Report

Project Code	151315	
Project Name	Cable Injection Project - (G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Steeles - Kennedy - Hwy 407 - Main area (Grid G5) to maintain system reliability and customer service. This area has experienced 1 cable failure from 2016 to 2018 and 2 failures from 2019 to 2021 impacting 231 customers for 74 minutes, less than once a year. Alectra sees an increase on cable failures in last three years. This area comprises residential customers and 13 commercial customers including the courthouse. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 24923 m of direct-buried XLPE cables. It is proposed to replace 8307 m each year in 2023, 2024 and 2025 based on work that can be executed within these years. It is expected that completion of this project will avoid 4 failures per year impacting 308 customers for 74 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 avoid 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 prevention strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Similar cable injection projects over the past three years (2018, 2019, and 2020) were $80/m.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 failures since 2016. 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	**Cables in this area are 36 years old, which exceeds Alectra Utilities' Typical Useful Life of 30 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**1881**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable:** **Frequency of Failure is: 0.16 failures per 1000 m of cable per year** **For 24923 m of cable in the whole area:** **Frequency of Failure is: 0.16 x 24923 /1000 = 4 failure(s)** **According to Alectra Central North Control Room data, there were , 1, 0, 0, 1,and 1 Cable failures in 2016 to 2021, respectively (6-year average is 1 failures per year).** **Annually on average there were 0.5 Cable failures affecting 39 customers and 2853 CMI.** **Impact of 1 failure: 46/0.5 = 77 customers affected and 2853/0.5 = 5705 CMI.** **Impact of 4 failures: 77 x 4 = 308 customers affected and 5705 x 4 = 22820 CMI**

Project Report

Project Code	151315
Project Name	Cable Injection Project - (G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Steeles - Kennedy - Hwy 407 - Main area (Grid G5) to maintain system reliability and customer service. This area has experienced 1 cable failure from 2016 to 2018 and 2 failures from 2019 to 2021 impacting 231 customers for 74 minutes, less than once a year. Alectra sees an increase on cable failures in last three years. This area comprises residential customers and 13 commercial customers including the courthouse. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 24923 m of direct-buried XLPE cables. It is proposed to replace 8307 m each year in 2023, 2024 and 2025 based on work that can be executed within these years. It is expected that completion of this project will avoid 4 failures per year impacting 308 customers for 74 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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	**Based on the Central North 5-year average Reliability, 1 cable failure causes approximately 5705 CMI. Thus, this project will help avoid a total of 4 potential cable faults and 22820 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(G5) - Steeles - Kennedy - Hwy 407 - Main, Brampton**

Project Report

Project Code	151318	
Project Name	Cable Injection Project - (I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bovaird - Dixie - Queen - Hwy 410 (Grid I3) area to maintain system reliability and customer service. This area has experienced 9 cable failures prior to 2019 and 1 cable failure in 2019. Based on regional reliability data, 990 customers were impacted for 69 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 35,086 m of direct-buried XLPE cables. It is proposed to inject 7,379 m in 2020, 6,790 m in 2021, 4,203 m in 2022, 9,242 m in 2023, and 7,472 m in 2024 based on the work that can be executed during these years. It is expected that completion of this project will avoid 3.5 failures per year impacting 1733 customers for 69 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**805 Sandalwood Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**35086**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Agostini, Robert (Robert.Agostini)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**634194**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151318	
Project Name	Cable Injection Project - (I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bovaird - Dixie - Queen - Hwy 410 (Grid I3) area to maintain system reliability and customer service. This area has experienced 9 cable failures prior to 2019 and 1 cable failure in 2019. Based on regional reliability data, 990 customers were impacted for 69 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 35,086 m of direct-buried XLPE cables. It is proposed to inject 7,379 m in 2020, 6,790 m in 2021, 4,203 m in 2022, 9,242 m in 2023, and 7,472 m in 2024 based on the work that can be executed during these years. It is expected that completion of this project will avoid 3.5 failures per year impacting 1733 customers for 69 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	**This project is driven by occurrences of cable failures impacting reliability on the distribution system in the area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 5 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not injected within the next 5 years, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 1 cable failure per year in 2021 and will increase to 3.5 failures per year starting 2025.**
	Customer Attachment / Load (KVA)	**1726 Residential and 7 Commercial customers / 3490 KVA**
	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.**
06. 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	**Inject all the cables in this area that are of the same vintage as those that experienced cable faults.**
	Alternative #2	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**

Project Report

Project Code	151318
Project Name	Cable Injection Project - (I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bovaird - Dixie - Queen - Hwy 410 (Grid I3) area to maintain system reliability and customer service. This area has experienced 9 cable failures prior to 2019 and 1 cable failure in 2019. Based on regional reliability data, 990 customers were impacted for 69 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 35,086 m of direct-buried XLPE cables. It is proposed to inject 7,379 m in 2020, 6,790 m in 2021, 4,203 m in 2022, 9,242 m in 2023, and 7,472 m in 2024 based on the work that can be executed during these years. It is expected that completion of this project will avoid 3.5 failures per year impacting 1733 customers for 69 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 2 cable failures since 2018. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are over 31 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #2 is not recommended because on average, cable replacement is 5 times more expensive than cable injection, and cables at this location are feasible for cable injection.

Project Report

Project Code	151318
Project Name	Cable Injection Project - (I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bovaird - Dixie - Queen - Hwy 410 (Grid I3) area to maintain system reliability and customer service. This area has experienced 9 cable failures prior to 2019 and 1 cable failure in 2019. Based on regional reliability data, 990 customers were impacted for 69 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 35,086 m of direct-buried XLPE cables. It is proposed to inject 7,379 m in 2020, 6,790 m in 2021, 4,203 m in 2022, 9,242 m in 2023, and 7,472 m in 2024 based on the work that can be executed during these years. It is expected that completion of this project will avoid 3.5 failures per year impacting 1733 customers for 69 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 avoid having 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 prevention 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 $70/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 (0 if not applicable)	**0**
08. 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 2018. 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	**Cables in this area are 31 to 35 years old, which exceeds Alectra Utilities' Typical Useful Life of 30 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**2807**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable:** **Frequency of Failure is: 0.1 failures per 1000 m of cable per year** **For 35086 m of cable in the whole area:** **Frequency of Failure is: 0.1 x 35086 /1000 = 3.5 failure(s)** **According to Alectra Central North Control Room data, there were 41, 62, 38, 40, and 49 Cable failures in 2017 to 2021, respectively (5-year average is 46 failures per year).** **Annually on average there were 46 Cable failures affecting 22753 customers and 1562780 CMI.** **Impact of 1 failure: 22753/46 = 495 customers affected and 1562780/46 = 33973 CMI.** **Impact of 3.5 failures: 495 x 3.5 = 1733 customers affected and 33973 x 3.5 = 118906 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).**

Project Report

Project Code	151318
Project Name	Cable Injection Project - (I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bovaird - Dixie - Queen - Hwy 410 (Grid I3) area to maintain system reliability and customer service. This area has experienced 9 cable failures prior to 2019 and 1 cable failure in 2019. Based on regional reliability data, 990 customers were impacted for 69 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 35,086 m of direct-buried XLPE cables. It is proposed to inject 7,379 m in 2020, 6,790 m in 2021, 4,203 m in 2022, 9,242 m in 2023, and 7,472 m in 2024 based on the work that can be executed during these years. It is expected that completion of this project will avoid 3.5 failures per year impacting 1733 customers for 69 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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 3.5 potential cable failures and 118906 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(I3) -Bovaird - Dixie - Queen - Hwy 410, Brampton**

Project Report

Project Code	151336
Project Name	Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie
Project Description	This investment is for replacing 30,076 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Barrie) BA22 grid – Sunnidale and Anne area. This project scope area has experienced 3 cable/splice failures since 2017 with 250 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 2 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable failures easier to avoid. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 30,076m. It is proposed to complete 2,858m in 2020, 5,473m in 2021, 4,236m in 2022, 4,374m in 2023, 11,019m in
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**825 Patterson Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**27961**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tran, Quan (Quan.Tran)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**634211**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151336
Project Name	Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie
Project Description	This investment is for replacing 30,076 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Barrie) BA22 grid – Sunnidale and Anne area. This project scope area has experienced 3 cable/splice failures since 2017 with 250 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 2 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable failures easier to avoid. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 30,076m. It is proposed to complete 2,858m in 2020, 5,473m in 2021,
Major Category	System Renewal
Scenario	Submitted

Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. 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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers. Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the next 2 years to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further. Deteriorated cables fail at greater rates, and Alectra Utilities forecast that if the investment is not made, that the rate of cable failures per year will increase to 0.3 in 2021 and 2 failures per year starting 2025.**
Customer Attachment / Load (KVA)	**3536 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
Environmental Benefits	**Not Applicable.**

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Project Report

Project Code	151336
Project Name	Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie
Project Description	This investment is for replacing 30,076 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Barrie) BA22 grid – Sunnidale and Anne area. This project scope area has experienced 3 cable/splice failures since 2017 with 250 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 2 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable failures easier to avoid. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 30,076m. It is proposed to complete 2,858m in 2020, 5,473m in 2021, 4,236m in 2022, 4,374m in 2023, 11,019m in
Major Category	System Renewal
Scenario	Submitted

06. 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 responding to outages under reactive capital.

Given that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.

This is not a viable alternative.

Alternative #1

Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.

This alternative is costly, disruptive to customers and does not address the failure situation adequately.

This is not a preferred alternative

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.

The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail.

This is the recommended alternative.

Project Report

Project Code: 151336

Project Name: Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie

Project Description:

This investment is for replacing 30,076 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Barrie) BA22 grid – Sunnidale and Anne area.

This project scope area has experienced 3 cable/splice failures since 2017 with 250 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 2 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area.

This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable failures easier to avoid.
If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers.

The total cable quantity for replacement is approximately 30,076m. It is proposed to complete 2,858m in 2020, 5,473m in 2021,

Major Category: System Renewal

Scenario: Submitted

Justification for Recommended Alternative

The cables in this area are at end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area there were 3 cable/splice failures since 2017. If not rehabilitated these cables will get older and will fail more often to a level that is not tolerable by customers.

Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria.

Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.

07. 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 avoid 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 avoidance strategies.

Comparative Information on Equivalent Historical Projects (if any)

Alectra has completed similar cable replacement projects since 2010.

Project Report

Project Code	151336	
Project Name	Cable Replacement Project - (BA22) - Sunnidale and Anne, Barrie	
Project Description	This investment is for replacing 30,076 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Barrie) BA22 grid – Sunnidale and Anne area. This project scope area has experienced 3 cable/splice failures since 2017 with 250 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 2 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable failures easier to avoid. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 30,076m. It is proposed to complete 2,858m in 2020, 5,473m in 2021, 4,236m in 2022, 4,374m in 2023, 11,019m in	
Major Category	System Renewal	
Scenario	Submitted	
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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/splice failures since 2017. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**The cable in this area is 45 - 48 years old (installed in 1974 - 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	**2180**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 3 failures in this project area since 2017.** **5 year average of failures is 3 failures / 5 years = 0.6 failure(s) per year** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failures in 2023, up to 3 failures by 2027.** **Impact of 1 failure: 250 customers affected, 21172 CMI, and average outage duration is 389 minutes per customer per 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	**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 63516 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(BA22) - Sunnidale and Anne, Barrie**

Project Report

Project Code	151360	
Project Name	Cable Injection Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham	
Project Description	This investment will inject 53,146m of direct-buried XLPE cables; 13,287m in 2022, 13,287m in 2023, 13,286m in 2024 and 13,286m in 2025 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M31 - 14th Ave, Old Kennedy Rd, Steeles Ave and Warden Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. This project scope area has experienced 18 cable/splice failures since 2010 with 87 customers affected on average. More specifically, customers in the project area in 2015-2018 had 6 outages, where from 2019-2022 they had 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 7 failures by	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Cost of Investment**
	Please provide additional justification for what has changed	**Project is re-estimated and re-submitted**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**53812**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tran, Quan (Quan.Tran)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**643850**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151360
Project Name	Cable Injection Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham
Project Description	This investment will inject 53,146m of direct-buried XLPE cables; 13,287m in 2022, 13,287m in 2023, 13,286m in 2024 and 13,286m in 2025 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M31 - 14th Ave, Old Kennedy Rd, Steeles Ave and Warden Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. This project scope area has experienced 18 cable/splice failures since 2010 with 87 customers affected on average. More specifically, customers in the project area in 2015-2018 had 6 outages, where from 2019-2022 they had 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 7 failures by
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 4 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the next 4 years, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed investment, 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)	**561 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable.**
06. 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 responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area). This alternative is costly, disruptive to customers and does not address the failure situation adequately. This is not a viable alternative.**

Project Report

Project Code	151360
Project Name	Cable Injection Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham
Project Description	This investment will inject 53,146m of direct-buried XLPE cables; 13,287m in 2022, 13,287m in 2023, 13,286m in 2024 and 13,286m in 2025 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M31 - 14th Ave, Old Kennedy Rd, Steeles Ave and Warden Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. This project scope area has experienced 18 cable/splice failures since 2010 with 87 customers affected on average. More specifically, customers in the project area in 2015-2018 had 6 outages, where from 2019-2022 they had 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. Since the cables at this location are nearing end of life, it is estimated that failures will escalate
Major Category	System Renewal
Scenario	Submitted

Alternative #2

Alternative #2 is to inject the cables as decribed in the project descripiton.

This is the preferred alternative.

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will reduce the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 18 cable/splice failures since 2010. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 34 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address

Project Report

Project Code	151360
Project Name	Cable Injection Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham
Project Description	This investment will inject 53,146m of direct-buried XLPE cables; 13,287m in 2022, 13,287m in 2023, 13,286m in 2024 and 13,286m in 2025 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M31 - 14th Ave, Old Kennedy Rd, Steeles Ave and Warden Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. This project scope area has experienced 18 cable/splice failures since 2010 with 87 customers affected on average. More specifically, customers in the project area in 2015-2018 had 6 outages, where from 2019-2022 they had 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 7 failures by
Major Category	System Renewal
Scenario	Submitted

07. 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 avoid 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 reduction strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable injection projects since 2010.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:**	**This project scope area has experienced 18 cable/splice failures since 2010 with 87 customers affected on average. More specifically, customers in the project area in 2015-2018 had 6 outages, where from 2019-2022 this increased to 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cable in this area is 35 years old (installed in 1987), which exceeds Typical Useful Life of non-tree retardant XLPE of 30 years.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**281**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 12 failures in this area since 2016.** **Frequency of Failure is 12 failures / 6 years = 2 failure(s) per year** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 7 failures by 2027.** **Impact of 1 failure: 87 customers affected, 14110 CMI, and average outage duration is 214 minutes per customer per 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	**Not Applicable.**

Project Report

Project Code	151360
Project Name	Cable Injection Project - (M31) - 14th - Old Kennedy - Steeles - Warden, Markham
Project Description	This investment will inject 53,146m of direct-buried XLPE cables; 13,287m in 2022, 13,287m in 2023, 13,286m in 2024 and 13,286m in 2025 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M31 - 14th Ave, Old Kennedy Rd, Steeles Ave and Warden Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. This project scope area has experienced 18 cable/splice failures since 2010 with 87 customers affected on average. More specifically, customers in the project area in 2015-2018 had 6 outages, where from 2019-2022 they had 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. Since the cables at this location are nearing end of life, it is estimated that failures will escalate
Major Category	System Renewal
Scenario	Submitted

	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. This project will help avoid 7 failures per year as of 2027 and 101,080 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(M31) - 14th - Old Kennedy - Steeles - Warden, Markham**

Project Report

Project Code	151362	
Project Name	Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham	
Project Description	This investment will inject 66,593m of direct-buried XLPE cables; 11,870m in year 1 (2023), 20,000m in year 2 (2024), 20,000m in year 3 (2025) and 14,723m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M39 - 16th Ave, Warden Ave, Hwy 7 and Woodbine Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 14 cable/splice failures since 2016 with 247 customers affected on average. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 236,215 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Cost of Investment**
	Please provide additional justification for what has changed	**Project is re-estimated and re-submitted**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**66593**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tran, Quan (Quan.Tran)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151362
Project Name	Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham
Project Description	This investment will inject 66,593m of direct-buried XLPE cables; 11,870m in year 1 (2023), 20,000m in year 2 (2024), 20,000m in year 3 (2025) and 14,723m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M39 - 16th Ave, Warden Ave, Hwy 7 and Woodbine Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 14 cable/splice failures since 2016 with 247 customers affected on average. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 236,215 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 4 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the next 4 years, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed investment, 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)	**1952 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable.**
06. 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 responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area). This alternative is costly, disruptive to customers and does not address the failure situation adequately. This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as decribed in the project descripiton. This is the preferred alternative.**

Project Report

Project Code	151362
Project Name	Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham
Project Description	This investment will inject 66,593m of direct-buried XLPE cables; 11,870m in year 1 (2023), 20,000m in year 2 (2024), 20,000m in year 3 (2025) and 14,723m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M39 - 16th Ave, Warden Ave, Hwy 7 and Woodbine Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 14 cable/splice failures since 2016 with 247 customers affected on average. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 236,215 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will reduce the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 14 cable/splice failures since 2016. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 33 - 40 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities’ ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Project Report

Project Code	151362	
Project Name	Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham	
Project Description	This investment will inject 66,593m of direct-buried XLPE cables; 11,870m in year 1 (2023), 20,000m in year 2 (2024), 20,000m in year 3 (2025) and 14,723m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M39 - 16th Ave, Warden Ave, Hwy 7 and Woodbine Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 14 cable/splice failures since 2016 with 247 customers affected on average. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 236,215 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 avoid 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 reduction strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable injection projects since 2010.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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/splice failures since 2016. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 7 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cables in this area are 33 to 40 years old (installed in 1982 to 1989), which exceed the Typical Useful Life of non-tree retardant XLPE of 30 years.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**2767**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 14 failures in this area since 2016.** **- From 2016-2017, there were 8 failures.** **- From 2020-2021, there were 6 failures** **Frequency of Failure is 14 failures / 6 years = 2.3 failure(s) per year** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 7 failures by 2027.** **Impact of 1 failure: 247 customers affected, 33745 CMI, and average outage duration is 187 minutes per customer per 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**

Project Report

Project Code	151362
Project Name	Cable Injection Project - (M39) - 16th - Warden - Hwy 7 - Woodbine, Markham
Project Description	This investment will inject 66,593m of direct-buried XLPE cables; 11,870m in year 1 (2023), 20,000m in year 2 (2024), 20,000m in year 3 (2025) and 14,723m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M39 - 16th Ave, Warden Ave, Hwy 7 and Woodbine Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 14 cable/splice failures since 2016 with 247 customers affected on average. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 236,215 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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 7 failures per year as of 2027 and 236,215 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(M39) - 16th - Warden - Hwy 7 - Woodbine, Markham**

Project Report

Project Code	151363
Project Name	Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham
Project Description	This investment will inject 64,537m of direct-buried XLPE cables; 13,000m in year 1 (2023), 13,000m in year 2 (2024), 13,000m in year 3 (2025) and 25,537m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M25 - 14th Ave, McCowan, Steeles and Old Kennedy Rd area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 12 cable/splice failures since 2011 with 216 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 3 outages, where from 2019-2021 this maintained at 3 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year as of 2027 and 210,185 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Cost of Investment**
	Please provide additional justification for what has changed	**Project is re-estimated and re-submitted**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**64737**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tran, Quan (Quan.Tran)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151363	
Project Name	Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham	
Project Description	This investment will inject 64,537m of direct-buried XLPE cables; 13,000m in year 1 (2023), 13,000m in year 2 (2024), 13,000m in year 3 (2025) and 25,537m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M25 - 14th Ave, McCowan, Steeles and Old Kennedy Rd area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 12 cable/splice failures since 2011 with 216 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 3 outages, where from 2019-2021 this maintained at 3 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year as of 2027 and 210,185 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 4 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the next 4 years, the only option left would be cable replacement which would cost 5 times that for cable injection. Without this proposed investment, 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)	3787 Customers (Mixed - Commercial/Residential) / 1,458 KVA
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.
	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	An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.
	Environmental Benefits	Not Applicable.
06. 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 responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.
	Alternative #1	Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area). This alternative is costly, disruptive to customers and does not address the failure situation adequately. This is not a viable alternative.

Project Report

Project Code	151363
Project Name	Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham
Project Description	This investment will inject 64,537m of direct-buried XLPE cables; 13,000m in year 1 (2023), 13,000m in year 2 (2024), 13,000m in year 3 (2025) and 25,537m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M25 - 14th Ave, McCowan, Steeles and Old Kennedy Rd area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 12 cable/splice failures since 2011 with 216 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 3 outages, where from 2019-2021 this maintained at 3 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year as of 2027 and 210,185 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Alternative #2

Alternative #2 is to inject the cables as decribed in the project descripiton.

This is the preferred alternative.

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will reduce the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 12 cable/splice failures since 2011. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 33 - 40 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Project Report

Project Code	151363
Project Name	Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham
Project Description	This investment will inject 64,537m of direct-buried XLPE cables; 13,000m in year 1 (2023), 13,000m in year 2 (2024), 13,000m in year 3 (2025) and 25,537m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M25 - 14th Ave, McCowan, Steeles and Old Kennedy Rd area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 12 cable/splice failures since 2011 with 216 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 3 outages, where from 2019-2021 this maintained at 3 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year as of 2027 and 210,185 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 avoid 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 has completed similar cable injection projects since 2010.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:	**This project area has experienced 12 cable/splice failures since 2011 with 216 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 3 outages, where from 2019-2021 this maintained at 3 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cables in this area are 35 to 40 years old (installed in 1982-1987), which exceed the Typical Useful Life of non-tree retardant XLPE of 30 years.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**222**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 12 failures in this area since 2011.** **- From 2016 - 2018, there were 3 failures** **- From 2019 - 2021, there were 3 failures** **6 year average of failures is 6 failures / 6 years = 1 failure(s) per year** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failures in 2023, up to 5 failures by 2027.** **Impact of 1 failure: 216 customers affected, 42037 CMI, and average outage duration is 286 minutes per customer per 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).**

Project Report

Project Code	151363	
Project Name	Cable Injection Project - (M25) - 14th - McCowan - Steeles - Old Kennedy, Markham	
Project Description	This investment will inject 64,537m of direct-buried XLPE cables; 13,000m in year 1 (2023), 13,000m in year 2 (2024), 13,000m in year 3 (2025) and 25,537m in year 4 (2026) of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M25 - 14th Ave, McCowan, Steeles and Old Kennedy Rd area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 12 cable/splice failures since 2011 with 216 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 3 outages, where from 2019-2021 this maintained at 3 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year as of 2027 and 210,185 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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 5 failures per year as of 2027 and 210,185 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(M25) - 14th - McCowan - Steeles - Old Kennedy, Markham**

Project Report

Project Code	151364	
Project Name	Cable Injection Project - (V23) - Hwy 7 - Keele - Langstaff - Jane, Vaughan	
Project Description	This investment will inject 10,500m (2023) of direct-buried XLPE cables in the East (Vaughan) grid V23 - Hwy 7, Keele, Langstaff and Jane area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 2 cable/splice failure since 2018 with 105 customers affected on average. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 3 failures per year as of 2027 and 60,394.5 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Cost of Investment**
	Please provide additional justification for what has changed	**Project is re-estimated and re-submitted**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**10500**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tran, Quan (Quan.Tran)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151364	
Project Name	Cable Injection Project - (V23) - Hwy 7 - Keele - Langstaff - Jane, Vaughan	
Project Description	This investment will inject 10,500m (2023) of direct-buried XLPE cables in the East (Vaughan) grid V23 - Hwy 7, Keele, Langstaff and Jane area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 2 cable/splice failure since 2018 with 105 customers affected on average. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 3 failures per year as of 2027 and 60,394.5 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 4 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the next 4 years, the only option left would be cable replacement which would cost 5 times that for cable injection.** **Without this proposed investment, 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)	**159 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as decribed in the project descripiton.** **This is the preferred alternative.**

Project Report

Project Code: 151364

Project Name: Cable Injection Project - (V23) - Hwy 7 - Keele - Langstaff - Jane, Vaughan

Project Description:

This investment will inject 10,500m (2023) of direct-buried XLPE cables in the East (Vaughan) grid V23 - Hwy 7, Keele, Langstaff and Jane area.

This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service.

This project area has experienced 2 cable/splice failure since 2018 with 105 customers affected on average. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition.

It is expected that completion of this project will avoid 3 failures per year as of 2027 and 60,394.5 potential CMI.

This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category: System Renewal

Scenario: Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will reduce the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there was 2 cable/splice failure since 2018. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 33 - 38 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

07. 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 avoid 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 reduction strategies.

Comparative Information on Equivalent Historical Projects (if any)

Alectra has completed similar cable injection projects since 2010.

Project Report

Project Code	151364	
Project Name	Cable Injection Project - (V23) - Hwy 7 - Keele - Langstaff - Jane, Vaughan	
Project Description	This investment will inject 10,500m (2023) of direct-buried XLPE cables in the East (Vaughan) grid V23 - Hwy 7, Keele, Langstaff and Jane area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 2 cable/splice failure since 2018 with 105 customers affected on average. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 3 failures per year as of 2027 and 60,394.5 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 project area, there were 2 cable/splice failures since 2018. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cables in this area are 33-38 years old (installed in 1984-1989), which exceeds the Typical Useful Life of non-tree retardant XLPE of 30 years.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**121**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 2 failures in this project area since 2018. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. Impact of 1 failure: 105 customers affected, 20,131.5 CMI, and average outage duration is 285 minutes per customer per 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	**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 3 failures per year as of 2027 and 60,394.5 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	
	PowerStream Plan Sub Category	
	Location Description	**(V23) - Hwy 7 - Keele - Langstaff - Jane, Vaughan**

Project Report

Project Code	151366
Project Name	Cable Injection Project - (M19) - Markham - Steeles - McCowan - 14th, Markham
Project Description	This investment will inject 42,960m of direct-buried XLPE cables; 21,480m in year 1 and 21,480m in year 2 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M19 - Markham, Steeles, McCowan and 14th Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 6 cable/splice failures since 2017 with 234 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 4 outages. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failure in 2023, up to 5 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year and 227675 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Cost of Investment**
	Please provide additional justification for what has changed	**Project is re-estimated and re-submitted**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**42960**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tran, Quan (Quan.Tran)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**643851**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151366
Project Name	Cable Injection Project - (M19) - Markham - Steeles - McCowan - 14th, Markham
Project Description	This investment will inject 42,960m of direct-buried XLPE cables; 21,480m in year 1 and 21,480m in year 2 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M19 - Markham, Steeles, McCowan and 14th Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 6 cable/splice failures since 2017 with 234 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 4 outages. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failure in 2023, up to 5 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year and 227675 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 4 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the next 4 years, the only option left would be cable replacement which would cost 5 times that for cable injection.** **Without this proposed investment, 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)	**4522 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**

Project Report

Project Code	151366
Project Name	Cable Injection Project - (M19) - Markham - Steeles - McCowan - 14th, Markham
Project Description	This investment will inject 42,960m of direct-buried XLPE cables; 21,480m in year 1 and 21,480m in year 2 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M19 - Markham, Steeles, McCowan and 14th Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 6 cable/splice failures since 2017 with 234 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 4 outages. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failure in 2023, up to 5 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year and 227675 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Alternative #2	**Alternative #2 is to inject the cables as decribed in the project descripiton.** **This is the preferred alternative.**
Justification for Recommended Alternative	**The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.** **To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.** **In this project scope area, there were 6 cable/splice failures since 2017. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.** **There are two methods of cable remediation: Cable Replacement and Cable Injection.** **Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.** **Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.** **The cables in this area are 34 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.** **The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.** **Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.**

Project Report

Project Code	151366
Project Name	Cable Injection Project - (M19) - Markham - Steeles - McCowan - 14th, Markham
Project Description	This investment will inject 42,960m of direct-buried XLPE cables; 21,480m in year 1 and 21,480m in year 2 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M19 - Markham, Steeles, McCowan and 14th Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 6 cable/splice failures since 2017 with 234 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 4 outages. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failure in 2023, up to 5 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year and 227675 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 avoid 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 reduction strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable injection projects since 2010.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:**	**This project scope area has experienced 6 cable/splice failures since 2017 with 234 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 4 outages. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failure in 2023, up to 5 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cable in this area is 34 years old (installed in 1988), which exceeds the Typical Useful Life of non-tree retardant XLPE of 30 years.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**183**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 6 failures in this project area since 2017.** **- From 2017-2019, there were 2 failures.** **- In 2020, there was 1 failure.** **- In 2021, there were 3 failures.** **5 year average of failures is 6 failures / 5 years = 1.2 failure(s) per year** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failures in 2023, up to 5 failures by 2027.** **Impact of 1 failure: 234 customers affected, 45535 CMI, and average outage duration is 214 minutes per customer per failure**

Project Report

Project Code	151366
Project Name	Cable Injection Project - (M19) - Markham - Steeles - McCowan - 14th, Markham
Project Description	This investment will inject 42,960m of direct-buried XLPE cables; 21,480m in year 1 and 21,480m in year 2 of the project (to account for an appropriate monetary division amongst the years) in the East (Markham) grid M19 - Markham, Steeles, McCowan and 14th Ave area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project scope area has experienced 6 cable/splice failures since 2017 with 234 customers affected on average. More specifically, customers in the project scope area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 4 outages. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failure in 2023, up to 5 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in poor condition. It is expected that completion of this project will avoid 5 failures per year and 227675 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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 5 failures per year and 227675 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(M19) - Markham - Steeles - McCowan - 14th, Markham**

Project Report

Project Code	151374	
Project Name	Cable and Transformer Replacement - (893) - 176 - 224 Janefield Ave Subdivision, Guelph	
Project Description	This investment is for replacing 1654m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra Southwest (Guelph) area at 176 - 224 Janefield Ave, built in 1974. This area has seen 2 failures as a result of cable faults for a failure rate of 121 failures/100km. It is mostly Residential with 226 customers. Along with the cable remediation, 7 transformers will also be replaced as part of the project. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**This is the initial submission of the project.**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**Guelph Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**1**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Bolton, Ian (Ian.Bolton)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151374
Project Name	Cable and Transformer Replacement - (893) - 176 - 224 Janefield Ave Subdivision, Guelph
Project Description	This investment is for replacing 1654m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra Southwest (Guelph) area at 176 - 224 Janefield Ave, built in 1974. This area has seen 2 failures as a result of cable faults for a failure rate of 121 failures/100km. It is mostly Residential with 226 customers. Along with the cable remediation, 7 transformers will also be replaced as part of the project. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers.** **Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the near term to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further.**
	Customer Attachment / Load (KVA)	**226 customers. Total connected transformation capacity for this area is 650 kVA and existing customer demand is at 638.4 kVA. Existing transformers have more than the standard number of customer attachments per transformer, causing overloading and potentially causing premature deterioration.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a preferred alternative.**

Project Report

Project Code	151374
Project Name	Cable and Transformer Replacement - (893) - 176 - 224 Janefield Ave Subdivision, Guelph
Project Description	This investment is for replacing 1654m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra Southwest (Guelph) area at 176 - 224 Janefield Ave, built in 1974. This area has seen 2 failures as a result of cable faults for a failure rate of 121 failures/100km. It is mostly Residential with 226 customers. Along with the cable remediation, 7 transformers will also be replaced as part of the project. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement.
Major Category	System Renewal
Scenario	Submitted

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.

The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail.

This is the recommended alternative.

Justification for Recommended Alternative

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.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Segments that do meet the criteria for cable injection are covered under a separate project.

Therefore, planned cable replacement within the area is selected as the preferred alternative. While it is a costly alternative, the added benefit of installing new conduit which will help with future cable issues as well as avoiding future outages on other cable segments that have been subjected to previous high stress fault conditions. The benefits to the customer include reducing the likelihood of unplanned disruptions and new underground equipment which should provide reliable, continuous service for many more years. Furthermore, the replacement of several transformers that are at risk of failing allows for an opportunistic renewal of assets while work crews are already in the area performing cable replacement, minimizing the outage impacts for customers who would otherwise eventually experience an unplanned outage once the transformer fails. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Project Report

Project Code: 151374

Project Name: Cable and Transformer Replacement - (893) - 176 - 224 Janefield Ave Subdivision, Guelph

Project Description: This investment is for replacing 1654m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra Southwest (Guelph) area at 176 - 224 Janefield Ave, built in 1974.

This area has seen 2 failures as a result of cable faults for a failure rate of 121 failures/100km. It is mostly Residential with 226 customers. Along with the cable remediation, 7 transformers will also be replaced as part of the project. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement.

Major Category: System Renewal

Scenario: Submitted

07. 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:** **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 avoid 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 avoidance 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. 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 (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record	**There is 1 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 121 failures/100km. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **Cable in this area are 48 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.** **All transformers within the scope are live front transformers installed on concrete slabs. Current standards would require these existing transformers to be replaced with new dead-front transformer on a concrete base and sized appropriately.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**226**

Project Report

Project Code	151374	
Project Name	Cable and Transformer Replacement - (893) - 176 - 224 Janefield Ave Subdivision, Guelph	
Project Description	This investment is for replacing 1654m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra Southwest (Guelph) area at 176 - 224 Janefield Ave, built in 1974. This area has seen 2 failures as a result of cable faults for a failure rate of 121 failures/100km. It is mostly Residential with 226 customers. Along with the cable remediation, 7 transformers will also be replaced as part of the project. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**This area has seen 8 equipment failures since 2011, including cable faults and defective transformers. Due to these 8 incidents, there were 288 customers affected with a total of 46,000 total customer minutes.** **For 1000 m of cable:** **Frequency of Failure is: 0.25 failures per 1000 m of cable per year** **For 1654m of cable in the whole area:** **Frequency of Failure is: 0.25 x 1654 /1000 = 0.41 failures** **Annually on average over the past five years (2017 - 2021) in Alectra Southwest, there were 14 cable and cable accessory failures (XLPE) affecting 4,333 customers and 111,060 CMI** **Impact of 1 failure: 4,333/14 = 310 customers affected and 111,060/14 = 7,933 CMI** **Impact of 0.41 failures: 310 x 0.41 = 127 customers affected and 7,933 x 0.41 = 3,253 CMI** **Since this area will be implemented in one year, the estimated quantity is 1654m in Year 1. In addition, the total number of transformers in the area is approximately 7 totaling 650 KVA.** **For the purpose of Reliability Benefits:** **For Year 1** **Frequency of Failure is: 0.25 x 1654 /1000 = 0.41 failures** **Impact of 0.41 failures: 310 x 0.41 = 127 customers affected and 7,933 x 0.41 = 3,253 CMI** **The benefit following the project is based on 0.41 failures** **Peak KVA = 650 KVA**
	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 0.41 potential cable failure and 3,253 potential CMI per year.**
	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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	151385	
Project Name	Cable and Transformer Replacement - (892) - 74 - 176 Janefield Ave Subdivision, Guelph	
Project Description	This investment is for replacing 1200m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra Southwest (Guelph) area at 74 - 176 Janefield Ave, built in 1974. This area has seen 6 failures as a result of cable faults for a failure rate of 500 failures/100km. It is mostly Residential with 122 customers. Four of the 6 failures have occured in the last 3 years. Along with the cable remediation, 12 transformers will also be replaced as part of the project. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Postpone the project to 2024, due to other higher priority projects.**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**Guelph Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**1**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Bolton, Ian (Ian.Bolton)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151385
Project Name	Cable and Transformer Replacement - (892) - 74 - 176 Janefield Ave Subdivision, Guelph
Project Description	This investment is for replacing 1200m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra Southwest (Guelph) area at 74 - 176 Janefield Ave, built in 1974. This area has seen 6 failures as a result of cable faults for a failure rate of 500 failures/100km. It is mostly Residential with 122 customers. Four of the 6 failures have occured in the last 3 years. Along with the cable remediation, 12 transformers will also be replaced as part of the project. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers.** **Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the near term to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further.**
	Customer Attachment / Load (KVA)	**122 customers. Total connected transformer capacity in this subdivision is 400kVA and existing customer demand is 337.9kVA. The existing transformers are overloaded.**
	Safety	**Not Applicable**
	Cyber-Security, Privacy	**Not Applicable**
	Coordination, Interoperability	**Pertaining to coordination with utilities, regional planning and other 3rd parties, Alectra Guelph 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 Guelph 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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a preferred alternative.**

Project Report

Project Code	151385
Project Name	Cable and Transformer Replacement - (892) - 74 - 176 Janefield Ave Subdivision, Guelph
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Major Category	System Renewal
Scenario	Submitted

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.

The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail.

This is the recommended alternative.

Justification for Recommended Alternative

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.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Segments that do meet the criteria for cable injection are covered under a separate project.

Therefore, planned cable replacement within the area is selected as the preferred alternative. While it is a costly alternative, the added benefit of installing new conduit which will help with future cable issues as well as avoiding future outages on other cable segments that have been subjected to previous high stress fault conditions. The benefits to the customer include reducing the likelihood of unplanned disruptions and new underground equipment which should provide reliable, continuous service for many more years. Furthermore, the replacement of several transformers that are at risk of failing allows for an opportunistic renewal of assets while work crews are already in the area performing cable replacement, minimizing the outage impacts for customers who would otherwise eventually experience an unplanned outage once the transformer fails. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Project Report

Project Code	151385	
Project Name	Cable and Transformer Replacement - (892) - 74 - 176 Janefield Ave Subdivision, Guelph	
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Major Category	System Renewal	
Scenario	Submitted	
07. 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:** **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 avoid 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 avoidance 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. 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 (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record	**There are 6 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 500 failures/100km. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **Cable in this area are 48 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.** **All transformers within the scope are live front transformers installed on concrete slabs. Current standards would require these existing transformers to be replaced with new dead-front transformer on a concrete base and sized appropriately.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**122**

Project Report

Project Code	151385	
Project Name	Cable and Transformer Replacement - (892) - 74 - 176 Janefield Ave Subdivision, Guelph	
Project Description	This investment is for replacing 1200m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra Southwest (Guelph) area at 74 - 176 Janefield Ave, built in 1974. This area has seen 6 failures as a result of cable faults for a failure rate of 500 failures/100km. It is mostly Residential with 122 customers. Four of the 6 failures have occured in the last 3 years. Along with the cable remediation, 12 transformers will also be replaced as part of the project. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement	
Major Category	System Renewal	
Scenario	Submitted	
	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 1200m of cable in the whole area:** **Frequency of Failure is: 0.25 x 1200 /1000 = 0.3 failures** **Annually on average over the past five years (2017 - 2021) in Alectra Southwest, there were 14 cable and cable accessory failures (XLPE) affecting 4,333 customers and 111,060 CMI** **Impact of 1 failure: 4,333/14 = 310 customers affected and 111,060/14 = 7,933 CMI** **Impact of 0.3 failures: 310 x 0.3 = 93 customers affected and 7,933 x 0.3 = 2,380 CMI** **Since this area will be implemented in one year, the estimated quantity is 1200m in Year 1. In addition, the total number of transformers in the area is approximately 12 totaling 400 KVA.** **For the purpose of Reliability Benefits:** **For Year 1** **Frequency of Failure is: 0.25 x 1200 /1000 = 0.3 failures** **Impact of 0.3 failures: 310 x 0.3 = 93 customers affected and 7,933 x 0.3 = 2,380 CMI** **The benefit following the project is based on 0.3 failures** **Peak KVA = 400 KVA**
	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	**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	**This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 0.3 potential cable failure and 2,380 potential CMI per year.**
	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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	151408	
Project Name	Cable and Transformer Replacement Project - (AREA24) - Burnhamthorpe & Miss. Road, Mississauga	
Project Description	This investment is for replacing 10365 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Burnhamthorpe & Miss. Road (AREA24) area. This area has experienced 1 cable failure from 2016 to 2018 and 13 failures from 2019 to 2021, 99 customers were impacted for 101 minutes, 6 times a year in recent years. In 2021 ACA, these cables were determined to be at the end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 5.5 failures per year impacting 545 customers for 101 minutes per failure. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**New project based on number of cable failures and other deteriorating assets.**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**10365**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**643853**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151408
Project Name	Cable and Transformer Replacement Project - (AREA24) - Burnhamthorpe & Miss. Road, Mississauga
Project Description	This investment is for replacing 10365 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Burnhamthorpe & Miss. Road (AREA24) area. This area has experienced 1 cable failure from 2016 to 2018 and 13 failures from 2019 to 2021, 99 customers were impacted for 101 minutes, 6 times a year in recent years. In 2021 ACA, these cables were determined to be at the end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 5.5 failures per year impacting 545 customers for 101 minutes per failure. Installing the new cables in conduit will make future cable remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**This investment is driven by a progressive decline in reliability at this location. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers.** **Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the next 2 years to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further. Deteriorated cables fail at greater rates, and Alectra Utilities forecast that if the investment is not made, that the rate of cable failures per year will be 5.5 in 2025.**
	Customer Attachment / Load (KVA)	**534 Residential and 11 Commercial customers / 5484 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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**

Project Report

Project Code	151408
Project Name	Cable and Transformer Replacement Project - (AREA24) - Burnhamthorpe & Miss. Road, Mississauga
Project Description	This investment is for replacing 10365 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Burnhamthorpe & Miss. Road (AREA24) area. This area has experienced 1 cable failure from 2016 to 2018 and 13 failures from 2019 to 2021, 99 customers were impacted for 101 minutes, 6 times a year in recent years. In 2021 ACA, these cables were determined to be at the end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 5.5 failures per year impacting 545 customers for 101 minutes per failure. Installing the new cables in conduit will make future cable remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

Alternative #1

Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.

This alternative is costly, disruptive to customers and does not address the failure situation adequately.

This is not a preferred alternative.

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.

The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail.

This is the recommended alternative.

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 14 cable failures since 2016. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

25% of the transformers in this area were identified in very poor condition in the most recent ACA. Logistically, it would be beneficial to address these transformers at the same time as the cables. In addition, this strategy would improve customer experience as they would experience one less outage during construction. If not replaced and these transformers fail, Alectra would have to go back to replace them and clean up from oil leaks which would again be disruptive to the customers. Therefore, Alternative #1 is not recommended.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria.

Cables in this area have failures and partial replacement will not deal with the degradation and damage done to other assets and therefore cable and transformer replacement is required.

Project Report

Project Code	151408	
Project Name	Cable and Transformer Replacement Project - (AREA24) - Burnhamthorpe & Miss. Road, Mississauga	
Project Description	This investment is for replacing 10365 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Burnhamthorpe & Miss. Road (AREA24) area. This area has experienced 1 cable failure from 2016 to 2018 and 13 failures from 2019 to 2021, 99 customers were impacted for 101 minutes, 6 times a year in recent years. In 2021 ACA, these cables were determined to be at the end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 5.5 failures per year impacting 545 customers for 101 minutes per failure. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 avoid 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 prevention 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.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 2016. 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	**Cables in this area are on average 40 years old, which is at Alectra Utilities' End-of-Useful Life of 40 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**545**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable:** **Frequency of Failure is: 0.53 failures per 1000 m of cable per year** **For 10365 m of cable in the whole area:** **Frequency of Failure is: 0.53 x 10365 /1000 = 5.5 failure(s)** **According to Alectra Central South Control Room data, there were 1,0,1,6,6 Cable failures in 2017 to 2021, respectively (5-year average is 2.8 failures per year).** **Annually on average there were 2.8 Cable failures affecting 277 customers and 27838 CMI.** **Impact of 1 failure: 277/2.8 = 99 customers affected and 27838/2.8 = 9942 CMI.** **Impact of 5.5 failures: 99 x 5.5 = 545 customers affected and 9942 x 5.5 = 54681 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**

Project Report

Project Code	151408
Project Name	Cable and Transformer Replacement Project - (AREA24) - Burnhamthorpe & Miss. Road, Mississauga
Project Description	This investment is for replacing 10365 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Burnhamthorpe & Miss. Road (AREA24) area. This area has experienced 1 cable failure from 2016 to 2018 and 13 failures from 2019 to 2021, 99 customers were impacted for 101 minutes, 6 times a year in recent years. In 2021 ACA, these cables were determined to be at the end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 5.5 failures per year impacting 545 customers for 101 minutes per failure. Installing the new cables in conduit will make future cable remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

	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 5.5 cable failure repairs = $20,000 x 5.5= $110,000**
	Reliability and Safety Factors	**This project will help avoid a total of 5.5 potential cable faults and 54681 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Burnhamthorpe & Miss. Road (13)**

Project Report

Project Code	151424	
Project Name	Cable and Transformer Replacement Project - (AREA21) - Miss. Valley & Bloor, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Miss. Valley & Bloor area (AREA21) to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 8 cable failures from 2016 to 2018 and 5 failures from 2019 to 2021 impacting 1443 customers for 127 minutes, more than twice a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will replace 10780 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is proposed to replace 400 m in 2023, 3400 m in 2024, 3450 m in 2025, and 3530 m in 2026 based on work that can be executed within these years. It is expected that completion of this project will avoid 8 failures per year impacting 899 customers for 127 minutes.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**New project based on number of cable failures and other deteriorating assets.**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**10780**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Reliability**

Project Report

Project Code	151424	
Project Name	Cable and Transformer Replacement Project - (AREA21) - Miss. Valley & Bloor, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Miss. Valley & Bloor area (AREA21) to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 8 cable failures from 2016 to 2018 and 5 failures from 2019 to 2021 impacting 1443 customers for 127 minutes, more than twice a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will replace 10780 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is proposed to replace 400 m in 2023, 3400 m in 2024, 3450 m in 2025, and 3530 m in 2026 based on work that can be executed within these years. It is expected that completion of this project will avoid 8 failures per year impacting 899 customers for 127 minutes.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	**This project is driven by the outage impact in reliability on the distribution system in this area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable replacement within the next 2 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels.** **Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 0.3 cable failures per year in 2023 and will increase to 8 failures per year starting 2027.**
	Customer Attachment / Load (KVA)	**794 Residential and 105 Commercial customers / 52492 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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a preferred alternative.**

Project Report

Project Code: 151424

Project Name: Cable and Transformer Replacement Project - (AREA21) - Miss. Valley & Bloor, Mississauga

Project Description: This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Miss. Valley & Bloor area (AREA21) to maintain system reliability and customer service.

Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 8 cable failures from 2016 to 2018 and 5 failures from 2019 to 2021 impacting 1443 customers for 127 minutes, more than twice a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will replace 10780 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is proposed to replace 400 m in 2023, 3400 m in 2024, 3450 m in 2025, and 3530 m in 2026 based on work that can be executed within these years.

It is expected that completion of this project will avoid 8 failures per year impacting 899 customers for 127 minutes.

Major Category: System Renewal

Scenario: Submitted

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.

The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail.

This is the recommended alternative.

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 13 cable failures since 2016. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

Rear lot primary poses a problem for both reliability and safety, and have historically shown to be susceptible to adverse weather events. 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. Since the cables are required to be replaced, execution of this project will be disruptive to the customers as their backyards will be destroyed by open trenching. If the cables were installed by directional bore, Alectra has to secure easements from all the customers. In addition, the transformers are also nearing their end-of-life.
When these transformers fail, Alectra would have to go back and replace them and clean up from oil leaks would again be disruptive to the customers. Therefore, Alternative #1 is not recommended.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria.

Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.

Project Report

Project Code	151424	
Project Name	Cable and Transformer Replacement Project - (AREA21) - Miss. Valley & Bloor, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Miss. Valley & Bloor area (AREA21) to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 8 cable failures from 2016 to 2018 and 5 failures from 2019 to 2021 impacting 1443 customers for 127 minutes, more than twice a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will replace 10780 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is proposed to replace 400 m in 2023, 3400 m in 2024, 3450 m in 2025, and 3530 m in 2026 based on work that can be executed within these years. It is expected that completion of this project will avoid 8 failures per year impacting 899 customers for 127 minutes.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 underground construction 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 avoid 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 prevention strategies**
	Comparative Information on Equivalent Historical Projects (if any)	**Previous 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 $550/m.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 13 cable failures since 2016. 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, which exceeds Alectra Utilities' End-of-Useful Life of 40 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**899**

Project Report

Project Code	151424	
Project Name	Cable and Transformer Replacement Project - (AREA21) - Miss. Valley & Bloor, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Miss. Valley & Bloor area (AREA21) to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 8 cable failures from 2016 to 2018 and 5 failures from 2019 to 2021 impacting 1443 customers for 127 minutes, more than twice a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will replace 10780 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is proposed to replace 400 m in 2023, 3400 m in 2024, 3450 m in 2025, and 3530 m in 2026 based on work that can be executed within these years. It is expected that completion of this project will avoid 8 failures per year impacting 899 customers for 127 minutes.	
Major Category	System Renewal	
Scenario	Submitted	
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable:** **Frequency of Failure is: 0.75 failures per 1000 m of cable per year** **For 10780 m of cable in the whole area:** **Frequency of Failure is: 0.75 x 10780 /1000 = 8.1 failure(s)** **According to Alectra Central South Control Room data, there were 4, 1, 3, 1, 3,and 1 Cable failures in 2016 to 2021, respectively (6-year average is 2 failures per year).** **Annually on average there were 2.167 Cable failures affecting 241 customers and 30626 CMI.** **Impact of 1 failure: 241/2.167 = 111 customers affected and 30626/2.167 = 14133 CMI.** **Impact of 8.1 failures: 111 x 8.1 = 899 customers affected and 14133 x 8.1 = 114477 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	**- Cost for emergency cable failure repair = $20,000 per failure** **- Cost for 8.1 cable failure repairs = $20,000 x 8.1 = $162000**
	Reliability and Safety Factors	**This project will help avoid a total of 8.1 potential cable faults and 114477 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Miss. Valley & Bloor (15), Mississauga**

Project Report

Project Code	151428	
Project Name	Cable Injection - (AREA30) - Eglinton Ave W & Miss Rd, Mississauga	
Project Description	This investment is necessary to avoid the risk of increasing outage impacts due to deteriorating underground system assets within the Eglinton Ave W & Miss Rd (AREA30) area to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021, 117 customers were impacted for 99 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 14,541 m of direct-buried XLPE cables. It is proposed to inject 7,417 m in 2022 and 7,124 m in 2023 based on the work that can be executed within these years. It is expected that completion of this project will avoid 2 failures per year impacting 234 customers for 99 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**N/A**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**14541**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**643854**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151428
Project Name	Cable Injection - (AREA30) - Eglinton Ave W & Miss Rd, Mississauga
Project Description	This investment is necessary to avoid the risk of increasing outage impacts due to deteriorating underground system assets within the Eglinton Ave W & Miss Rd (AREA30) area to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021, 117 customers were impacted for 99 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 14,541 m of direct-buried XLPE cables. It is proposed to inject 7,417 m in 2022 and 7,124 m in 2023 based on the work that can be executed within these years. It is expected that completion of this project will avoid 2 failures per year impacting 234 customers for 99 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**This project is driven by failure risks on the distribution system in this area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 2 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not injected within the next 2 years, the only option left would be cable replacement which would cost 5 times that for cable injection.** **Without this proposed expenditure, 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 and Alectra Utilities will be experiencing 2 cable failures per year starting in 2024.**
	Customer Attachment / Load (KVA)	**230 Residential and 4 Commercial customers / 1994 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.**
06. 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	**Inject all the cables in this area that are of the same vintage as those that experienced cable faults.**
	Alternative #2	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**

Project Report

Project Code 151428

Project Name Cable Injection - (AREA30) - Eglinton Ave W & Miss Rd, Mississauga

Project Description

This investment is necessary to avoid the risk of increasing outage impacts due to deteriorating underground system assets within the Eglinton Ave W & Miss Rd (AREA30) area to maintain system reliability and customer service.

Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021, 117 customers were impacted for 99 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 14,541 m of direct-buried XLPE cables. It is proposed to inject 7,417 m in 2022 and 7,124 m in 2023 based on the work that can be executed within these years.

It is expected that completion of this project will avoid 2 failures per year impacting 234 customers for 99 minutes.

This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category System Renewal

Scenario Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

At this location, there were 2 cable failures since 2016. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 34 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #2 is not recommended because on average, cable replacement is 5 times more expensive than cable injection, and cables at this location are feasible for cable injection.

Project Report

Project Code	151428	
Project Name	Cable Injection - (AREA30) - Eglinton Ave W & Miss Rd, Mississauga	
Project Description	This investment is necessary to avoid the risk of increasing outage impacts due to deteriorating underground system assets within the Eglinton Ave W & Miss Rd (AREA30) area to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021, 117 customers were impacted for 99 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 14,541 m of direct-buried XLPE cables. It is proposed to inject 7,417 m in 2022 and 7,124 m in 2023 based on the work that can be executed within these years. It is expected that completion of this project will avoid 2 failures per year impacting 234 customers for 99 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 avoid having 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 prevention 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.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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, two of the 27 segments marked by their individual Feature IDs (FIDs) which have failed once and would need to be rehabilitated through cable injection including the adjacent cable segments as they would have experienced fault current during the 2 cable fault events. 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 34 years old, which exceeds Alectra Utilities' Typical Useful Life of 30 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**234**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable: Frequency of Failure is: 0.14 failures per 1000 m of cable per year For 14541 m of cable in the whole area: Frequency of Failure is: 0.14 x 14541 /1000 = 2 failure(s) According to Alectra Central South Control Room data, there were 1 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021 (6-year average is 0.33 failures per year). Annually on average there were 0.33 cable failures affecting 39 customers and 3837 CMI. Impact of 1 failure: 39/0.33 = 117 customers affected and 3837/0.33 = 11628 CMI. Impact of 2 failures: 117 x 2 = 234 customers affected and 11628 x 2 = 23256 CMI**

Project Report

Project Code	151428
Project Name	Cable Injection - (AREA30) - Eglinton Ave W & Miss Rd, Mississauga
Project Description	This investment is necessary to avoid the risk of increasing outage impacts due to deteriorating underground system assets within the Eglinton Ave W & Miss Rd (AREA30) area to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021, 117 customers were impacted for 99 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 14,541 m of direct-buried XLPE cables. It is proposed to inject 7,417 m in 2022 and 7,124 m in 2023 based on the work that can be executed within these years. It is expected that completion of this project will avoid 2 failures per year impacting 234 customers for 99 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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	**Based on the Central South 5-year average Reliability, 1 cable failure causes approximately 11628 CMI. Thus, this project will help avoid a total of 2 potential cable faults and 23256 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	**1a / Lines Replacement Program/Projects**
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	**Sustainment Capital (1)**
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	**Cable Remediation**
	Location Description	**Eglinton Ave W & Miss Rd, Mississauga**

Project Report

Project Code	151430	
Project Name	Cable Injection- (AREA 38) - Bristol & Creditview, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bristol and Creditview area (AREA38) to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure prior to 2016 and zero failures since 2016, impacting an average of 414 customers for 51 minutes, less than once a year, based on regional reliability data. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 11046 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.4 failures per year impacting 580 customers for 51 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**11193**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151430
Project Name	Cable Injection- (AREA 38) - Bristol & Creditview, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bristol and Creditview area (AREA38) to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure prior to 2016 and zero failures since 2016, impacting an average of 414 customers for 51 minutes, less than once a year, based on regional reliability data. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 11046 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.4 failures per year impacting 580 customers for 51 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**This project is driven by the cable failure risks impacting the reliability of the distribution system in this area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable remediation within the next 5 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 1.4 cable failures per year in 2026.**
	Customer Attachment / Load (KVA)	**577 Residential and 3 Commercial customers / 1396 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.**
06. 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	**Inject all the cables in this area that are of the same vintage as those that experienced cable faults.**
	Alternative #2	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**

Project Report

Project Code	151430
Project Name	Cable Injection- (AREA 38) - Bristol & Creditview, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bristol and Creditview area (AREA38) to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure prior to 2016 and zero failures since 2016, impacting an average of 414 customers for 51 minutes, less than once a year, based on regional reliability data. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 11046 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.4 failures per year impacting 580 customers for 51 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 0 cable failures since 2016 but had experienced one failure prior to 2016. If not rehabilitated, these cables will get older and will fail more often.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 34 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #2 is not recommended because on average, cable replacement is 5 times more expensive than cable injection, and cables at this location are feasible for cable injection.

Project Report

Project Code	151430
Project Name	Cable Injection- (AREA 38) - Bristol & Creditview, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bristol and Creditview area (AREA38) to maintain system reliability and customer service. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure prior to 2016 and zero failures since 2016, impacting an average of 414 customers for 51 minutes, less than once a year, based on regional reliability data. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 11046 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.4 failures per year impacting 580 customers for 51 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 avoid 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 prevention strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Injection projects in other Alectra regions cost an average of $80/m. This project is estimated at $80/m.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 15 segments marked by their individual Feature IDs (FIDs) which have failed a maximum of 1 time which accounts for 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 34 years old, which exceeds Alectra Utilities' Typical Useful Life of 30 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**580**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable:** **Frequency of Failure is: 0.13 failures per 1000 m of cable per year** **For 11046 m of cable in the whole area:** **Frequency of Failure is: 0.13 x 11046 /1000 = 1.4 failure(s)** **According to Alectra Central South Control Room data, there were 214, 238, 154, 183, and 185 Cable failures in 2017 to 2021, respectively (5-year average is 195 failures per year).** **Annually on average there were 195 Cable failures affecting 80556 customers and 4145700 CMI.** **Impact of 1 failure: 80556/195 = 414 customers affected and 4145700/195 = 21260 CMI.** **Impact of 1.4 failures: 414 x 1.4 = 580 customers affected and 21260 x 1.4 = 29764 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).**

Project Report

Project Code	151430
Project Name	Cable Injection- (AREA 38) - Bristol & Creditview, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Bristol and Creditview area (AREA38) to maintain system reliability and customer service. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 1 cable failure prior to 2016 and zero failures since 2016, impacting an average of 414 customers for 51 minutes, less than once a year, based on regional reliability data. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 11046 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.4 failures per year impacting 580 customers for 51 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Value of Customer Impact	**High**
	Factors Affecting Project Timing, if any	**Not Applicable.**
	Consequences for O&M System Costs Including Implications of Not Implementing Reliability and Safety Factors	**- Cost for emergency cable failure repair = $20,000 per failure - Cost for 1.4 cable failure repairs = $20,000 x 3= $28,000. This project will help avoid a total of 1.4 potential cable faults and 29764 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	**1a / Lines Replacement Program/Projects**
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	**Sustainment Capital (1)**
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	**Cable Remediation**
	Location Description	**Bristol & Creditview, Mississauga**

OEB Multi-Project Report

Project Code	151433
Project Name	Cable Injection - (AREA46) - Glen Erin & Aquitane, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Glen Erin & Aquitane area (AREA46) to maintain system reliability and customer service. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 6 cable failures prior to 2016 and 1 failure from 2019 to 2021 impacting 538 customers for 86 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 18174 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.8 failures per year impacting 968 customers for 86 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**N/A**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**18174**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**634189**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

OEB Multi-Project Report

Project Code	151433
Project Name	Cable Injection - (AREA46) - Glen Erin & Aquitane, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Glen Erin & Aquitane area (AREA46) to maintain system reliability and customer service. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 6 cable failures prior to 2016 and 1 failure from 2019 to 2021 impacting 538 customers for 86 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 18174 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.8 failures per year impacting 968 customers for 86 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**This project is driven by the cable failure risks impacting the reliability of the distribution system in this area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities’ system. Cable and cable accessory failures account for 50% of all equipment-related outages.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable remediation within the next 2 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels.** **Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 1 cable failure per year in 2023 and will increase to 1.8 failures per year starting 2024.**
	Customer Attachment / Load (KVA)	**950 Residential and 18 Commercial customers / 8973 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as decribed in the project descripiton.** **This is the preferred alternative.**

OEB Multi-Project Report

Project Code	151433
Project Name	Cable Injection - (AREA46) - Glen Erin & Aquitane, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Glen Erin & Aquitane area (AREA46) to maintain system reliability and customer service. Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 6 cable failures prior to 2016 and 1 failure from 2019 to 2021 impacting 538 customers for 86 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 18174 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.8 failures per year impacting 968 customers for 86 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 1 cable failure since 2021. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 34 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities’ ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #2 is not recommended because on average, cable replacement is 5 times more expensive than cable injection, and cables at this location are feasible for cable injection.

OEB Multi-Project Report

Project Code	151433
Project Name	Cable Injection - (AREA46) - Glen Erin & Aquitane, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Glen Erin & Aquitane area (AREA46) to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 6 cable failures prior to 2016 and 1 failure from 2019 to 2021 impacting 538 customers for 86 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 18174 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.8 failures per year impacting 968 customers for 86 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 avoid 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 prevention strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**No historical projects.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 injection projects were worth $80/m in other rate zones.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cable in this area is on average 34 years old, which exceeds Alectra Utilities' Typical Useful Life of 30 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**968**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable:** **Frequency of Failure is: 0.1 failures per 1000 m of cable per year** **For 18174 m of cable in the whole area:** **Frequency of Failure is: 0.1 x 18174 /1000 = 1.8 failure(s)** **According to Alectra Central South Control Room data, there were 0, 0, 0, 0, 0,and 1 Cable failures in 2016 to 2021, respectively (6-year average is 0 failures per year).** **Annually on average there were 0.167 Cable failures affecting 90 customers and 7713 CMI.** **Impact of 1 failure: 90/0.167 = 538 customers affected and 7713/0.167 = 46186 CMI.** **Impact of 1.8 failures: 538 x 1.8 = 968 customers affected and 46186 x 1.8 = 83135 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.**

OEB Multi-Project Report

Project Code	151433
Project Name	Cable Injection - (AREA46) - Glen Erin & Aquitane, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Glen Erin & Aquitane area (AREA46) to maintain system reliability and customer service. Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure, this area has experienced 6 cable failures prior to 2016 and 1 failure from 2019 to 2021 impacting 538 customers for 86 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 18174 m of direct-buried XLPE cables. It is expected that completion of this project will avoid 1.8 failures per year impacting 968 customers for 86 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Consequences for O&M System Costs Including Implications of Not Implementing	**- Cost for emergency cable failure repair = $20,000 per failure - Cost for 1.8 cable failure repairs = $20,000 x 1.8= $36,000.**
	Reliability and Safety Factors	**This project is part of the long-term cable rehabilitation program. The project will help avoid a total of 1.8 potential cable faults and 83135 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	**1a / Lines Replacement Program/Projects**
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	**Sustainment Capital (1)**
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	**Cable Remediation**
	Location Description	**Glen Erin & Aquitane, Mississauga**

Project Report

Project Code	151457
Project Name	Cable Injection Project - (V25) - Major Mackenzie - Keele - Rutherford - Jane, Vaughan
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (V25) - Major Mackenzie - Keele - Rutherford - Jane area in Vaughan to maintain system reliability and customer service. Cables in this area are 33 to 35 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. There was 1 cable/splice failure in 2021 affecting 40 customers on average. More specifically, customers in the project scope area in 2016-2018 had 0 outages, where from 2019-2021 this increased to 1 outage. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. The total cable quantity for injection is approximately 20,481m. It is proposed to complete 7,647m in 2021, 6,417m in 2022, and 6,417m in 2023. This investment will help avoid a total of 3 potential cable failure and 233523 potential CMI.
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Cost of Investment**
	Please provide additional justification for what has changed	**Project is re-estimated and re-submitted**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**20481**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**Yes**
	Project Estimator	**Tran, Quan (Quan.Tran)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**639204**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151457
Project Name	Cable Injection Project - (V25) - Major Mackenzie - Keele - Rutherford - Jane, Vaughan
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (V25) - Major Mackenzie - Keele - Rutherford - Jane area in Vaughan to maintain system reliability and customer service. Cables in this area are 33 to 35 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. There was 1 cable/splice failure in 2021 affecting 40 customers on average. More specifically, customers in the project scope area in 2016-2018 had 0 outages, where from 2019-2021 this increased to 1 outage. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. The total cable quantity for injection is approximately 20,481m. It is proposed to complete 7,647m in 2021, 6,417m in 2022, and 6,417m in 2023. This investment will help avoid a total of 3 potential cable failure and 233523 potential CMI.
Major Category	System Renewal
Scenario	Submitted

Urgency and Reasons for Urgency	**Alectra Utilities' service area has a population of underground cables totaling approximately 21 million linear meters of cable. Alectra Utilities' planned Underground Asset Renewal investments are driven by failure risks on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. 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 Cross-Linked Polyethylene (XLPE) cable and related accessories that are either in poor or very poor condition. It is expected that completion of this project will reduce customer outage frequency and duration. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.** **Cable manufacturers introduced the first-generation XLPE cable into the market in the late 1960's. These cables have inherent problems of having impurities due to the nature of the manufacturing processes. Utilities installed these cables directly in the ground. These led to breakdown of insulation over time and are responsible for the increase in cable failures that Alectra Utilities and other utilities have been experiencing with cables from this period.** **When failed, 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. In addition, it does not solve the underlying issue, since the older direct-buried cable remains installed and likelihood of failing again increases over time. 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. Specifically, this area has had 1 failure between 2019-2021.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must not only halt the increasing trend, but also 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. Future failures are predicted at an escalating rate as cables deteriorate.**
Customer Attachment / Load (KVA)	**Not Applicable.**
Safety	**Not Applicable.**
Cyber-Security, Privacy	**1347 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
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.**

Project Report

Project Code	151457
Project Name	Cable Injection Project - (V25) - Major Mackenzie - Keele - Rutherford - Jane, Vaughan
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (V25) - Major Mackenzie - Keele - Rutherford - Jane area in Vaughan to maintain system reliability and customer service. Cables in this area are 33 to 35 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. There was 1 cable/splice failure in 2021 affecting 40 customers on average. More specifically, customers in the project scope area in 2016-2018 had 0 outages, where from 2019-2021 this increased to 1 outage. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. The total cable quantity for injection is approximately 20,481m. It is proposed to complete 7,647m in 2021, 6,417m in 2022, and 6,417m in 2023. This investment will help avoid a total of 3 potential cable failure and 233523 potential CMI.
Major Category	System Renewal
Scenario	Submitted

06. 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. This project scope area has had 1 failure in 2021. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.**
	Alternative #1	**Inject all the cables in this area that are of the same vintage as those that experienced cable faults.**
	Alternative #2	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.**
	Justification for Recommended Alternative	**The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.** **Alternative #2 is not recommended because on average, cable replacement is 5 times more expensive than cable injection, and cables at this location are feasible for cable injection.** **The recommended Alternative is Alternative #1 because it will decrease the outage impacts due to deteriorating underground system assets within the (V25) - Major Mackenzie - Keele - Rutherford - Jane area in Vaughan. In contrast to cable replacement (alternative 1), these cables are optimal candidates for cable injection and the relative cost-benefit to customers ensures greater value for use of cable injection in order to maintain system reliability and customer service. Cables in this area are 33 to 35 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. There was 1 cable/splice failure in 2021. More specifically, customers in the project area in 2016-2018 had 0 outages, where from 2019-2021 this increased to 1 outage. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area.** **If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.** **The total cable quantity for injection is approximately 20,481m. It is proposed to complete 7,647m in 2021, 6,417m in 2022, and 6,417m in 2023. This investment will help avoid a total of 3 potential cable failure and 233523 potential CMI.** **To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by rehabilitating all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.**

Project Report

Project Code	151457	
Project Name	Cable Injection Project - (V25) - Major Mackenzie - Keele - Rutherford - Jane, Vaughan	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (V25) - Major Mackenzie - Keele - Rutherford - Jane area in Vaughan to maintain system reliability and customer service. Cables in this area are 33 to 35 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. There was 1 cable/splice failure in 2021 affecting 40 customers on average. More specifically, customers in the project scope area in 2016-2018 had 0 outages, where from 2019-2021 this increased to 1 outage. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. The total cable quantity for injection is approximately 20,481m. It is proposed to complete 7,647m in 2021, 6,417m in 2022, and 6,417m in 2023. This investment will help avoid a total of 3 potential cable failure and 233523 potential CMI.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 avoid 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 reduction strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable injection projects since 2010.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 was 1 cable/splice failure since 2021. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failures in 2023, up to 3 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cables in this area are 33 to 35 years old (installed in 1987-1989), which exceed the Typical Useful Life of non-tree retardant XLPE of 30 years.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**641**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 2 failure in this project area since 2017.** **5 year average of failures is 2 failures / 5 years = 0.4 failure(s) per year** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.** **We will use Alectra wide reliability information as a proxy for this project's reliability.** **Impact of 1 failure: 277 customers affected, 77841 CMI, and average outage duration is 104 minutes per customer per 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**

Project Report

Project Code	151457
Project Name	Cable Injection Project - (V25) - Major Mackenzie - Keele - Rutherford - Jane, Vaughan
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the (V25) - Major Mackenzie - Keele - Rutherford - Jane area in Vaughan to maintain system reliability and customer service. Cables in this area are 33 to 35 years old, whereas the typical useful life of non-tree retardant XLPE cable is 30 years. There was 1 cable/splice failure in 2021 affecting 40 customers on average. More specifically, customers in the project scope area in 2016-2018 had 0 outages, where from 2019-2021 this increased to 1 outage. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. The total cable quantity for injection is approximately 20,481m. It is proposed to complete 7,647m in 2021, 6,417m in 2022, and 6,417m in 2023. This investment will help avoid a total of 3 potential cable failure and 233523 potential CMI.
Major Category	System Renewal
Scenario	Submitted

	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. This investment will help avoid a total of 3 potential cable failure and 233523 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(V25) - Major Mackenzie - Keele - Rutherford - Jane, Vaughan**

Project Report

Project Code	151458
Project Name	Cable Injection Project - (V31) - Langstaff - Weston - Rutherford - Jane, Vaughan
Project Description	This investment will inject 9,798m of direct-buried XLPE cables in the East (Vaughan) grid V31 - Langstaff, Weston, Rutherford and Jane area. It is proposed to be completed in 2026. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 1 cable/splice failure since 2017 with 39 customers affected on average. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in fair to poor condition. It is expected that completion of this project will avoid 3 failures per year and 233523 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Cost of Investment**
	Please provide additional justification for what has changed	**Project is re-estimated and re-submitted**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**9798**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**Yes**
	Project Estimator	**Tran, Quan (Quan.Tran)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151458
Project Name	Cable Injection Project - (V31) - Langstaff - Weston - Rutherford - Jane, Vaughan
Project Description	This investment will inject 9,798m of direct-buried XLPE cables in the East (Vaughan) grid V31 - Langstaff, Weston, Rutherford and Jane area. It is proposed to be completed in 2026. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 1 cable/splice failure since 2017 with 39 customers affected on average. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in fair to poor condition. It is expected that completion of this project will avoid 3 failures per year and 233523 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 4 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the next 4 years, the only option left would be cable replacement which would cost 5 times that for cable injection.** **Without this proposed investment, 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)	**138 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as decribed in the project descripiton.** **This is the preferred alternative.**

Project Report

Project Code	151458
Project Name	Cable Injection Project - (V31) - Langstaff - Weston - Rutherford - Jane, Vaughan

Project Description

This investment will inject 9,798m of direct-buried XLPE cables in the East (Vaughan) grid V31 - Langstaff, Weston, Rutherford and Jane area. It is proposed to be completed in 2026.

This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service.

This project area has experienced 1 cable/splice failure since 2017 with 39 customers affected on average. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in fair to poor condition.

It is expected that completion of this project will avoid 3 failures per year and 233523 potential CMI.

This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this project area, there was 1 cable/splice failure since 2017. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 32 - 34 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Project Report

Project Code	151458
Project Name	Cable Injection Project - (V31) - Langstaff - Weston - Rutherford - Jane, Vaughan
Project Description	This investment will inject 9,798m of direct-buried XLPE cables in the East (Vaughan) grid V31 - Langstaff, Weston, Rutherford and Jane area. It is proposed to be completed in 2026. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 1 cable/splice failure since 2017 with 39 customers affected on average. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in fair to poor condition. It is expected that completion of this project will avoid 3 failures per year and 233523 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable injection projects since 2010.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:**	**This project area has experienced 1 cable/splice failure since 2017 with 39 customers affected on average. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cables in this area are 33 to 35 years old (installed in 1987-1989), which exceed the Typical Useful Life of non-tree retardant XLPE of 30 years.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**136**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There was 1 failure in this project area since 2017.** **5 year average of failures is 1 failures / 5 years = 0.2 failure(s) per year** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.** **We will use Alectra wide reliability information as a proxy for this project's reliability.** **Impact of 1 failure: 277 customers affected, 77841 CMI, and average outage duration is 104 minutes per customer per 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	**Not Applicable.**
	Consequences for O&M System Costs Including Implications of Not Implementing	**Not Applicable.**

Project Report

Project Code	151458	
Project Name	Cable Injection Project - (V31) - Langstaff - Weston - Rutherford - Jane, Vaughan	
Project Description	This investment will inject 9,798m of direct-buried XLPE cables in the East (Vaughan) grid V31 - Langstaff, Weston, Rutherford and Jane area. It is proposed to be completed in 2026. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. This project area has experienced 1 cable/splice failure since 2017 with 39 customers affected on average. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in fair to poor condition. It is expected that completion of this project will avoid 3 failures per year and 233523 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Reliability and Safety Factors	**The project will help avoid a total of 3 failures per year and 233523 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(V31) - Langstaff - Weston - Rutherford - Jane, Vaughan**

Project Report

Project Code	151462	
Project Name	Cable Injection Project - (G1) - Hwy 410 - Kennedy - Wanless - Main, Brampton	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Hwy 410 - Kennedy - Wanless - Main area (Grid G1) to maintain system reliability and customer service. This area has experienced 1 cable failure from 2016 to 2018 and 7 failure from 2019 to 2021 impacting 304 customers for 185 minutes, more than once a year. One cable segment failed three times in 2021 which caused customer frustrations and drove complaints. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 15263 m of direct-buried XLPE cables. It is proposed to replace 7000 m in 2022, and 8263 m in 2023 based on work that can be executed within these years. It is expected that completion of this project will avoid 3.8 failures per year impacting 144 customers for 186 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**805 Sandalwood Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**15263**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**Yes**
	Project Estimator	**Agostini, Robert (Robert.Agostini)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**639205**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151462
Project Name	Cable Injection Project - (G1) - Hwy 410 - Kennedy - Wanless - Main, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Hwy 410 - Kennedy - Wanless - Main area (Grid G1) to maintain system reliability and customer service. This area has experienced 1 cable failure from 2016 to 2018 and 7 failure from 2019 to 2021 impacting 304 customers for 185 minutes, more than once a year. One cable segment failed three times in 2021 which caused customer frustrations and drove complaints. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 15263 m of direct-buried XLPE cables. It is proposed to replace 7000 m in 2022, and 8263 m in 2023 based on work that can be executed within these years. It is expected that completion of this project will avoid 3.8 failures per year impacting 144 customers for 186 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**This project is driven by the cable failure risks impacting the reliability of the distribution system in this area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable remediation within the next 2 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels.** **Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 1.8 cable failures per year in 2023 and will increase to 3.8 failures per year starting 2024.**
	Customer Attachment / Load (KVA)	**137 Residential and 8 Commercial customers / 3789 KVA**
	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.**
06. 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	**Inject all the cables in this area that are of the same vintage as those that experienced cable faults.**
	Alternative #2	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**

Project Report

Project Code 151462

Project Name Cable Injection Project - (G1) - Hwy 410 - Kennedy - Wanless - Main, Brampton

Project Description This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Hwy 410 - Kennedy - Wanless - Main area (Grid G1) to maintain system reliability and customer service.

This area has experienced 1 cable failure from 2016 to 2018 and 7 failure from 2019 to 2021 impacting 304 customers for 185 minutes, more than once a year. One cable segment failed three times in 2021 which caused customer frustrations and drove complaints. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 15263 m of direct-buried XLPE cables. It is proposed to replace 7000 m in 2022, and 8263 m in 2023 based on work that can be executed within these years.

It is expected that completion of this project will avoid 3.8 failures per year impacting 144 customers for 186 minutes.

This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category System Renewal

Scenario Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 8 cable failures since 2016. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 35 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #2 is not recommended because on average, cable replacement is 5 times more expensive than cable injection, and cables at this location are feasible for cable injection.

Project Report

Project Code	151462
Project Name	Cable Injection Project - (G1) - Hwy 410 - Kennedy - Wanless - Main, Brampton
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Hwy 410 - Kennedy - Wanless - Main area (Grid G1) to maintain system reliability and customer service. This area has experienced 1 cable failure from 2016 to 2018 and 7 failure from 2019 to 2021 impacting 304 customers for 185 minutes, more than once a year. One cable segment failed three times in 2021 which caused customer frustrations and drove complaints. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 15263 m of direct-buried XLPE cables. It is proposed to replace 7000 m in 2022, and 8263 m in 2023 based on work that can be executed within these years. It is expected that completion of this project will avoid 3.8 failures per year impacting 144 customers for 186 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 avoid 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 prevention strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Similar cable injection projects over the past three years (2018, 2019, and 2020) were $80/m.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 failures since 2016. If not rehabilitated, these cables 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 1986), which exceeds Alectra Utilities' Typical Useful Life of 30 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**144**
	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 15263 m of cable in the whole area:** **Frequency of Failure is: 0.25 x 15263 /1000 = 3.8 failure(s)** **According to Alectra Central North Control Room data, there were 0, 1, 0, 0, 2,and 5 Cable failures in 2016 to 2021, respectively (6-year average is 1 failures per year).** **Annually on average there were 1.333 Cable failures affecting 51 customers and 9383 CMI.** **Impact of 1 failure: 61/1.333 = 38 customers affected and 9383/1.333 = 7039 CMI.** **Impact of 3.8 failures: 38 x 3.8 = 144 customers affected and 7039 x 3.8 = 26748 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).**

Project Report

Project Code	151462	
Project Name	Cable Injection Project - (G1) - Hwy 410 - Kennedy - Wanless - Main, Brampton	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Hwy 410 - Kennedy - Wanless - Main area (Grid G1) to maintain system reliability and customer service. This area has experienced 1 cable failure from 2016 to 2018 and 7 failure from 2019 to 2021 impacting 304 customers for 185 minutes, more than once a year. One cable segment failed three times in 2021 which caused customer frustrations and drove complaints. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in poor condition. This investment will inject 15263 m of direct-buried XLPE cables. It is proposed to replace 7000 m in 2022, and 8263 m in 2023 based on work that can be executed within these years. It is expected that completion of this project will avoid 3.8 failures per year impacting 144 customers for 186 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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	**The project will help avoid a total of 3.8 potential cable failures and 26748 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**(G1) - Hwy 410 - Kennedy - Wanless - Main, Brampton**

Project Report

Project Code	151465	
Project Name	Cable Replacement - Mississauga Left Behind Cable	
Project Description	This investment is for replacing “Left-Behind” underground Cross-Linked Polyethylene (XLPE) cables in the Central South region. "Left-behind" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure. In 2021 ACA, these cables were determined to be beyond typical useful life and in very poor condition. This investment will replace the direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. If this project is not implemented, Central South would experience 2 failures per year, due to "Left Behind" cables, by 2025. It is expected that each year this project is executed, 1 failure, impacting 346 customers for 55 minutes, will be avoided.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**Yes**
	What is the main driver for the change	**Timing**
	Please provide additional justification for what has changed	**Budget was moved to 2023. Cable injection project will not start in Mississauga until 2022.**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	**1**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**Yes**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**Yes**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Reliability**

Project Report

Project Code	151465	
Project Name	Cable Replacement - Mississauga Left Behind Cable	
Project Description	This investment is for replacing “Left-Behind” underground Cross-Linked Polyethylene (XLPE) cables in the Central South region. "Left-behind" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure. In 2021 ACA, these cables were determined to be beyond typical useful life and in very poor condition. This investment will replace the direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. If this project is not implemented, Central South would experience 2 failures per year, due to "Left Behind" cables, by 2025. It is expected that each year this project is executed, 1 failure, impacting 346 customers for 55 minutes, will be avoided.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	**This project is driven by failure risks on the distribution system. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities’ system. Cable and cable accessory failures account for 50% of all equipment-related outages.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable replacements within the year following the completion of cable injection project where the "Left Behind" cables were identified, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 1 cable failure per year starting in 2023 and 2 failures per year starting 2025.**
	Customer Attachment / Load (KVA)	**344 Residential and 2 Commercial customers / 1,516 KVA**
	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**
06. 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	**Replace all the cables in this area that are of the same vintage as those that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**
	Alternative #2	**Replace only the cable segments that experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.**

Project Report

Project Code	151465	
Project Name	Cable Replacement - Mississauga Left Behind Cable	
Project Description	This investment is for replacing “Left-Behind” underground Cross-Linked Polyethylene (XLPE) cables in the Central South region. "Left-behind" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). Alectra Utilities’ planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure. In 2021 ACA, these cables were determined to be beyond typical useful life and in very poor condition. This investment will replace the direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. If this project is not implemented, Central South would experience 2 failures per year, due to "Left Behind" cables, by 2025. It is expected that each year this project is executed, 1 failure, impacting 346 customers for 55 minutes, will be avoided.	
Major Category	System Renewal	
Scenario	Submitted	
	Justification for Recommended Alternative	**The cables in this area are at end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.** **To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.** **Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories.** **One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria.** **Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.**
07. 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 avoid 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 Group 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 prevention strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Project cost estimates are based on historical cable replacement cost per m.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record**	**According to Alectra Central South Control Room data, there were 250, 251, 214, 238, and 154 Cable failures in 2015 to 2019, respectively (5-year average is 221 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.** **Cable in this project exceeds Alectra Utilities' End-of-Useful Life of 40 years for non-tree retardant XLPE.**

Project Report

Project Code	151465	
Project Name	Cable Replacement - Mississauga Left Behind Cable	
Project Description	This investment is for replacing "Left-Behind" underground Cross-Linked Polyethylene (XLPE) cables in the Central South region. "Left-behind" cable segments are those segments that were intended for cable injection but turn-out to be not injectable for various reasons (e.g. too many splices, corrosion). Alectra Utilities' planned Underground Asset Renewal investments are driven by an increasing decline in reliability on the distribution system. Cable and cable accessories are the highest cause of failure. In 2021 ACA, these cables were determined to be beyond typical useful life and in very poor condition. This investment will replace the direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. If this project is not implemented, Central South would experience 2 failures per year, due to "Left Behind" cables, by 2025. It is expected that each year this project is executed, 1 failure, impacting 346 customers for 55 minutes, will be avoided.	
Major Category	System Renewal	
Scenario	Submitted	
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**554**
	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 6,500 m of cable in the whole area:** **Frequency of Failure is: 0.25 x 6500 /1000 = 1.6 failure(s)** **According to Alectra Central South Control Room data, there were 250, 251, 214, 238, and 154 Cable failures in 2015 to 2019, respectively (5-year average is 221 failures per year).** **Annually on average there were 221 Cable failures affecting 76,534 customers and 4,200,120 CMI** **Impact of 1 failure: 76,534/221 = 346 customers affected and 4,200,120/221 = 19,005 CMI** **Impact of 1.6 failures: 346 x 1.6 = 554 customers affected and 19,005 x 1.6 = 30,408 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	**Based on the Central South 5-year average Reliability, 1 cable failure causes approximately 19,005 CMI. Thus, this project will help avoid a total of 1.6 potential cable faults and 30,408 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 installed 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, minimal digging is required).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	**Various locations in Alectra Mississauga**

Project Report

Project Code	151516	
Project Name	Cable Replacement Project - (AREA46)- Millcreek Dr & Erin Mills Pkway, Mississauga	
Project Description	This investment is for replacing 7,627m (3,003m in 2022, and 4,624m in 2023) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Millcreek Dr & Erin Mills Pkwy (AREA46). The cables in this project had experienced 6 cable failures from 2016-2018 and 4 failures from 2019-2021, 348 customers were impacted for 32 minutes, 2 times a year. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 2.2 failures per year impacting 766 customers for 32 minutes. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to failing underground system assets. Installing the new cables in conduit will make future cable failure remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**New project**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**7627**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**643857**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151516
Project Name	Cable Replacement Project - (AREA46)- Millcreek Dr & Erin Mills Pkway, Mississauga
Project Description	This investment is for replacing 7,627m (3,003m in 2022, and 4,624m in 2023) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Millcreek Dr & Erin Mills Pkwy (AREA46). The cables in this project had experienced 6 cable failures from 2016-2018 and 4 failures from 2019-2021, 348 customers were impacted for 32 minutes, 2 times a year. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 2.2 failures per year impacting 766 customers for 32 minutes. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to failing underground system assets. Installing the new cables in conduit will make future cable failure remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**This investment is driven by continuing cable failures impacting the reliability in the Millcreek Drive area. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers.** **Due to the continuous occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the next 2 years to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further. Deteriorated cables fail at greater rates, and Alectra Utilities forecast that if the investment is not made, that the rate of cable failures per year will increase to 0.9 in 2023 and 2.2 failures per year starting 2024.**
	Customer Attachment / Load (KVA)	**742 Residential and 24 Commercial customers / 13212 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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**

Project Report

Project Code	151516
Project Name	Cable Replacement Project - (AREA46)- Millcreek Dr & Erin Mills Pkway, Mississauga
Project Description	This investment is for replacing 7,627m (3,003m in 2022, and 4,624m in 2023) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Millcreek Dr & Erin Mills Pkwy (AREA46). The cables in this project had experienced 6 cable failures from 2016-2018 and 4 failures from 2019-2021, 348 customers were impacted for 32 minutes, 2 times a year. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 2.2 failures per year impacting 766 customers for 32 minutes. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to failing underground system assets. Installing the new cables in conduit will make future cable failure remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

Alternative #1

Alternative #1 is to perform replacement only of cable segments that have experienced a fault. Several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.

This alternative is costly, disruptive to customers and does not address the failure situation adequately.

This is not a preferred alternative.

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.

This is the recommended alternative.

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there were 10 cable failures since 2016. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories. Therefore, Alternative #1 is not recommended.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria.

Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.

Project Report

Project Code	151516	
Project Name	Cable Replacement Project - (AREA46)- Millcreek Dr & Erin Mills Pkway, Mississauga	
Project Description	This investment is for replacing 7,627m (3,003m in 2022, and 4,624m in 2023) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Millcreek Dr & Erin Mills Pkwy (AREA46). The cables in this project had experienced 6 cable failures from 2016-2018 and 4 failures from 2019-2021, 348 customers were impacted for 32 minutes, 2 times a year. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 2.2 failures per year impacting 766 customers for 32 minutes. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to failing underground system assets. Installing the new cables in conduit will make future cable failure remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 avoid having 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 prevention strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Similar replacement project was Rathburn Rd W Cable Replacement in 2019 for $3.6 M.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 33 cable failures since 2016. 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, which exceeds Alectra Utilities' End of Useful Life of 40 years for non-tree retardant XLPE and does not meet Alectra's age criterion for cable injection eligibility.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**766**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable:** **Frequency of Failure is: 0.29 failures per 1000 m of cable per year** **For 7627 m of cable in the whole area:** **Frequency of Failure is: 0.29 x 7627 /1000 = 2.2 failure(s)** **According to Alectra Central South Control Room data, there were 1, 3, 2, 0, 2, and 2 Cable failures from 2016 to 2021, respectively (6-year average is 1.67 failures per year).** **Annually on average 1 cable failure affecting 348 customers and 11015 CMI.** **Impact of 2.2 failures: 2.2 x 348 = 766 customers affected and 2.2 x 11015 = 24233 CMI**

Project Report

Project Code	151516
Project Name	Cable Replacement Project - (AREA46)- Millcreek Dr & Erin Mills Pkway, Mississauga
Project Description	This investment is for replacing 7,627m (3,003m in 2022, and 4,624m in 2023) of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Central South (Mississauga) within the Millcreek Dr & Erin Mills Pkwy (AREA46). The cables in this project had experienced 6 cable failures from 2016-2018 and 4 failures from 2019-2021, 348 customers were impacted for 32 minutes, 2 times a year. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. It is expected that completion of this project will avoid 2.2 failures per year impacting 766 customers for 32 minutes. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to failing underground system assets. Installing the new cables in conduit will make future cable failure remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

	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 2.2 cable failure repairs = $20,000 x 2.2= $44,000**
	Reliability and Safety Factors	**Based on the Central South 5-year average Reliability, 1 cable failure causes approximately 21260 CMI. Thus, this project will help avoid a total of 2.2 potential cable faults and 24233 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	151556	
Project Name	Cable and Transformer Replacement - (HAM) - Hollybush - Parkside - Dundas - Spring Creek	
Project Description	This investment is for replacing 20,340m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton/Waterdown) area between Dundas St and Parkside Dr. (while project #151308 covers the cable injection portion). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 29.5 failures/100km. Five failures occuring in the last 3 years. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Initial submission of project.**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**820 Nebo Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**20340**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**2**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151556
Project Name	Cable and Transformer Replacement - (HAM) - Hollybush - Parkside - Dundas - Spring Creek
Project Description	This investment is for replacing 20,340m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton/Waterdown) area between Dundas St and Parkside Dr. (while project #151308 covers the cable injection portion). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 29.5 failures/100km. Five failures occuring in the last 3 years. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers.** **Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the near term to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, 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)	**1705 customers and 9500 kVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**

Project Report

Project Code	151556
Project Name	Cable and Transformer Replacement - (HAM) - Hollybush - Parkside - Dundas - Spring Creek
Project Description	This investment is for replacing 20,340m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton/Waterdown) area between Dundas St and Parkside Dr. (while project #151308 covers the cable injection portion). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 29.5 failures/100km. Five failures occuring in the last 3 years. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Alternative #1	**Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a preferred alternative.**
Alternative #2	**Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.** **The benefit in replacing these transformers is that it mitigates future outages and potential damage to newly installed cable once the transformers fail.** **This is the recommended alternative.**
Justification for Recommended Alternative	**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.** **One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Segments that do meet the criteria for cable injection are covered under a separate project.** **Therefore, planned cable replacement within the area is selected as the preferred alternative. While it is a costly alternative, the added benefit of installing new conduit which will help with future cable issues as well as avoiding future outages on other cable segments that have been subjected to previous high stress fault conditions. The benefits to the customer include reducing the likelihood of unplanned disruptions and new underground equipment which should provide reliable, continuous service for many more years. Furthermore, the replacement of several transformers that are at risk of failing allows for an opportunistic renewal of assets while work crews are already in the area performing cable replacement, minimizing the outage impacts for customers who would otherwise eventually experience an unplanned outage once the transformer fails. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.**

Project Report

Project Code	151556
Project Name	Cable and Transformer Replacement - (HAM) - Hollybush - Parkside - Dundas - Spring Creek
Project Description	This investment is for replacing 20,340m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton/Waterdown) area between Dundas St and Parkside Dr. (while project #151308 covers the cable injection portion). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 29.5 failures/100km. Five failures occuring in the last 3 years. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 utilized coordination with third parties to avoid 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 avoidance 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 (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure: Condition of Asset vs. Typical Life Cycle and Performance Record**	**There are 6 failures in this project scope, for a failure rate of 27.8 failures/100km. Five of the failures occuring in the last 3 years. If not rehabilitated, this cable will get older and will fail more often to the level that is not tolerable by customers.** **Cable in this area ranges from 26 to 72 years old (installed in 1993 and 1947 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**

Project Report

Project Code	151556
Project Name	Cable and Transformer Replacement - (HAM) - Hollybush - Parkside - Dundas - Spring Creek
Project Description	This investment is for replacing 20,340m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton/Waterdown) area between Dundas St and Parkside Dr. (while project #151308 covers the cable injection portion). It is served by the 2D13X which was on the Worst Performing Feeders list. It is mostly Residential/Commercial with 1705 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. This area has seen 6 failures as a result of cable faults for a failure rate of 29.5 failures/100km. Five failures occuring in the last 3 years. Installing the new cables in conduit will make future cable replacements easier to implement. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**Area is supplied by 2D13X which is on the Worst Performing feeder list. For 1000 m of cable: Frequency of Failure is: 0.25 failures per 1000 m of cable per year For 20343m of cable in the whole area: Frequency of Failure is: 0.25 x 20343 /1000 = 5.09 failures Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI Impact of 5.09 failures: 598 x 5.09 = 3044 customers affected and 52,945 x 5.09 = 269,491 CMI Since this area will be implemented in phases over a period of three years, the estimated quantity is 7627m in Year 1, 9868m in Year 2, and 2848m in Year 3. In addition, the total number of transformers in the area is approximately 188 totalling 12,854 KVA. For the purpose of Reliability Benefits: Year 1 Frequency of Failure is: 0.25 x 7627 /1000 = 1.91 failures Impact of 1.91 failure: 598 x 1.91 = 1142 customers affected and 52,945 x 1.91 = 101,125 CMI The benefit from this year onwards is based on 1.91 failures Peak KVA = 3,600 KVA Year 2 Frequency of Failure is: 0.25 x (7627+9868) /1000 = 4.37 failures Impact of 4.37 failure: 598 x 4.37 = 2613 customers affected and 52,945 x 4.37 = 231,370 CMI The benefit from this year onwards is based on 4.37 failures Peak KVA = 8,200 KVA Year 3 Frequency of Failure is: 0.25 x (7627+9868+2848) /1000 = 5.09 failures Impact of 5.09 failures: 598 x 5.09 = 3044 customers affected and 52,945 x 5.09 = 269,491 CMI The benefit from this year onwards is based on 5.09 failures**
	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 remediation program. The project will help avoid a total of 5.09 potential cable failures and 269,491 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	151855	
Project Name	Cable Replacement and Switchgear Removal - (AREA19) - Fieldgate and Ponytrail Dr, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Fieldgate and Ponytrail Dr area (AREA19) to maintain system reliability and customer service. This area has experienced 4 cable failures from 2016 to 2018 and 0 failures from 2019 to 2021 impacting 336 customers for 53 minutes, less than once a year. One of the cable segments at this location had experienced 3 cable failures which impacted the 10 commercial customers. This cable need to be replaced to avoid having more frequent failures in the future. In addition, SG1471 is in very poor condition. Customers here are supplied radially which does not provide backup in outage events. This project will not only remove the switchgears which incurs OM&A reduction but also reconfigure the system into a looped system so customers can have backup supply in case of outages. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. This investment will replace 5280 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is expected that completion of this project will avoid 1.3 failures per year impacting 109 customers for 53 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**5280**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**1**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code: 151855

Project Name: Cable Replacement and Switchgear Removal - (AREA19) - Fieldgate and Ponytrail Dr, Mississauga

Project Description: This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Fieldgate and Ponytrail Dr area (AREA19) to maintain system reliability and customer service.

This area has experienced 4 cable failures from 2016 to 2018 and 0 failures from 2019 to 2021 impacting 336 customers for 53 minutes, less than once a year. One of the cable segments at this location had experienced 3 cable failures which impacted the 10 commercial customers. This cable need to be replaced to avoid having more frequent failures in the future. In addition, SG1471 is in very poor condition. Customers here are supplied radially which does not provide backup in outage events. This project will not only remove the switchgears which incurs OM&A reduction but also reconfigure the system into a looped system so customers can have backup supply in case of outages.

In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. This investment will replace 5280 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit.

It is expected that completion of this project will avoid 1.3 failures per year impacting 109 customers for 53 minutes.

This aligns with Alectra Utilities' focus on decreasing the outage impacts due to

Major Category: System Renewal

Scenario: Submitted

Urgency and Reasons for Urgency: These investments are driven by failure risks on the distribution system. This area has radial supplies which does not provide backup in case of outage. One switchgear is in very poor condition and one cable segment had experienced 3 cable faults. Remediation is required to avoid more frequent outages due to deteriorated underground assets. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.

Due to the risk of failures caused by this cable vintage, Alectra Utilities must execute cable replacements within the next 2 years to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels.

Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 1.3 cable failures per year in 2024.

Customer Attachment / Load (KVA): 92 Residential and 17 Commercial customers / 8425 KVA

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: Not applicable

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: An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.

Environmental Benefits: Not applicable

06. 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 and switchgear run to failure and respond to outages under reactive capital.

Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.

This is not a viable alternative.

Alternative #1: Alternative #1 is to only replace the switchgear SG1471 on a like for like basis.

This alternative is costly, disruptive to customers and does not address the failure situation adequately.

This is not a viable alternative.

Alternative #2: Alternative #2 is to remove the switchgear and install new cable segments as described in the project description. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits.

This is the recommended alternative.

Project Report

Project Code	151855
Project Name	Cable Replacement and Switchgear Removal - (AREA19) - Fieldgate and Ponytrail Dr, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Fieldgate and Ponytrail Dr area (AREA19) to maintain system reliability and customer service. This area has experienced 4 cable failures from 2016 to 2018 and 0 failures from 2019 to 2021 impacting 336 customers for 53 minutes, less than once a year. One of the cable segments at this location had experienced 3 cable failures which impacted the 10 commercial customers. This cable need to be replaced to avoid having more frequent failures in the future. In addition, SG1471 is in very poor condition. Customers here are supplied radially which does not provide backup in outage events. This project will not only remove the switchgears which incurs OM&A reduction but also reconfigure the system into a looped system so customers can have backup supply in case of outages. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. This investment will replace 5280 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is expected that completion of this project will avoid 1.3 failures per year impacting 109 customers for 53 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to
Major Category	System Renewal
Scenario	Submitted

	Justification for Recommended Alternative	**The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers. In this area, there were 2 cable failures since 2016 which caused one cable segment to have experienced 3 cable failures. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers. Running the SG1471 to failure is not acceptable as a large number of customers are impacted by a switchgear failure. This alternative will not avoid the issue of declining reliability. For this reason, Status quo is not recommended. Proactively replacing SG1471 only misses out on the opportunity to eliminate all switchgear in this area entirely. This alternative is at a lower cost but this investment avoids only the risk associated with SG1471. Leaving the customers with radial supplies does not avoid risks of failure thus would still impact reliability. Therefore Alternative #1 is not recommended. Reconfiguring the distribution system in the area by removing all switchgear and kbar and providing looped supplies to all transformer banks will not only improve reliability but also reduce maintenance cost on switchgears. Therefore, Alternative #2 is the recommended alternative.**
07. 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 avoid 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 prevention 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.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**

Project Report

Project Code	151855	
Project Name	Cable Replacement and Switchgear Removal - (AREA19) - Fieldgate and Ponytrail Dr, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Fieldgate and Ponytrail Dr area (AREA19) to maintain system reliability and customer service. This area has experienced 4 cable failures from 2016 to 2018 and 0 failures from 2019 to 2021 impacting 336 customers for 53 minutes, less than once a year. One of the cable segments at this location had experienced 3 cable failures which impacted the 10 commercial customers. This cable need to be replaced to avoid having more frequent failures in the future. In addition, SG1471 is in very poor condition. Customers here are supplied radially which does not provide backup in outage events. This project will not only remove the switchgears which incurs OM&A reduction but also reconfigure the system into a looped system so customers can have backup supply in case of outages. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. This investment will replace 5280 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is expected that completion of this project will avoid 1.3 failures per year impacting 109 customers for 53 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to	
Major Category	System Renewal	
Scenario	Submitted	
08. 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 2 cable failures since 2016. 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	**Alectra Utilities' Typical Useful Life for 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 primary cables included in the scope of this project are 46 years old and are expected to fail impacting all the commercial/industrial customers that are radially supplied.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**109**
	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 5280 m of cable in the whole area: Frequency of Failure is: 0.25 x 5280 /1000 = 1.3 failure(s) According to Alectra Central South Control Room data, there were 2, 2, 0, 0, 0,and 0 Cable failures in 2016 to 2021, respectively (6-year average is 1 failure per year). Annually on average there were 0.667 Cable failures affecting 56 customers and 2951 CMI. Impact of 1 failure: 56/0.667 = 84 customers affected and 2951/0.667 = 4425 CMI. Impact of 1.3 failures: 84 x 1.3 = 109 customers affected and 4425 x 1.3 = 5753 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 investment 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 1 cable and 1 switchgear failures and 5753 potential CMI. The project will also help avoid safety risks associated with switchgear failures.**
	Analysis for "Like for Like" Renewal Project	**Refer to alternative #1**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	151879	
Project Name	Cable and Transformer Replacement - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal	
Project Description	This investment is for replacing 15,302m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Upper Sherman, Stone Church, Nebo and Rymal Rds. (while project #151307 covers the cable injection portion). It is mostly Residential/Commercial with 1283 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. Cables are between 27 to 69 years old. The oldest cables were be targetted for replacment as these cables most likely have corrodied neutrals and are well beyond the end of life for these assets. In conjunction with the replacment, targetted injection will be completed are newer cables providing customers in this area with complete converage. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**This is the initial submission of the project.**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**820 Nebo Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**15302**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Beaudrie, Scott (Scott.Beaudrie)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**1**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151879
Project Name	Cable and Transformer Replacement - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal
Project Description	This investment is for replacing 15,302m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Upper Sherman, Stone Church, Nebo and Rymal Rds. (while project #151307 covers the cable injection portion). It is mostly Residential/Commercial with 1283 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. Cables are between 27 to 69 years old. The oldest cables were be targetted for replacment as these cables most likely have corrodied neutrals and are well beyond the end of life for these assets. In conjunction with the replacment, targetted injection will be completed are newer cables providing customers in this area with complete converage. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction. 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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers. Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the near term to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, 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)	**1283 customers and 8000 kVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable.**
06. 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 responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**

Project Report

Project Code	151879
Project Name	Cable and Transformer Replacement - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal
Project Description	This investment is for replacing 15,302m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Upper Sherman, Stone Church, Nebo and Rymal Rds. (while project #151307 covers the cable injection portion). It is mostly Residential/Commercial with 1283 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. Cables are between 27 to 69 years old. The oldest cables were be targetted for replacment as these cables most likely have corrodied neutrals and are well beyond the end of life for these assets. In conjunction with the replacment, targetted injection will be completed are newer cables providing customers in this area with complete converage. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

Alternative #1

Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively.

This alternative is costly, disruptive to customers and does not address the failure situation adequately.

This is not a preferred alternative.

Alternative #2

Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place.

The benefit in replacing these transformers is that it mitigates future outages and potential damage to newly installed cable once the transformers fail.

This is the recommended alternative.

Justification for Recommended Alternative

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.

One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Segments that do meet the criteria for cable injection are covered under a separate project.

Therefore, planned cable replacement within the area is selected as the preferred alternative. While it is a costly alternative, the added benefit of installing new conduit which will help with future cable issues as well as avoiding future outages on other cable segments that have been subjected to previous high stress fault conditions. The benefits to the customer include reducing the likelihood of unplanned disruptions and new underground equipment which should provide reliable, continuous service for many more years. Furthermore, the replacement of several transformers that are at risk of failing allows for an opportunistic renewal of assets while work crews are already in the area performing cable replacement, minimizing the outage impacts for customers who would otherwise eventually experience an unplanned outage once the transformer fails. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Project Report

Project Code	151879
Project Name	Cable and Transformer Replacement - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal
Project Description	This investment is for replacing 15,302m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Upper Sherman, Stone Church, Nebo and Rymal Rds. (while project #151307 covers the cable injection portion). It is mostly Residential/Commercial with 1283 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. Cables are between 27 to 69 years old. The oldest cables were be targetted for replacment as these cables most likely have corrodied neutrals and are well beyond the end of life for these assets. In conjunction with the replacment, targetted injection will be completed are newer cables providing customers in this area with complete converage. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 utilized coordination with third parties to avoid 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 avoidance 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 (0 if not applicable)	**0**
08. 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 0 failures in this project scope within the 2016 - 2021 timeframe, for a failure rate of 0 failures/100km. The failures can be split between a Pre-DSP (2016 - 2018) and Post-DSP (2019 - 2021) timeframe, with 0 failures occurring Pre-DSP and 0 failures occurring Post-DSP. 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 27 to 69 years old (installed in 1992 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	**1283**

Project Report

Project Code	151879
Project Name	Cable and Transformer Replacement - (HAM) - Upper Sherman - Stone Church - Nebo - Rymal
Project Description	This investment is for replacing 15,302m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the Alectra West (Hamilton) area bounded by Upper Sherman, Stone Church, Nebo and Rymal Rds. (while project #151307 covers the cable injection portion). It is mostly Residential/Commercial with 1283 customers. Along with the cable remediation, some of the distribution transformers will also be replaced as part of the project. Cables are between 27 to 69 years old. The oldest cables were be targetted for replacment as these cables most likely have corrodied neutrals and are well beyond the end of life for these assets. In conjunction with the replacment, targetted injection will be completed are newer cables providing customers in this area with complete converage. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	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 15302m of cable in the whole area: Frequency of Failure is: 0.25 x 15302 /1000 = 3.83 failures Annually on average over the past five years (2017 - 2021) in Alectra West, there were 53 cable and cable accessory failures (XLPE) affecting 31,663 customers and 2,806,080 CMI Impact of 1 failure: 31,663/53 = 598 customers affected and 2,806,080/53 = 52,945 CMI Impact of 3.83 failures: 598 x 3.83 = 2290 customers affected and 52,945 x 3.83 = 202,779 CMI Since this area will be implemented in phases over a period of three years, the estimated quantity is 5000m in year 1, 5302m in year 2, and 5000m in year 3. In addition, the total number of transformers in the area is approximately 105 totaling 8000 KVA. For the purpose of Reliability Benefits: Year 1: Frequency of Failure is: 0.25 x 5000 /1000 = 1.25 failures Impact of 1.25 failure: 598 x 1.25 = 748 customers affected and 52,945 x 1.25 = 66,181 CMI Peak KVA = 8000 / 15302 * 5000 = 2600 KVA The benefit for 2028 is based on 1.25 failures Year 2: Frequency of Failure is: 0.25 x (5000+5302) /1000 = 2.58 failures Impact of 2.58 failure: 598 x 2.58 = 1543 customers affected and 52,945 x 2.58 = 136,598 CMI Peak KVA = 8000 / 15302 x (5000+5302) = 5400 KVA The benefit from this year onwards is based on 2.58 failures Year 3: Frequency of Failure is: 0.25 x (5000+5302+5000) /1000 = 3.83 failures Impact of 3.83 failures: 598 x 3.83 = 2290 customers affected and 52,945 x 3.83 = 202,779 CMI Peak KVA = 8000 / 15302 x (5000+5302+5000) = 8000 KVA**
	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 remediation program. The project will help avoid a total of 3.83 potential cable failures and 202,779 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not applicable.**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	151904	
Project Name	Cable Replacement Project - (AREA54) - Copenhagen Rd, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Copenhagen Rd area (AREA54) to maintain system reliability and customer service. This area has experienced 5 cable failures from 2016 to 2018 and 4 failures from 2019 to 2021 impacting 3213 customers for 50 minutes, more than once a year. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. This investment will replace 3307 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is expected that completion of this project will avoid 3.3 failures per year impacting 1178 customers for 50 minutes. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**3307**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**1**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**
	Urgency and Reasons for Urgency	**This project is driven by the outage impact on reliability on the distribution system in this area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable replacement within the next 2 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 3.3 cable failures per year in 2025.**
	Customer Attachment / Load (KVA)	**1172 Residential and 7 Commercial customers / 5057 KVA**

Project Report

Project Code	151904
Project Name	Cable Replacement Project - (AREA54) - Copenhagen Rd, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Copenhagen Rd area (AREA54) to maintain system reliability and customer service. This area has experienced 5 cable failures from 2016 to 2018 and 4 failures from 2019 to 2021 impacting 3213 customers for 50 minutes, more than once a year. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. This investment will replace 3307 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is expected that completion of this project will avoid 3.3 failures per year impacting 1178 customers for 50 minutes. Installing the new cables in conduit will make future cable remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not applicable**
06. 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 responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively. This alternative is costly, disruptive to customers and does not address the failure situation adequately. This is not a preferred alternative.**
	Alternative #2	**Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place. The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail. This is the recommended alternative.**

Project Report

Project Code	151904
Project Name	Cable Replacement Project - (AREA54) - Copenhagen Rd, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Copenhagen Rd area (AREA54) to maintain system reliability and customer service. This area has experienced 5 cable failures from 2016 to 2018 and 4 failures from 2019 to 2021 impacting 3213 customers for 50 minutes, more than once a year. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. This investment will replace 3307 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is expected that completion of this project will avoid 3.3 failures per year impacting 1178 customers for 50 minutes. Installing the new cables in conduit will make future cable remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

	Justification for Recommended Alternative	**The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.** **To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.** **In this area, there were 9 cable failures since 2016. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.** **Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories. Therefore, Alternative #2 is not recommended.** **One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria.** **Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.**
07. 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 underground construction 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 avoid 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 prevention 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 $550/m.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**

Project Report

Project Code	151904	
Project Name	Cable Replacement Project - (AREA54) - Copenhagen Rd, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the Copenhagen Rd area (AREA54) to maintain system reliability and customer service. This area has experienced 5 cable failures from 2016 to 2018 and 4 failures from 2019 to 2021 impacting 3213 customers for 50 minutes, more than once a year. In 2021 ACA, these cables were determined to be beyond end of useful life of 40 years and in very poor condition. This investment will replace 3307 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit. It is expected that completion of this project will avoid 3.3 failures per year impacting 1178 customers for 50 minutes. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
08. 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 2016. 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 are 46 years old, which is at Alectra Utilities' End-of-Useful Life of 40 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**1178**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable: Frequency of Failure is: 1 failures per 1000 m of cable per year For 3307 m of cable in the whole area: Frequency of Failure is: 1 x 3307 /1000 = 3.3 failure(s) According to Alectra Central South Control Room data, there were 4, 0, 1, 0, 1,and 3 Cable failures in 2016 to 2021, respectively (6-year average is 2 failures per year). Annually on average there were 1.5 Cable failures affecting 536 customers and 27039 CMI. Impact of 1 failure: 536/1.5 = 357 customers affected and 27039/1.5 = 18026 CMI. Impact of 3.3 failures: 357 x 3.3 = 1178 customers affected and 18026 x 3.3 = 59486 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	**- Cost for emergency cable failure repair = $20,000 per failure - Cost for 3.3 cable failure repairs = $20,000 x 3.3= $66,000**
	Reliability and Safety Factors	**This project will help avoid a total of 3.3 potential cable faults and 59486potential 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).**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	151911	
Project Name	Cable Replacement Project - (A05) - Golf Links, Aurora	
Project Description	This investment is for replacing 14,112 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Aurora) A05 grid – Golf Links area. This project scope area has experienced 10 cable/splice failures since 2017 with 563 customers affected on average. More specifically, customers in the project scope area in 2017-2018 had 3 outages, where from 2020-2021 this increased to 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 698,320 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 8 failures by 2027. Based on the condition of the assets cable replacement	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not Applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not Applicable**
	Units	
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tenorlas, Reynaldo (Reynaldo.Tenorlas)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	**1**
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	**643893**
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	151911
Project Name	Cable Replacement Project - (A05) - Golf Links, Aurora
Project Description	This investment is for replacing 14,112 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Aurora) A05 grid – Golf Links area. This project scope area has experienced 10 cable/splice failures since 2017 with 563 customers affected on average. More specifically, customers in the project scope area in 2017-2018 had 3 outages, where from 2020-2021 this increased to 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 698,320 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 8 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that
Major Category	System Renewal
Scenario	Submitted

Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers.** **Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the next 2 years to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further. Deteriorated cables fail at greater rates, and Alectra Utilities forecast that if the investment is not made, that the rate of cable failures per year will increase to 0.3 in 2021 and 2 failures per year starting 2025.**
Customer Attachment / Load (KVA)	**168 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
Environmental Benefits	**Not Applicable**

Project Report

Project Code	151911
Project Name	Cable Replacement Project - (A05) - Golf Links, Aurora
Project Description	This investment is for replacing 14,112 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Aurora) A05 grid – Golf Links area. This project scope area has experienced 10 cable/splice failures since 2017 with 563 customers affected on average. More specifically, customers in the project scope area in 2017-2018 had 3 outages, where from 2020-2021 this increased to 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 698,320 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 8 failures by 2027. Based on the condition of the assets cable replacement
Major Category	System Renewal
Scenario	Submitted

06. 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 responding to outages under reactive capital. Given that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively. This alternative is costly, disruptive to customers and does not address the failure situation adequately. This is not a preferred alternative.**
	Alternative #2	**Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place. The benefit in replacing these transformers is that it avoids future outages and potential damage to newly installed cable once the transformers fail. This is the recommended alternative.**

Project Report

Project Code	151911
Project Name	Cable Replacement Project - (A05) - Golf Links, Aurora
Project Description	This investment is for replacing 14,112 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Aurora) A05 grid – Golf Links area. This project scope area has experienced 10 cable/splice failures since 2017 with 563 customers affected on average. More specifically, customers in the project scope area in 2017-2018 had 3 outages, where from 2020-2021 this increased to 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 698,320 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 8 failures by 2027. Based on the condition of the assets cable replacement
Major Category	System Renewal
Scenario	Submitted

	Justification for Recommended Alternative	**The cables in this area are at end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers. In this project scope area there were 10 cable/splice failures since 2017. If not rehabilitated these cables will get older and will fail more often to a level that is not tolerable by customers. Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories. One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria. Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.**
07. 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**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable replacement projects since 2010,**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:**	**This project scope area has experienced 10 cable/splice failures since 2017 with 563 customers affected on average. More specifically, customers in the project scope area in 2017-2018 had 3 outages, where from 2020-2021 this increased to 7 outages. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 7 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**The cable in this area is 38 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.**

Project Report

Project Code	151911	
Project Name	Cable Replacement Project - (A05) - Golf Links, Aurora	
Project Description	This investment is for replacing 14,112 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Aurora) A05 grid – Golf Links area. This project scope area has experienced 10 cable/splice failures since 2017 with 563 customers affected on average. More specifically, customers in the project scope area in 2017-2018 had 3 outages, where from 2020-2021 this increased to 7 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. It is expected that completion of this project will avoid 7 failures per year as of 2027 and 698,320 potential CMI. Installing the new cables in conduit will make future cable failures easier to avoid. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 8 failures by 2027. Based on the condition of the assets cable replacement	
Major Category	System Renewal	
Scenario	Submitted	
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**408**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 10 failures in this area since 2017.** **Frequency of Failure is 10 failures / 5 years = 2 failure(s) per year** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 3 failures in 2023, up to 7 failures by 2027.** **Impact of 1 failure: 563 customers affected, 99760 CMI, and average outage duration is 228 minutes per customer per 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**
	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. This project will help avoid 7 failures per year as of 2027 and 698,320 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).**
10. Obsolete	**Budget Type**	
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	
	Rates Category	
	Job Cost Chart Type	
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	152281
Project Name	Cable Replacement Project - (M31) - Denison and Birchmount, Markham
Project Description	This investment is for replacing 3,699 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Markham) M31 grid – Denison and Birchmount area. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. In this project scope area, there were 8 cable/splice failures since 2015 affecting 52 customers on average. More specifically, customers in the project area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failures in 2023, up to 5 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 3,726m. It is proposed to complete this in 2022. This investment will help avoid a total of 5 potential cable failure(s) as of 2027 and 38640 potential CMI
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**New Project.**
	Why has it changed	
	Please provide additional justification for why the project has changed	**Not applicable.**
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Handy, James (James.Handy)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation –Replacement**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code
152281

Project Name
Cable Replacement Project - (M31) - Denison and Birchmount, Markham

Project Description
This investment is for replacing 3,699 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Markham) M31 grid – Denison and Birchmount area.

This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers.

In this project scope area, there were 8 cable/splice failures since 2015 affecting 52 customers on average. More specifically, customers in the project area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failures in 2023, up to 5 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers.

The total cable quantity for replacement is approximately 3,726m. It is proposed to complete this in 2022. This investment will help avoid a total of 5 potential cable failure(s) as of 2027 and 38640 potential CMI

Major Category
System Renewal

Scenario
Submitted

Urgency and Reasons for Urgency
These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.

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 were 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. It does not 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 and impact the quality of service received by Alectra Utilities' customers.

Due to the increasing occurrence of failures caused by this vintage of cable, Alectra Utilities must execute cable replacements within the next 2 years to end the trend and to reverse it by reducing the number of cable failures. This should return customers to historical reliability levels. Without this proposed investment, cables will continue to degrade and Alectra Utilities expects reliability to decline further. Deteriorated cables fail at greater rates, and Alectra Utilities forecast that if the investment is not made, that the rate of cable failures per year will increase to 0.3 in 2021 and 2 failures per year starting 2025.

Customer Attachment / Load (KVA)
2236 Customers (Mixed - Commercial/Residential) / 1,458 KVA

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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.

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
An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.

Environmental Benefits
Not Applicable.

Project Report

Project Code	152281
Project Name	Cable Replacement Project - (M31) - Denison and Birchmount, Markham
Project Description	This investment is for replacing 3,699 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Markham) M31 grid – Denison and Birchmount area. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. In this project scope area, there were 8 cable/splice failures since 2015 affecting 52 customers on average. More specifically, customers in the project area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failures in 2023, up to 5 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 3,726m. It is proposed to complete this in 2022. This investment will help avoid a total of 5 potential cable failure(s) as of 2027 and 38640 potential CMI
Major Category	System Renewal
Scenario	Submitted

06. 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 responding to outages under reactive capital. Given that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to perform replacement only of cable segments that have experienced a fault. While this area has not seen a large number of faults, several sections of cable would need to be replaced under this alternative. This approach provides a bare minimum investment approach to targeting segments that have already seen repair action taken place, and is intended to remove the possibility of future failures occurring on an already compromised cable segment by installing a new length of cable. This approach neglects the impact that failures have on adjacent equipment within the area. Under this alternative, no transformer replacements would occur, allowing those units to run-to-failure and be replaced reactively. This alternative is costly, disruptive to customers and does not address the failure situation adequately. This is not a preferred alternative.**
	Alternative #2	**Alternative #2 is to replace all the cables in this area that are of the same vintage as those that have experienced cable faults. The cables will be replaced with Tree-Retardant XLPE cables and installed in conduits. Transformer replacement will also be carried out on those transformers within the scope area that are at risk of failure or do not meet minimum condition criteria to leave in place. The benefit in replacing these transformers is that it reduces future outages and potential damage to newly installed cable once the transformers fail. This is the recommended alternative.**

Project Report

Project Code	152281
Project Name	Cable Replacement Project - (M31) - Denison and Birchmount, Markham
Project Description	This investment is for replacing 3,699 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Markham) M31 grid – Denison and Birchmount area. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. In this project scope area, there were 8 cable/splice failures since 2015 affecting 52 customers on average. More specifically, customers in the project area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failures in 2023, up to 5 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 3,726m. It is proposed to complete this in 2022. This investment will help avoid a total of 5 potential cable failure(s) as of 2027 and 38640 potential CMI
Major Category	System Renewal
Scenario	Submitted

	Justification for Recommended Alternative	**The cables in this area are at end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.** **To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will reduce the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.** **In this project scope area there were 8 cable/splice failures since 2015. If not rehabilitated these cables will get older and will fail more often to a level that is not tolerable by customers.** **Replacing only the segments that failed negates the issue that the other segments were affected by cable faults which further degrades the cables' insulation and therefore, will not halt or reverse the increasing trend of outages due to cable failure as the cables of the same vintage are at end-of-life, have deteriorated and are at risk of failing soon as exhibited in many areas with multiple cable failures across Alectra Utilities' service territories.** **One other alternative Alectra Utilities considered for cable remediation is cable injection. However, these cables did not meet Alectra Utilities' cable injection criteria.** **Cables in this area have failures and partial replacement will not deal with the degradation and damage done to adjacent segments and therefore total cable replacement is required.**
07. 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 avoid 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 reduction strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable replacement projects since 2010,**

Project Report

Project Code	152281
Project Name	Cable Replacement Project - (M31) - Denison and Birchmount, Markham
Project Description	This investment is for replacing 3,699 m of direct-buried XLPE cables with Tree-Retardant XLPE cables installed in conduit in the East (Markham) M31 grid – Denison and Birchmount area. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable replacements easier to implement. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. In this project scope area, there were 8 cable/splice failures since 2015 affecting 52 customers on average. More specifically, customers in the project area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failures in 2023, up to 5 failures by 2027. Based on the condition of the assets cable replacement is recommended and is the alternative that provides the greatest value to customers. The total cable quantity for replacement is approximately 3,726m. It is proposed to complete this in 2022. This investment will help avoid a total of 5 potential cable failure(s) as of 2027 and 38640 potential CMI
Major Category	System Renewal
Scenario	Submitted

	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 were 8 cable/splice failures since 2015 affecting 52 customers on average. More specifically, customers in the project area in 2016-2018 had 2 outages, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failures in 2023, up to 5 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**The cable in this area is 38 - 42 years old (installed in 1980 - 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	**307**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 8 failures in this area since 2015. Frequency of Failure is 8 failures / 7 years = 1.14 failure(s) per year Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 2 failures in 2023, up to 5 failures by 2027. Impact of 1 failure: 52 customers affected, 7728 CMI, and average outage duration is 196 minutes per customer per 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	**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 5 potential cable failure(s) as of 2027 and 38640 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).**
10. Obsolete	**Budget Type**	
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	
	Rates Category	
	Job Cost Chart Type	
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	152383	
Project Name	Cable Injection - (AREA 39) - Erin Mills Pkwy & Thomas St, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area (AREA39) to maintain system reliability and customer service. This area has experienced 0 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021 impacting 2444 customers for 47 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 47313 m of direct-buried XLPE cables. It is proposed to replace 12000 m in 2024, 12000 m in 2025, 12000 m in 2026, and 11313 m in 2027 based on work that can be executed within these years. It is expected that completion of this project will avoid 5.9 failures per year impacting 14420 customers for 47 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable**
	Why has it changed	
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**800 Mavis Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	**47313**
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Lucic, Marko (Marko.Lucic)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	152383
Project Name	Cable Injection - (AREA 39) - Erin Mills Pkwy & Thomas St, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area (AREA39) to maintain system reliability and customer service. This area has experienced 0 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021 impacting 2444 customers for 47 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 47313 m of direct-buried XLPE cables. It is proposed to replace 12000 m in 2024, 12000 m in 2025, 12000 m in 2026, and 11313 m in 2027 based on work that can be executed within these years. It is expected that completion of this project will avoid 5.9 failures per year impacting 14420 customers for 47 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**This project is driven by the cable failure risks impacting the reliability of the distribution system in this area. At present, defective equipment accounts for 45% of controllable outages in Alectra Utilities' system. Cable and cable accessory failures account for 50% of all equipment-related outages. Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable remediation within the next 2 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. Without this proposed expenditure, 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 and Alectra Utilities will start experiencing 1.5 cable failures per year in 2025 and will increase to 5.9 failures per year starting 2028.**
	Customer Attachment / Load (KVA)	**14408 Residential and 12 Commercial customers / 27512 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable.**
06. 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 responding to outages under reactive capital. Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction. This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area). This alternative is costly, disruptive to customers and does not address the failure situation adequately. This is not a viable alternative.**
	Alternative #2	**Alternative #2 is to inject the cables as described in the project description. This is the preferred alternative.**

Project Report

Project Code	152383
Project Name	Cable Injection - (AREA 39) - Erin Mills Pkwy & Thomas St, Mississauga
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area (AREA39) to maintain system reliability and customer service. This area has experienced 0 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021 impacting 2444 customers for 47 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 47313 m of direct-buried XLPE cables. It is proposed to replace 12000 m in 2024, 12000 m in 2025, 12000 m in 2026, and 11313 m in 2027 based on work that can be executed within these years. It is expected that completion of this project will avoid 5.9 failures per year impacting 14420 customers for 47 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable remediation easier to implement.
Major Category	System Renewal
Scenario	Submitted

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this area, there was 1 cable failure since 2020. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 32 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Project Report

Project Code	152383	
Project Name	Cable Injection - (AREA 39) - Erin Mills Pkwy & Thomas St, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area (AREA39) to maintain system reliability and customer service. This area has experienced 0 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021 impacting 2444 customers for 47 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 47313 m of direct-buried XLPE cables. It is proposed to replace 12000 m in 2024, 12000 m in 2025, 12000 m in 2026, and 11313 m in 2027 based on work that can be executed within these years. It is expected that completion of this project will avoid 5.9 failures per year impacting 14420 customers for 47 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
07. 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 avoid having 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 prevention strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Completed injection projects from other Alectra regions cost $80/m which is used to estimate this project.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 had been 1 cable failure since 2020. If not rehabilitated, the cables will get older and will fail more often to the level that is not tolerable by the customers.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cable in this area is on average 32 years old, which exceeds Alectra Utilities' Typical Useful Life of 30 years for non-tree retardant XLPE.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**12621**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**For 1000 m of cable: Frequency of Failure is: 0.13 failures per 1000 m of cable per year For 46035 m of cable in the whole area: Frequency of Failure is: 0.13 x 46035 /1000 = 5.8 failure(s) According to Alectra Central South Control Room data, there were 0, 0, 0, 0, 1,and 1 Cable failures in 2016 to 2021, respectively (6-year average is 0.333 failures per year). Annually on average there were 0.333 Cable failures affecting 725 customers and 70382 CMI. Impact of 1 failure: 725/0.333 = 2176 customers affected and 70382/0.333 = 211358 CMI. Impact of 5.8 failures: 2176 x 5.8 = 12621 customers affected and 211358 x 5.8 = 1225876 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**

Project Report

Project Code	152383	
Project Name	Cable Injection - (AREA 39) - Erin Mills Pkwy & Thomas St, Mississauga	
Project Description	This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area (AREA39) to maintain system reliability and customer service. This area has experienced 0 cable failure from 2016 to 2018 and 1 failure from 2019 to 2021 impacting 2444 customers for 47 minutes, less than once a year. In 2021 ACA, these cables were determined to be beyond typical useful life of 30 years and in fair condition. This investment will inject 47313 m of direct-buried XLPE cables. It is proposed to replace 12000 m in 2024, 12000 m in 2025, 12000 m in 2026, and 11313 m in 2027 based on work that can be executed within these years. It is expected that completion of this project will avoid 5.9 failures per year impacting 14420 customers for 47 minutes. This aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets. Installing the new cables in conduit will make future cable remediation easier to implement.	
Major Category	System Renewal	
Scenario	Submitted	
	Factors Affecting Project Timing, if any	**Not Applicable.**
	Consequences for O&M System Costs Including Implications of Not Implementing Reliability and Safety Factors	**- Cost for emergency cable failure repair = $20,000 per failure - Cost for 5.8 cable failure repairs = $20,000 x 5.8= $116,000 This project will help avoid a total of 5.8 potential cable faults and 1225876 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable**
10. Obsolete	**Budget Type**	**B) Capital Works**
	PowerStream Old Sub-Category	**1a / Lines Replacement Program/Projects**
	PowerStream Plan Category	**UG Lines - Planned Asset Replacement**
	Phase Code	**11 / Alectra Initiated Capital**
	Rates Category	**Sustainment Capital (1)**
	Job Cost Chart Type	**Master Chart**
	PowerStream Plan Sub Category	**Cable Remediation**
	Location Description	

Project Report

Project Code	152385	
Project Name	Cable Injection Project - (R23) - Bathurst - Weldrick - Yonge - Carville, Richmond Hill	
Project Description	This investment will inject 23,187m of direct-buried XLPE cables in the East (Richmond Hill) grid R23 - Bathurst - Weldrick - Yonge St - Carville area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Customers in the project scope area experienced 1 outage in 2019. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in fair condition. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. The total cable quantity for injection is approximately 23,187m. It is proposed to be completed in 2024. It is expected that completion of this project will avoid a total of 3 potential cable failures and 233523 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	**Not applicable**
	Units	
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tenorlas, Reynaldo (Reynaldo.Tenorlas)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	152385	
Project Name	Cable Injection Project - (R23) - Bathurst - Weldrick - Yonge - Carville, Richmond Hill	
Project Description	This investment will inject 23,187m of direct-buried XLPE cables in the East (Richmond Hill) grid R23 - Bathurst - Weldrick - Yonge St - Carville area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Customers in the project scope area experienced 1 outage in 2019. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in fair condition. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. The total cable quantity for injection is approximately 23,187m. It is proposed to be completed in 2024. It is expected that completion of this project will avoid a total of 3 potential cable failures and 233523 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 4 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the next 4 years, the only option left would be cable replacement which would cost 5 times that for cable injection.** **Without this proposed investment, 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)	**4922 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**

Project Report

Project Code	152385
Project Name	Cable Injection Project - (R23) - Bathurst - Weldrick - Yonge - Carville, Richmond Hill
Project Description	This investment will inject 23,187m of direct-buried XLPE cables in the East (Richmond Hill) grid R23 - Bathurst - Weldrick - Yonge St - Carville area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Customers in the project scope area experienced 1 outage in 2019. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in fair condition. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. The total cable quantity for injection is approximately 23,187m. It is proposed to be completed in 2024. It is expected that completion of this project will avoid a total of 3 potential cable failures and 233523 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Alternative #2	**Alternative #2 is to inject the cables as described in the project description.** **This is the preferred alternative.**
	Justification for Recommended Alternative	**The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.** **To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.** **In this project scope area, there was 1 cable/splice failure in 2019. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.** **There are two methods of cable remediation: Cable Replacement and Cable Injection.** **Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.** **Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.** **The cables in this area are 29 - 33 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.** **The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.** **Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.**
07. 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**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable injection projects since 2010.**

Project Report

Project Code	152385	
Project Name	Cable Injection Project - (R23) - Bathurst - Weldrick - Yonge - Carville, Richmond Hill	
Project Description	This investment will inject 23,187m of direct-buried XLPE cables in the East (Richmond Hill) grid R23 - Bathurst - Weldrick - Yonge St - Carville area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Customers in the project scope area experienced 1 outage in 2019. During the 2020 ACA process, these cables were determined to be beyond typical useful life of 30 years and in fair condition. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027. The total cable quantity for injection is approximately 23,187m. It is proposed to be completed in 2024. It is expected that completion of this project will avoid a total of 3 potential cable failures and 233523 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. 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 project scope area, there was 1 cable/splice failure in 2019. If not rehabilitated, this cable will continue to degrade, and failures will increase to a level that is not tolerable by customers. Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cables in this area are 29 to 34 years old (installed in 1988-1993), which exceed the Typical Useful Life of non-tree retardant XLPE of 30 years.**
	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)	**There was 1 failure in this project area in 2019.** **Since the cables at this location are nearing end of life, it is estimated that failures will escalate starting with 1 failure in 2023, up to 3 failures by 2027.** **We will use Alectra wide reliability as a proxy for this project's reliability.** **Impact of 1 failure in the project area: 277 customers affected, 77,841 CMI, and average outage duration is 104 minutes per customer per 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	**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 233523 potential**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	
	Rates Category	
	Job Cost Chart Type	
	PowerStream Plan Sub Category	
	Location Description	

Project Report

Project Code	152388
Project Name	Cable Injection Project - (V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan
Project Description	This investment will inject 22,734m (2024) of direct-buried XLPE cables in the East (Vaughan) grid V17 -Langstaff - Keele - Rutherford - Dufferin area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Since 2017, the project area has had 6 outages. More specifically customers in the project area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area Due to the age of the cable in the project scope area and reliability history of adjacent cable, we can predict that we will start to experience more frequent outages in the future starting with 1 outage in 2023, up to 3 outages in 2027. It is expected that completion of this project will avoid 3 failures per year and 44079 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

01. Changes	**Are you changing this project from what was previously approved in the budget cycle**	**No**
	What is the main driver for the change	**No Change/New Project**
	Please provide additional justification for what has changed	**Not applicable**
	Why has it changed	**Updated information for budget purposes**
	Please provide additional justification for why the project has changed	
02. Additional Information	**Branch Plant**	**815 Addiscott Service Centre**
	Has Smart Grid Component	**No**
	Smart Grid Cost Estimate	
	Smart Grid Comments	
	Units	
	Project Class	**Regular**
	Does this Project include R&D?	**No**
	Will this Project generate ongoing IT OM&A Costs?	**No**
	Project Above Material Threshhold	**No**
	Project Estimator	**Tenorlas, Reynaldo (Reynaldo.Tenorlas)**
	Previous FULL Business Case Approval	
	Business Case Approval Status	**In Progress**
	Additional Funding Approval Status	
	Reporting Department	**PLNC - Planned Capital**
	Interest Capitalization	**No**
	Last Business Case Version Number	
	Is this a Multi-Year Project	**No**
03. Project Management Office Information	**Is this a Technology Project or does it have a Technology Component?**	**No**
04. General Project Information (OEB)	**Alectra Grouping**	**Underground Asset Renewal**
	Alectra Subcategory	**Cable Remediation – Injection**
	Contributed Capital	**Contributed Capital 0%**
	Expenditure Type	**Controllable**
	Rates ID	**Rate Base Funded**
	Parent WO#	
	Expenditure Timing	
05. Evaluation Criteria (OEB)	**Main Driver - System Renewal**	**Failure Risks**

Project Report

Project Code	152388
Project Name	Cable Injection Project - (V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan
Project Description	This investment will inject 22,734m (2024) of direct-buried XLPE cables in the East (Vaughan) grid V17 -Langstaff - Keele - Rutherford - Dufferin area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Since 2017, the project area has had 6 outages. More specifically customers in the project area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area Due to the age of the cable in the project scope area and reliability history of adjacent cable, we can predict that we will start to experience more frequent outages in the future starting with 1 outage in 2023, up to 3 outages in 2027. It is expected that completion of this project will avoid 3 failures per year and 44079 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

	Urgency and Reasons for Urgency	**These investments are driven by failure risks on the distribution system. Currently, defective equipment accounts for 45% of controllable outages in Alectra Utilities' distribution system. Cable and cable accessory failures account for 50% of all equipment-related outages. This has a large impact on reliability as well as customer service and satisfaction.** **Due to the increasing occurrence of failures caused by this cable vintage, Alectra Utilities must execute cable injection within the next 4 years, not only to halt the increasing trend, but also to reverse it and reduce the number of cable failures to return customers back to historical reliability levels. If these cables were not to be injected within the next 4 years, the only option left would be cable replacement which would cost 5 times that for cable injection.** **Without this proposed investment, 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)	**266 Customers (Mixed - Commercial/Residential) / 1,458 KVA**
	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. This investment ensures that both of these requirements can be met and that the distribution system can safely distribute the required capacity.**
	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	**An efficient and safe distribution system maintains reliability. Business activities and customer satisfaction value reliability. Also, some customers review outage statistics as part of the site selection process, and excellent reliability is valued in this process.**
	Environmental Benefits	**Not Applicable.**
06. 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 responding to outages under reactive capital.** **Give that 50% of defective equipment failures are occurring due to cable and cable accessories, and that 45% of all system outages are defective equipment, this would lead to an unacceptable level of outages and customer satisfaction.** **This is not a viable alternative.**
	Alternative #1	**Alternative #1 is to inject only the cable segments that experienced cable faults (not the entire area).** **This alternative is costly, disruptive to customers and does not address the failure situation adequately.** **This is not a viable alternative.**

Project Report

Project Code	152388
Project Name	Cable Injection Project - (V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan

Project Description

This investment will inject 22,734m (2024) of direct-buried XLPE cables in the East (Vaughan) grid V17 -Langstaff - Keele - Rutherford - Dufferin area.

This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service.

Since 2017, the project area has had 6 outages. More specifically customers in the project area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area Due to the age of the cable in the project scope area and reliability history of adjacent cable, we can predict that we will start to experience more frequent outages in the future starting with 1 outage in 2023, up to 3 outages in 2027.

It is expected that completion of this project will avoid 3 failures per year and 44079 potential CMI.

This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.

Major Category	System Renewal
Scenario	Submitted

Alternative #2

Alternative #2 is to inject the cables as described in the project description.

This is the preferred alternative.

Justification for Recommended Alternative

The cables in this area are nearing end-of-life and are failing. 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers. Therefore, Status quo is not recommended.

To manage the risk of large-scale cable failures, Alectra Utilities must implement proactive cable remediation projects. This can only be managed by replacing all the cables that are of the same vintage as the cables that failed. This will avoid the risk of cascading effect of cable failure, stressing the other cables in the same circuit, leading to more failures in the same area which negatively impacts the quality of service to Alectra Utilities' customers.

In this project area, there were 6 cable/splice failures since 2017. If not rehabilitated, these cables will get older and will fail more often to the level that is not tolerable by customers.

There are two methods of cable remediation: Cable Replacement and Cable Injection.
Cable Replacement has the advantage that old cable will be replaced with new cable that may last 55 years and are up to standard (i.e. in-duct); but it has the disadvantage that the unit cost is very high (5 times higher). This comes at a higher cost but would reduce the cost of future cable replaces and expedite replacement of failures.
Cable Injection has the advantage that the unit cost is very low (5 times lower) and still can extend the life of the cables (estimated to be 20 years); but it has the disadvantage that the existing cable will remain as direct-buried after injection, and eventually must be replaced.

The cables in this area are 33 - 40 years old, which exceeds the Typical Useful Life of 30 years for non-tree retardant XLPE as defined in Alectra Utilities' ACA but are still eligible for cable injection.

The Status Quo is not recommended because 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, therefore system integrity will be compromised and reliability will be at a level unacceptable to the customers.

Alternative #1 is not recommended because this alternative is costly, disruptive to customers and does not address the failure situation adequately.

Project Report

Project Code	152388
Project Name	Cable Injection Project - (V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan
Project Description	This investment will inject 22,734m (2024) of direct-buried XLPE cables in the East (Vaughan) grid V17 -Langstaff - Keele - Rutherford - Dufferin area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Since 2017, the project area has had 6 outages. More specifically customers in the project area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area Due to the age of the cable in the project scope area and reliability history of adjacent cable, we can predict that we will start to experience more frequent outages in the future starting with 1 outage in 2023, up to 3 outages in 2027. It is expected that completion of this project will avoid 3 failures per year and 44079 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.
Major Category	System Renewal
Scenario	Submitted

07. 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 avoid 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 avoidance strategies.**
	Comparative Information on Equivalent Historical Projects (if any)	**Alectra has completed similar cable injection projects since 2010.**
	Total Capital and OM&A Costs for Renewable Energy Generation portion of Projects (0 if not applicable)	**0**
08. Category-Specific Requirements for Each Project/Activity (OEB)	**Description of the Relationship between the Asset Characteristics and Consequences of Asset Performance Deterioration or Failure:**	**Since 2017, the project area has had 6 outages. More specifically customers in the project area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area Due to the age of the cable in the project scope area and reliability history of adjacent cable, we can predict that we will start to experience more frequent outages in the future starting with 1 outage in 2023, up to 3 outages in 2027.**
	Condition of Asset vs. Typical Life Cycle and Performance Record	**Cables in this area are 33 to 40 years old (installed in 1982-1989), which exceed the Typical Useful Life of non-tree retardant XLPE of 30 years.**
	Number of Customers in Each Customer Class Potentially Affected by Asset Failure	**194**
	Quantitative Customer Impacts (frequency or duration of interruptions and associated risk level)	**There were 6 failures in this project area since 2017.** **-From 2016-2018, there was failure.** **-From 2019-2021, there were 5 failures.** **5 year average of failures is 6 failures / 5 years = 1.2 failure(s) per year** **Due to the age of the cable in the project scope area and reliability history of adjacent cable, we can predict that we will start to experience more frequent outages in the future starting with 1 outage in 2023, up to 3 outages in 2027.** **Impact of 1 failure: 96 customers affected, 14694 CMI, and average outage duration is 184 minutes per customer per failure**

Project Report

Project Code	152388	
Project Name	Cable Injection Project - (V17) - Langstaff - Keele - Rutherford - Dufferin, Vaughan	
Project Description	This investment will inject 22,734m (2024) of direct-buried XLPE cables in the East (Vaughan) grid V17 -Langstaff - Keele - Rutherford - Dufferin area. This investment is necessary to decrease the outage impacts due to deteriorating underground system assets within the area to maintain system reliability and customer service. Since 2017, the project area has had 6 outages. More specifically customers in the project area in 2016-2018 had 1 outage, where from 2019-2021 this increased to 5 outages. This clearly indicates a worsening of the cables condition and a decrease in reliability to customers within the project area Due to the age of the cable in the project scope area and reliability history of adjacent cable, we can predict that we will start to experience more frequent outages in the future starting with 1 outage in 2023, up to 3 outages in 2027. It is expected that completion of this project will avoid 3 failures per year and 44079 potential CMI. This investment aligns with Alectra Utilities' focus on decreasing the outage impacts due to deteriorating underground system assets.	
Major Category	System Renewal	
Scenario	Submitted	
	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 failures per year and 44079 potential CMI.**
	Analysis for "Like for Like" Renewal Project	**Not Applicable.**
10. Obsolete	**Budget Type**	
	PowerStream Old Sub-Category	
	PowerStream Plan Category	
	Phase Code	
	Rates Category	
	Job Cost Chart Type	
	PowerStream Plan Sub Category	
	Location Description	

SEC-3

Reference: General

Please provide any information used by the Applicant in benchmarking the costs for cable renewal projects over the period 2017 to 2024, or advise that no benchmarking has been carried out.

Response:

Alectra Utilities completes cost comparisons using internal measures and comparators. Due to the wide range of factors involved with underground renewal work, it is not practical to simplify and compare project costs on a single unit of measure or cost. Factors such as location of the underground cable (rear lot, road crossing, under sidewalks or driveways), number of feeders in corridor, congestion with other utilities in the vicinity, soil and rock conditions, space available to operate machinery, density, landscapes, number of splices and connections all contribute to the complexities and variances in costs. To reflect such scope variance, Alectra Utilities approaches each cable replacement and cable injection as project with a defined scope, schedule and budget. As explained in response to SEC-9, Alectra Utilities develops a business case for each cable renewal project and scores each project value based on the Value Framework. Each cable renewal project business case is compared based on value. Projects that have similar reliability benefits, but higher costs are scored lower. Alectra Utilities selects project that drive the highest value while managing risk and compliance.

Secondly, Alectra Utilities continuously monitors project implementation costs to ensure materials, contractors and suppliers provide favourable market rates. During negotiations with contractor and suppliers, Alectra Utilities examines proposed costs against historical as well as internal costs to ensure prudency. Alectra Utilities seeks multiple bids from contractors on major projects to ensure proposed rates and material costs are reasonable.

SEC-4

Reference: Exhibit 1, Tab 1, Schedule 4 p.2

The Applicant's next rebasing is 2026 and the Applicant forecasts that "one out of every four neighborhoods in its service territory will be served by deteriorated and unreliable cables by 2025 the current condition of the cables will cause".

Please provide the Applicant's plan, including cost details and repair options, to respond to the impact of the forecasted deteriorating condition of the cable in some of the neighbourhoods in its service territory for the year of 2025 if this ICM application is not approved by the OEB.

Response:

Alectra Utilities' next rebasing is in 2027, not 2026. As identified in Exhibit 1, Tab 1, Schedule 4, p.10, without incremental funding, Alectra Utilities will not be able to undertake the proposed underground renewal work. Under such circumstance, Alectra Utilities will address failing cables reactively. Costs for reactive repairs or emergency replacements are dependent on many variables including the location of the faulted cable segment (backyard, under sidewalks, driveways or road crossings), proximity of the cable to other utilities infrastructure such as gas or watermains, as well as the severity of the damage caused by the failed cable to other cable or equipment in the vicinity. Such cost factors are not within the control of Alectra Utilities and prohibit accurate projection of future reactive or emergency replacement costs.

Since reactive costs are higher than planned work, increasing reactive costs and emergency replacement costs will further reduce funding available for other planned cable replacement work and further increase the backlog of deteriorated cable in the system. Furthermore, without incremental funding, Alectra Utilities will not be able to inject the cables as proposed in the ICM project list as these cables will no longer be candidates for injection, and the only option that remains for Alectra Utilities is to replace the cables at higher costs. Lastly, addressing cable failures reactively will increase the number and duration of service interruptions in the identified neighbourhoods and as well as the customers in the greater vicinity serviced by the same distribution feeder.

SEC-5

Reference: Exhibit 2, Tab 1, Schedule 1 p.15

Please justify and explain how does each of the proposed ICM investments for 2023 ($8,729,165, or 3.03% of the 2023 capital budget) and the maximum eligible incremental capital for 2024 ($7,886,792 or 2.69% of the 2024 capital budget) satisfy the project-specific materiality test in light of the OEB's ACM report and OEB precedents.

Response:

The project-specific materiality test provides that minor expenditures, in comparison to the overall capital budget, should be considered ineligible for ICM treatment. As provided in Exhibit 2, Tab 1, Schedule 1, pp.15-16, Alectra Utilities' overall capital budget is $287.8MM in 2023 and $293.5MM in 2024. The proposed investment in the Enersource RZ of $8.7MM in 2023 and $8.7MM in 2024 (capped at $7.9MM in 2024 based on the preliminary threshold calculation) is significant relative to the overall capital budget. The OEB has not defined the project-specific materiality threshold. In the OEB's decision on Alectra Utilities' 2018 ICM application (EB-2017-0024), at p.25, the OEB stated that "amending the ICM policy to include a mathematical materiality calculation for this second test should only be done through a policy review. The OEB has applied its judgement consistent with the ICM policy."

Further, in the OEB's Decision on Alectra Utilities' 2021 rate application (EB-2020-0002), at p. 63, the OEB stated that:

> *"Many parties submitted that the OEB should not approve one or more of these ICM funding requests with particular emphasis on project-specific materiality. The OEB has applied its judgement in considering the projects for 2021 and agrees with Alectra Utilities' reply submission that there is no "bright line" in the OEB's project-specific materiality criterion. The OEB confirms that project-specific funding amounts were considered relative to the Alectra Utilities' 2021 total capital budget of $250.3 million across all RZs. In addition to the size of the project funding requested, where the amount itself is not determinative in borderline cases, the nature and justification for the project may also be considered."*

SEC-6

Reference: Exhibit 3, Tab 1, Schedule 1 p.3

The Applicant identified deteriorating conditions of underground cables as an emergent need to be addressed. The Applicant also prioritized spending in IT related programs while reducing capital spending in the system access and system renewal categories.

Please explain the decision to prioritize capital spending in other areas instead of replacing or maintaining underground cables.

Response:

Please see response to 1-Staff-17 c).

SEC-7

Reference: Exhibit 3, Tab 1, Schedule 1 p.11

Please confirm that the Applicant is seeking to qualify Guidehouse as expert witnesses. If confirmed, please specify the expertise claimed and provide all supporting material including CVs and expert acknowledgements in the OEB's standard form. If not confirmed, please provide the basis on which the Applicant offers the opinions of non-experts as evidence for the OEB. In either case, in responding to all interrogatories please specify those responses authored by Guidehouse.

Response:

Alectra Utilities is seeking to qualify Eugene Shlatz, Director with Guidehouse as an expert witness in the areas of Distribution System: Asset Management and Capital Budgeting Prioritization and Optimization. Attachment 1 contains the CV for the witness and Attachment 2 contains Form A from the Ontario Energy Board.

Guidehouse responded to interrogatory 1-Staff-6.

SEC-7

Attachment 1
CV

Guidehouse
Outwit Complexity

Eugene L. Shlatz

Director

eshlatz@guidehouse.com
Tampa, FL
Direct: 802.233.1890

Professional Summary

Gene has over 35 years of management consulting and supervisory experience in energy delivery, electric power generation and distributed energy systems. He has directed numerous engagements on electric system reliability, smart and renewable technologies, microgrids, asset management, electric pricing, due diligence and system adequacy. His clients have included US, Canadian, European and South American electric utilities, electricity consumers, law firms and government agencies. Gene is an expert on electric power delivery systems; and has testified before FERC, state regulatory commissions and U.S. Congress on transmission open access, DG integration, retail rates, regulatory compliance, and capital planning. He has published numerous articles and industry presentations on smart grid, distributed resources, electric reliability, asset management, energy efficiency, and electric pricing.

Professional Experience

Directs project teams and manages consulting engagements for electric utility, government and energy supply clients. Responsible for energy delivery and power production assignments in the following areas:

- **Emerging Technologies** – renewable technology and smart grid integration, energy efficiency and technical/economic assessment of distributed resources
- **Asset Management** – implementation strategy, project prioritization, performance measurement, utilization and cost optimization, electric delivery system planning
- **Operations & Planning** – transmission and distribution performance evaluation; target setting, remediation analysis, service quality standards and business process improvement
- **Regulatory** – capital planning, transmission and distribution program support, renewables integration and pricing, expert witness support for state and federal agencies and commissions

Representative Client List and Engagements

Distributed Generation & Advanced Technologies

- **Aspen/California Energy Commission**. Conducted several independent reviews of advanced energy systems and applications for applicants seeking EPIC project funding. Technologies evaluated include integrated storage and renewables, advanced simulation software and Microgrids.
- **NYSERDA**. Evaluated impacts of small-scale energy storage on radial and network distribution systems to assess the applicability of standby rates adjustments for New York electric utilities.
- **California Utility (Confidential)**. In response to recent fires in California, evaluated wildfire prevention mitigation strategies to reduce the hazard potential for electric transmission and distribution lines and equipment.

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Director

- **Dubai Electric and Water Authority.** Project lead for distribution automation, transmission automation, asset management, and renewables integration smart technology assessment. Conducted technical and economic studies of smart technology options and developed roadmap for implementation of recommended strategies.
- **California Energy Commission/Southern California Edison**. Project manager of DER integration studies for a major utility planning region. Predicted hosting capacity limits and options to increase DER capacity and value via advanced communications and control technologies. Assessed the capability of energy storage to increase capacity limits.
- **U.S. Department of Energy/Dominion Virginia Power.** Project manager of Solar Integration Study to identify renewable capacity impacts and integration requirements in the state of Virginia. Determined distribution hosting capacity limits and impacts of increasing amounts of solar on DVP's generation, transmission and distribution system.
- **Los Angeles Department of Water & Power.** Technical lead of a DER integration study to determine integration requirements and hosting capacity limits, and approaches to target DER and storage based on locational needs and benefits. Assessed communication and control strategies, organization structure, tariffs and rates, and strategies to achieve renewable portfolio targets.
- **Orange & Rockland Utilities.** Project manager of a DG Interconnection benchmarking analysis. Conducting studies to predict hosting capacity limits on O&R's T&D system and mitigation options in support of NY's Renewable Energy Vision initiative.
- **Pacific Gas & Electric Company.** Project manager of a Transmission and Distribution PV Impact Study. It included engineering analyses designed to facilitate the integration of DGPV into the grid. Developed PV values based on analysis across multiple scenarios and attributable to DGPV.
- **Major Southeastern U.S. Utility (Confidential).** Project manager of a Solar Integration Study to assess the technical and economic impact of increasing amounts of solar on the utilities' generation, transmission and distribution system.
- **California Energy Commission/Southern California Edison.** Project manager of a study evaluating DG impacts and integration requirements for up to 12,000 MW of DG in California by 2020. Developed a technical evaluation and costing framework applicable to all CA utilities.
- **U.S. Navy.** Evaluated on-site microgrid options for a major military shipyard, including technical assessment of renewable generation, control strategies, electric system performance and system upgrades required to operate in stand-alone and parallel modes of operation.
- **U.S. Department of Energy (DOE).** Provided technical and program management support for DOE's Smart Grid Investment Grant (SGIG) program. Responsible for impact evaluation of smart grid technologies, including program benefits and implementation strategies.
- **PowerStream (Ontario).** Providing project management and evaluation services for an on-site microgrid comprised of a mix of wind, solar, storage and gas-fired technologies. Developing control and dispatch strategies and methods for assessing MG performance and benefits.

Eugene L. Shlatz

Director

- **NV Energy.** Project manager of DG and large PV integration studies for southern and northern Nevada. Identified technical/capacity limits of renewable energy sources on NV Energy's T&D system. Responsible for technical and economic evaluation of power system impacts and integration costs, including intermittency. Testified before Nevada Commission to support findings.
- **Toronto Hydro.** Project manager of comprehensive evaluation of distributed energy resources versus traditional T&D alternatives for a major urban center. Included a technical assessment of DG systems impacts, technology integration and forecast of cost-effective alternatives.
- **Southern California Edison Company.** Technical support a 3-year integrated grid pilot designed to demonstrate modern grid infrastructure functionality and advance customers' ability to interconnect renewable energy sources, proactively manage customer demand, and improve the safety and reliability of the grid in a cost-effective manner.

Reliability, Benchmarking and Electric System Planning

- **Toronto Hydro (THESL).** Prepared an independent technical assessment of a proposed relocation of a major segment urban transmission and distribution system as evidence before a tribunal in the City of Toronto. Analyzed relocation options and impact on power system reliability and performance.
- **BC Hydro.** Lead investigator to benchmark and assess vegetation management practices and applications across the province of British Columbia. Provided recommendations on enhancing processes and VM methods to improve efficiency and cost.
- **Government of Puerto Rico (Public Private Partnership).** Program oversight lead for long-term disaster recovery efforts for the Puerto Rico Electric Power Authority (PREPA) generation, transmission and distribution systems. Responsible for developing Grid Modernization plans to restore the electric grid to current standards, consistent with FEMA and BBA funding requirements.
- **New York Power Authority/ Puerto Rico Electric Power Authority**. Lead investigator and subject matter expert of a study to assess damage caused by major hurricanes in 2017 and to provide recommendations to bring the power generation and delivery system to current design standards.
- **Hawaiian Electric Company**. Project manager of a technical analysis to assess the impact of capital and O&M improvement programs on electric system reliability performance during storms and major events. Demonstrated a correlation of program improvements and system resiliency during storms.
- **Exelon/Commonwealth Edison.** Lead consultant of an engineering and operational assessment of Exelon's system design, construction and maintenance practices. Our study was filed before the ICC in response to claims of system inadequacy for major storms. Provided expert witness testimony that confirmed ComEd's T&D practices were consistent with or exceeded industry standards.
- **Jersey Central Power & Light.** Principle investigator of a commission-mandated Operations Review of JCP&L's distribution system. The review included an assessment of reliability, storm response, preventative maintenance and budgeting processes. Navigant's report and recommendations were unanimously approved and accepted by the New Jersey Board of Public Utilities.

Eugene L. Shlatz

Director

- **Exelon/Commonwealth Edison.** Lead consultant of an engineering and operational assessment of Exelon's system design, construction and maintenance practices. Our study was filed before the ICC in response to claims of system inadequacy for major storms. Provided expert witness testimony that confirmed ComEd's T&D practices were consistent with or exceeded industry standards.
- **Saskatoon Light & Power.** Project manager of a 20-year capital development plan designed to meet reliability and performance objectives at lowest cost. Our assessment included a review and analysis of T&D engineering, maintenance and operations; and recommendations for improvement.
- **Sulphur Springs Valley Electric Cooperative (SSVEC).** Project manager of an independent Feasibility Study of delivery alternatives, including T&D, distributed generation, energy efficiency, energy storage and renewables. Successfully testified as an expert witness before AZ commission.
- **Austin Energy.** Performed a benchmarking and gap analysis of AE's engineering and operations. Prepared recommendations to enhance reliability and operations efficiency.
- **Saskatoon Light & Power.** Project manager of a 20-year capital development plan designed to meet reliability and performance objectives at lowest cost. Our assessment included a review and analysis of T&D engineering, maintenance and operations; including recommendations for improvement.
- **Toronto Hydro Electric System, Limited (THESL).** Performed a long-range planning study for THESL's radial and network downtown distribution system. Evaluated capital expansion versus CDM needed to serve downtown Toronto for 20 years.
- **Sulphur Springs Valley Electric Cooperative (SSVEC)**. Project manager of an independent Feasibility Study of delivery alternatives, including T&D, distributed generation, energy efficiency, energy storage and renewables. Successfully testified as an expert witness before AZ commission.
- **Austin Energy.** Performed a benchmarking and gap analysis of engineering and operations performance for AE's energy delivery organization.
- **Ameren Services.** Conducted a review and predictive assessment of distribution reliability. A methodology was developed to apply fact-based methods to allocate reliability expenditures.
- **American Electric Power.** Conducted a review and predictive assessment of distribution reliability. Applied fact-based methods to prioritize investment decisions and to quantify risk.
- **Potomac Electric Power Company (PHI).** Conducted an investigation and benchmarking of PEPCO's T&D system, including transmission and distribution infrastructure. Prepared recommendations to enhance performance and reduce outage risk.
- **National Grid.** Conducted a system review and predictive assessment of distribution reliability. A strategic methodology was developed to predict system outage performance based on system attributes, equipment performance and historical reliability.
- **Potomac Electric Power Company (PHI).** Project manager of a benchmarking analysis of PEPCO's T&D system, including transmission and distribution infrastructure. Prepared recommendations to enhance performance and reduce outage risk.

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Director

- **Dominion – Virginia Power**. Project manager and lead investigator of a comprehensive technical review and risk assessment of secondary networks. Reviewed and analyzed engineering standards, planning criteria, operations and maintenance, and construction methods.

Asset Management

- **Horizon Utilities Corporation.** Developed strategies and provided ongoing support for HU's asset management initiative. Conducted a gap analysis and implementation of asset management strategies and evaluation methods. Included an evaluation of infrastructure upgrades, operational and reliability improvement and implementation strategies using AM-based approaches.

- **First Energy**. Lead consultant of a project team that implemented asset management processes and capital prioritization models for 6 operating companies in three jurisdictions. Responsible for model development and applications, technical review and overall quality assurance.

- **Seattle City Light**. Conducted a benchmarking and gap analysis of the power supply and energy delivery business units. It included a business case analysis to support implementation of asset management methods and new AM organization.

- **Pepco/Conectiv (PHI)**. Responsible for an asset management and prioritization assessment of capital improvement and O&M programs for three states and the District of Columbia. It included developing asset prioritization methods for transmission, distribution and IT programs.

- **Entergy**. Responsible for an asset management and prioritization assessment of Entergy's capital improvement programs for six jurisdictional utilities in 5 states. It included developing asset-specific prioritization methods for transmission and distribution programs.

- **PacifiCorp**. Responsible for an asset management and prioritization assessment of PacifiCorp's capital improvement programs for six jurisdictional utilities in 6 states. It included developing asset-specific prioritization methods for transmission and distribution and IT programs.

Regulatory and Legal

- **Hydro Ottawa (Ontario).** Conducted an independent review of Hydro Ottawa's asset management and Distribution System Plan to support a rate request filing before the Ontario Energy Board (OEB). Provided recommendations to ensure compliance with OEB filing requirements for capital investments.

- **Expert Witness - Civil Litigation (Various Jurisdictions).** Expert witness in personal injury cases involving electric utility assets. Conducted technical investigations, reviewed and submitted discovery, and declarations to support evidentiary hearings and settlement agreements.

- **NorthWestern Energy (Montana).** Expert witness supporting ancillary services schedules and pricing for a filling before the U.S. Federal Energy Regulatory Commission.

Eugene L. Shlatz

Director

- **NorthWestern Energy (Montana).** Expert witness for NEM Solar Integration and NERC Reliability Performance studies to comply with Montana Public Service Commission and U.S. Federal Energy Regulatory Commission requirements. Conducted technical and economic studies of solar impacts on NorthWestern's service territory and submitted expert testimony to support findings before the MPSC.
- **International Business Machines (IBM).** Conducted a reliability assessment of issues related to the City of Boulder, Colorado's application to the Colorado Public Utility Commission (PUC) to form a municipal electric utility. Conducted independent technical review of separation of electric assets and appeared as an expert witness before the CPSC on behalf of IBM.
- **Green Mountain Power (GMP).** Prepared independent testimony and appeared as an expert witness in a rate filing before the Vermont Public Service Commission (VPSC). Testimony supported capital investments for generation, transmission, distribution, IT/OT and physical assets.
- **NV Energy (Sierra Pacific Power Company).** Conducted a T&D avoided cost study to support an SPPC's rate filing and to determine Excess Energy Charges for net metering customers. Submitted expert testimony before the Nevada Commission on T&D marginal costs and application to NEM solar.
- **Toronto Hydro Electric System, Limited (THESL).** Prepared business case studies for major capital programs in rate filings before the Ontario Energy Board (OEB). Testified as an independent expert witness before the OEB on Distribution System Plans and renewable energy programs in Custom Incentive Rate (CIR) and Incremental Capital Module (ICM) filings.
- **Exelon (Philadelphia Electric Company).** Developed T&D avoided cost study to support PECO energy efficiency programs. Participated in a statewide stakeholder process to approve T&D avoided costs, which included the statewide EE program evaluator, the electric utility and related parties.
- **Puerto Rico Electric Power Authority (PREPA).** Conducted a T&D avoided cost analysis and prepared expert testimony to support PREPA's rate filing and avoided costs applied to net metering.
- **Public Utility Authority (Israel).** Conducted a technical and economic review of the Israeli Electric Corporation and Palestinian Electric Authority electric generation and power delivery system on behalf of the PUA. Assessed the adequacy of electric infrastructure, power costs and investment programs.
- **Vermont Department of Public Service (VDPS).** Conducted a geo-targeted analysis of energy efficiency programs designed to defer T&D investments. Worked with electric utility stakeholders to identify cost-effective deferral opportunities and to assess processes designed to target EE programs.
- **Canadian Utility (Confidential) –** Confidential study to assess the value and strategic benefits of the acquisition of electric utility energy delivery assets. Included a technical and economic assessment of key regulatory and acquisition risk factors to support a recommendation.
- **Progress Energy.** Project manager of a best practices and compliance review of fixed asset charging practices. Reviewed methods, systems and practices used to record fixed assets for Florida and the Carolinas to support proposed changes filed with state commissions and the SEC.

Eugene L. Shlatz

Director

- **Citizens Utilities/Vermont Electric Cooperative.** Supported numerous Certificate of Public Good (CPG) applications before the Vermont Public Service Board (VPSB). Expert witness for technical, environmental, and costing studies.

- **Vermont Department of Public Service (VDPS).** Conducted research and prepared sections of the Twenty-Year Electric Plan, including the impact of the independent system operator (ISO) and regional transmission organization (RTO) initiatives on Vermont's transmission providers.

- **Potomac Electric Power Company (PHI).** Project manager of a benchmarking study of storm hardening measures. Assessed the impact of hardening options on reliability and performance. Also assessed service quality (SQI) measures and performance-based rate (PBR) mechanisms.

- **Citizens Utilities (Vermont Electric Division).** Project manager for a T&D Audit mandated by the Vermont Public Service Board. Reviewed T&D plant accounting systems and processes, and provided recommendations for improvement.

- **Massachusetts Department of Telecommunications and Energy (MDTE).** Project manager of a stray voltage assessment of jurisdictional utilities. Identified causes of stray voltage and provided recommendations to mitigate future events, including action and improvement plans.

Work History

- Navigant Consulting, Director
- Stone & Webster Management Consultants, Executive Consultant
- Green Mountain Power Corp, Assistant Vice President, Energy Planning
- Ernst & Whinney, Supervisor
- Gilbert/Commonwealth, Senior Consulting Engineer
- Westinghouse Electric Corporation, Systems Analysis Engineer
- Boston Edison Company, Student Engineer, Cooperative Education Prog.

Certifications, Memberships, and Awards

- Professional Engineer - State of Vermont
- Institute of Electrical and Electronic Engineers, Section Chairman (Past)

Education

- M.S. Electric Power Engineering, Rensselaer Polytechnic Institute
- B.S. Electric Power Engineering, Rensselaer Polytechnic Institute

Articles, Publications and Course Instruction

- Grid Reliability and Resiliency Initiatives for the Island of Puerto Rico," Midwest Energy Solutions Conference, Chicago, February 2019.

Eugene L. Shlatz

Director

- “Microgrid Development – Making it Work: ,” Instructor: PowerGen Competitive Power College, Orlando, December 2016.
- “DG Proliferation Trends, Challenges and Solutions Addressing Interconnection Planning, Operations, Benefits & Cost Allocation,” Instructor: DistribuTECH University, San Diego, Feb. 2015.
- “Smart Grid and Distributed Energy Storage,” Total Energy USA, Houston Texas, November 2012.
- “Distributed Generation: Grid Impacts and Interconnection Strategies,” Rocky Mountain Electric League, 2012 Spring Management, Engineering and Operations Conference, Omaha Nebraska.
- “Energy Storage Opportunities for Integration of Large-Scale Renewable Generation,” Electricity Storage Association (ESA) Annual Conference, Washington DC, May 2012.
- “Grid Integration of Renewable, Intermittent Resources,” 2011 PowerGen International Conference, December 2011, Las Vegas, NV, with Vladimir Chadliev.
- “Reducing T&D Investments Through Energy Efficiency” IEPEC, August 2011, with K. Parlin & W. Poor.
- “Value of Distributed Generation and Smart Grid Applications,” DistribuTECH, San Diego, Feb. 2011.
- “Prioritization Methods for Smart Grid Investments,” EEI Perspectives, April-May, 2010.
- “Evaluation of Targeted Demand-Side Management at ConEd (CECONY),” ACEEE Energy Efficiency Conference, September, 2009, with Craig McDonald.
- “DER Operational & Grid Benefits” Electric Light & Power, February, 2009.
- “Benefits of Smart Grid Integration with Distributed Energy Storage Systems,” Infocast Power Storage Conference, July, 2008.
- “The Rise of Distributed Energy Resources,” Public Utilities Fortnightly, Feb, 2007, with S. Tobias.
- “Risk Planning & Project Prioritization: Bringing Energy Delivery to the Next Level in Asset Management,” InfoCast T&D Asset Management Conference, St. Louis, MI, May 2004.
- “Valuation Methods: Estimating the Value of Avoiding the Risks Associated with T&D Reliability Failures,” EEI Spring 2004 T&D Conference, Charlotte, NC, April 2004.
- “Reliability Tradeoffs,” EEI Perspectives, January-February, 2004, with Daniel O’Neill.
- “What’s the Outlook for Distributed Generation Interconnection Standards?” 2003 PowerGen International Conference, Las Vegas, Nevada, December 2003.
- “Federal Interconnection Standards: Putting DG in a Box,” Public Utilities Fortnightly, April 2003, with Stan Blazewicz.
- “An Innovative Approach to Fact-Based Distribution Reliability Cost Optimization,” Distribution 2000, Brisbane, Australia, November 1999, with Cheryl Warren.
- “System Reliability: Competitive Issues,” Rethinking Electric Reliability Conf., Chicago Il, Sept 1997.
- “Reliability: Competition & Keeping the Lights On,” EUCI, Denver, Colorado, October 1998.
- “System Reliability in a Restructured Environment,” Electric System Reliability in a Competitive Environment Workshop, Denver, Colorado, October 1997.
- “Privatization Efforts in South America” EUCI Workshop, Denver, Colorado, January 1997.
- “Open Access Pricing Issues,” Transmission Pricing Conference, Vail, Colorado, Sept. 1996.

Guidehouse
Outwit *Complexity*

Eugene L. Shlatz

Director

Testimony and Appearances as an Expert Witness

Case Description	Company	Year	Docket	Jurisdiction
Rate Cases, Resource Planning, Open Access and Regulatory Investigations				
Wholesale Rate Filing (OATT)	Duke Energy	2020	ER20-919-000	FERC
Wholesale Rate Filing (OATT)	NorthWestern	2019	ER-1756-000	FERC
Retail Rate Filing (Net Metering)	NorthWestern	2018	D2018.2.12	Montana
Request for Increase in Retail Rates	GMP	2017	17-3112	Vermont
Transfer of Electric Assets (Municipalization)	IBM	2017	15A-0589E	Colorado
Marginal Cost Study (NEM & Rate Filing)	NV Energy	2016	16-06006	Nevada
Custom Incentive Rate Filing	Toronto Hydro	2016	EB -2014-0116	Ontario
Incremental Capital Module (Rate Filing)	Toronto Hydro	2014	EB-2012-0064	Ontario
Summer/Winter 2011 Storm Review	Exelon/ComEd	2013	11-0588	Illinois
Distributed Generation Integration	NV Energy	2012	10-04008	Nevada
Distributed Utility Planning	CUC	2011	6290	Vermont
Power Purchase Contracts – IURC Complaint	Jay REMC	2003	9704-CP-069	Indiana
Section 205 Filing – Wholesale Rates	NISource	1998	ER96-35-000	FERC
Open Access Transmission Tariff Filing	NISource	1997	ER96-399-000	FERC
Request for Increase in Wholesale Rates	NISource	1996	ER92-330-000	FERC
Request for Increase in Retail Rates	GMP	1996	5532	Vermont
Least-Cost Planning Integrated Resource Plan	GMP	1991	5270	Vermont
Request for Increase in Retail Rates	GMP	1991	5428	Vermont
Request for Increase in Retail Rates	GMP	1990	5370	Vermont
Request for Increase in Retail Rates	GMP	1989	5282	Vermont
Request for Increase in Retail Rates	GMP	1988	5125	Vermont
Certificates of Public Good				
Transmission Line Construction Authorization	SSVEC	2010	E-01575A	Arizona
Northern Loop Transmission Upgrades	Velco/CUC	2004	6792	Vermont
Substation Reconstruction – Richford	CUC	2003	6682	Vermont
Island Pond to Bloomfield Line	CUC	2001	6044	Vermont
HK Webster Substation	CUC	1999	6045	Vermont
Burton Hill Substation	CUC	1999	6046	Vermont
Border to Richford 120/46kV Line	CUC	1998	5331A	Vermont
New Transmission Lines and Substation	IBM	1991	5549	Vermont
New Substation – Northern Vermont	GMP	1990	5459	Vermont
Gas Turbine Interconnection Facilities	IBM	1989	5347	Vermont
Dover Substation Expansion	GMP	1987	5226	Vermont
Industry Restructuring & Asset Transactions				
Purchase of Electric Assets	VEC	2004	6853	Vermont
Certificate of Consent, Sale of Distribution Assets	CUC	2004	6850	Vermont
Certificate of Consent, Sale of Transmission Assets	Velco/CUC	2004	6825	Vermont
Prudency Review and Audit Support	CUC	2003	5841/5859	Vermont
Competitive Opportunities Filing	ConEdison	1997	96-E-0897	New York

SEC-7

Attachment 2
Acknowledgment of Expert's Duty

FORM A

Proceeding:............................

ACKNOWLEDGMENT OF EXPERT'S DUTY

1. My name is ......Eugene L. Shlatz...........(*name*). I live at ..Willsboro.. (*city*), in the .... (~~*province*~~/*state*) of ..New....York..... .

2. I have been engaged by or on behalf of ..Alectra..Utilities (*name of party/parties)* to provide evidence in relation to the above-noted proceeding before the Ontario Energy Board.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the Board may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date ....July...21,..2022

Eugene L Shlatz
Signature

SEC-8

Reference: Exhibit 3, Tab 1, Schedule 2 p.4

Please provide a set of tables showing the total length of direct-buried XLPE cable, and the total number of customers in each of the Applicant's rate zones, and the customer hours of interruption in each of those rate zones due to failure of those cables, for each of 2017 to 2021.

Response:

Table 1 provides the kms of direct buried cable from 2017-2021. Table 2 provides the customer count per rate zone. Table 3 provides the customer hours of interruption due to XLPE cable.

Table 1 – Kilometers of Direct Buried XLPE Cable Per Rate Zone

Rate Zone	2017	2018	2019	2020	2021
Brampton RZ	1,008	1,001	997	989	987
Enersource RZ	2,514	2,482	2,450	2,419	2,385
Guelph RZ	323	320	313	310	303
Horizon RZ	1,279	1,265	1,247	1,244	1,238
PowerStream RZ	3,297	3,263	3,225	3,190	3,167

Table 2 – Year End Customer Count Per Rate Zone

Rate Zone	2017	2018	2019	2020	2021
Brampton RZ	163,194	165,479	167,287	169,172	170,621
Enersource RZ	206,667	207,294	207,807	208,299	209,478
Guelph RZ	55,732	56,189	56,795	57,015	57,579
Horizon RZ	248,695	250,878	252,905	254,416	256,118
PowerStream RZ	372,794	377,644	380,702	383,942	386,748

Table 3 – Customer Hours of Interruption by Defective Equipment Sub Cause Code XLPE Cable & Accessories Per Rate Zone

Rate Zone	2017	2018	2019	2020	2021
Brampton RZ	14,954	35,522	31,630	22,221	25,904
Enersource RZ	61,390	81,539	67,443	53,400	81,356
Guelph RZ	4,089	770	2,230	799	1,367
Horizon RZ	29,967	37,699	37,149	52,371	76,656
PowerStream RZ	79,954	72,022	54,200.	94,915	88,115

SEC-9

Reference: Exhibit 3, Tab 1, Schedule 4 p.10

Please explain the rationale for prioritizing the "base" cable renewal projects over the ICM cable renewal projects in each rate zone.

Response:

As described in Alectra Utilities' 2020-2024 DSP[1], Alectra Utilities develops a business case for each cable renewal project and scores each project value based on the Value Framework. The Value Framework analyzes and scores each potential investment's benefits, costs and risk mitigation measures. Project benefits include financial (Capital, OM&A), reliability (customer outages), customer satisfaction, environmental, regulatory and innovation. Project risk mitigation measures include financial risk, reliability (capacity risk), compliance risk, reputation risk as well as environmental risk. Alectra Utilities compares all investments when developing a capital work plan portfolio based on the value the project provides to meet customer and organization needs, risk tolerances and timing requirements. The base cable renewal projects were identified through the optimization process as projects that reflected the most urgent need of renewal and yielded the highest expected value.

[1] EB-2019-0018, Exhibit 4, Tab 1, Schedule 1, pages 332-335

SEC-10

Reference: Exhibit 3, Tab 1, Schedule 4 p.13

Please provide a table in the form of Table 21 for each of the Applicant's rate zones.

Response:

Provided in Table 1-6 below is the Cable Renewal, Cable Injection and Emerging Underground spend from 2018 to Q1 Forecast 2022 for each of Alectra Utilities' rate zones in the form of Table 21. For the Brampton Rate Zone, the 2018 cable replacement value includes both cable replacement and cable injection. For the Enersource Rate Zone, under Emerging Underground Projects for the 2022 Forecast, the amount is $0 because Alectra Utilities reallocated this budget to fund a complete cable replacement project instead of several smaller projects.

Table 1 – UG Cable Renewal Investments PRZ

PRZ	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Q1 2022 Fcst	Total
Cable Replacement	$ 9.9	$ 6.7	$ 11.9	$ 6.3	$ 7.1	$ 41.9
Cable Injection	$ 3.6	$ 3.8	$ 7.9	$ 7.4	$ 11.2	$ 33.9
Emerging Underground Projects	$ -	$ 1.9	$ 1.9	$ 3.0	$ 2.3	$ 9.1
Total	**$ 13.5**	**$ 12.4**	**$ 21.7**	**$ 16.7**	**$ 20.6**	**$ 84.9**

Table 2 – UG Cable Renewal Investments HRZ

HRZ	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Q1 2022 Fcst	Total
Cable Replacement	$ 6.6	$ 7.5	$ 5.8	$ 3.8	$ 5.9	$ 29.6
Cable Injection	$ -	$ 0.2	$ 0.1	$ 0.7	$ 1.1	$ 2.0
Emerging Underground Projects	$ 2.3	$ 1.6	$ 3.6	$ 3.1	$ 3.5	$ 14.0
Total	**$ 8.9**	**$ 9.3**	**$ 9.6**	**$ 7.5**	**$ 10.4**	**$ 45.6**

Table 3 – UG Cable Renewal Investments ERZ

ERZ	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Q1 2022 Fcst	Total
Cable Replacement	$ 16.1	$ 13.8	$ 15.2	$ 9.7	$ 7.4	$ 62.1
Cable Injection	$ -	$ 0.0	$ 0.0	$ 0.0	$ 1.5	$ 1.6
Emerging Underground Projects	$ -	$ 0.7	$ 1.0	$ 2.8	$ 0.0	$ 4.5
Total	**$ 16.1**	**$ 14.5**	**$ 16.2**	**$ 12.6**	**$ 8.9**	**$ 68.2**

Table 4 – UG Cable Renewal Investments BRZ

BRZ	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Q1 2022 Fcst	Total
Cable Replacement	$ 4.0	$ 1.7	$ 0.9	$ 4.4	$ 0.9	$ 12.0
Cable Injection	$ -	$ 1.0	$ 3.5	$ 5.6	$ 5.0	$ 15.1
Emerging Underground Projects	$ -	$ 1.6	$ 1.5	$ 1.0	$ 0.7	$ 4.8
Total	**$ 4.0**	**$ 4.3**	**$ 5.9**	**$ 11.0**	**$ 6.6**	**$ 31.8**

Table 5 – UG Cable Renewal Investments GRZ

GRZ	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Q1 2022 Fcst	Total
Cable Replacement	$ 0.6	$ 1.4	$ 1.6	$ 1.0	$ -	$ 4.7
Cable Injection	$ -	$ -	$ -	$ -	$ -	$ -
Emerging Underground Projects	$ -	$ 0.1	$ -	$ 0.2	$ 0.5	$ 0.8
Total	**$ 0.6**	**$ 1.5**	**$ 1.6**	**$ 1.3**	**$ 0.5**	**$ 5.4**

SEC-11

Reference: Exhibit 4, Tab 1, Schedule 1, Attachment 12, p.1

Please provide a copy of the updated DSP referred to in footnote 1, in the form and including all supporting materials as provided to Guidehouse for their analysis.

Response:

Alectra Utilities does not have an updated DSP. Footnote 1 on Page 1 of the Guidehouse Assurance Review references Alectra Utilities' 2020-2024 DSP as submitted in EB-2019-0018 on May 28, 2019, as well as the Adjusted Capital Plan as explained in detail on Page 2 of Exhibit 3, Tab 1, Schedule 1.

Alectra Utilities provides the supporting materials provided to Guidehouse required to complete the assurance review of the Adjusted Capital Plan as attachments:

- SEC-11_Attachment_1_2020ACA
- SEC-11_Attachment_2_2021 Asset Utilization
- SEC-11_Attachment_3_T1 Consolidated Schedule
- SEC-11_Attachement_4_Narrative Summaries
- SEC-11_Attachment_5_Variance to DSP Schedule

Alectra Utilities also provides references to the following supporting materials also reviewed by Guidehouse as part of the assurance review:

- Alectra Utilities' 2020-2024 DSP filed in Alectra Utilities' 2020 EDR Application (EB-2019-0018, Exhibit 4, Tab 1, Schedule 1)
    - Alectra Utilities' 2018 Asset Condition Assessment included as Appendix D in Alectra Utilities' 2020-2024 DSP
    - Appendix 2-AA, Capital Project by Group Table included in Section 5.4.2 Capital Expenditure Summary of Alectra Utilities' 2020-2024 DSP (Table 5.4.2-7, p.370)
- Alectra Utilities' Customer Engagement Report filed in this application as Attachment 11 (EB-2022-0013, Attachment 11).

SEC-11

Attachment 1
2020 ACA

2020

alectra

Discover the possibilities

Asset Condition Assessment - 2020

ASSET MANAGEMENT

2020 ACA REPORT

JUNE 2021

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Executive Summary

In 2018, Alectra Utilities harmonized its Asset Condition Assessment (ACA) practices. Alectra Utilities compiles an annual report based on the latest inputs to the ACA. This report presents the 2020 ACA using input data as of December 2020.

Alectra's service territories extend 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 territories span over 1,800 square kilometers, providing electricity to approximately one million customers. Alectra owns, operates, and maintains distribution assets in these territories. Asset condition assessments are used to assist in developing asset sustainment strategies and guiding investments.

Asset condition assessment involves monitoring and inspecting assets and analyzing the collected data to determine their condition. Assessment is performed using Health Index (HI) models. The HI model is an analytical one that quantifies the condition of an asset in a consistent manner. Models reflect asset degradation, industry guidelines, and Alectra's experience. HI model formulas, parameters, inputs, and results are stored in a Relational Database, enabling a unified source for performing HI computations and providing the agility for future enhancements.

Health Index was calculated for the distribution asset classes listed below. A summary of the results is presented in Figure 1.

- Pad-mounted transformers
- Pole-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

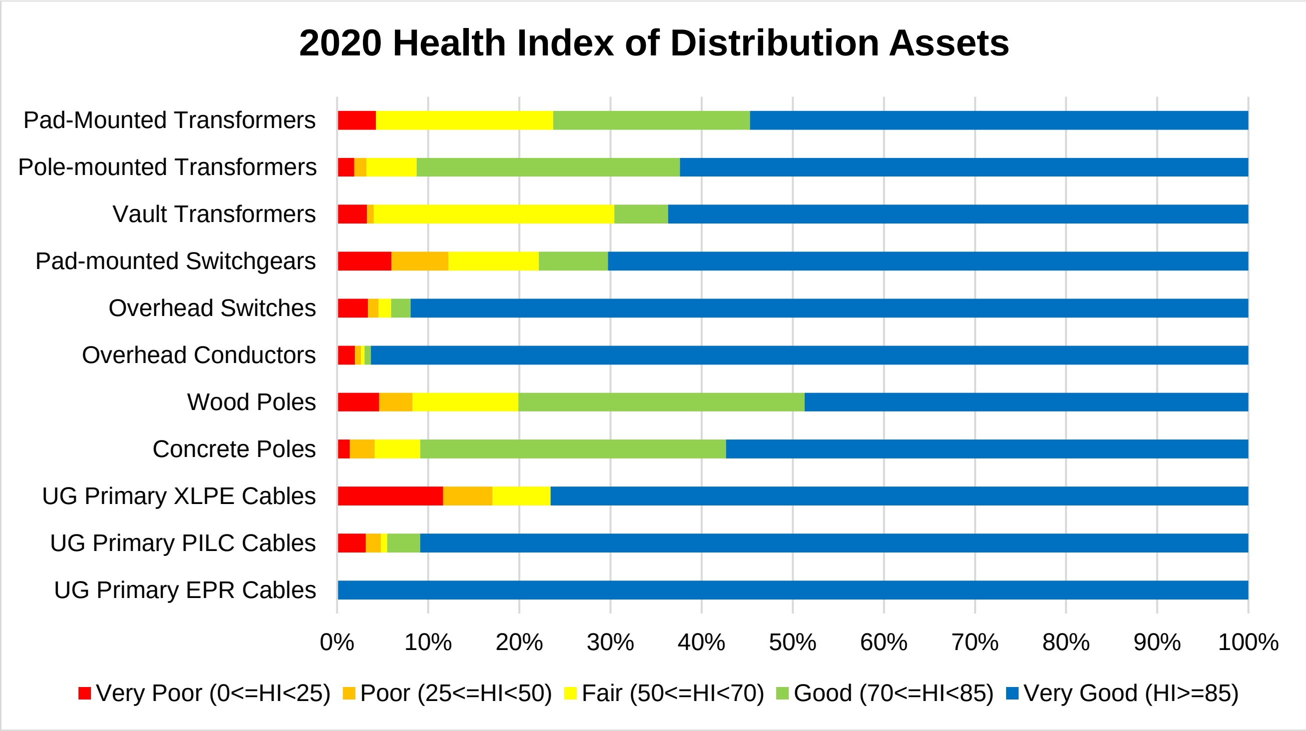

Figure 1 Distribution Asset Health Index Results Summary for 2020

Distribution asset HI results and sustainment pacing recommendations are provided to subject matter experts (SME) for each asset class. SMEs determine system sustainment needs and develop business cases based on a recommended number of assets that require attention. Business cases are submitted for optimization using Alectra's Capital Investment Portfolio application (Copperleaf C55).

HI was calculated for the station asset classes listed below. A summary of the results is presented in Figure 2.

- Station power transformers
- Station class switchgear
- Station circuit breakers

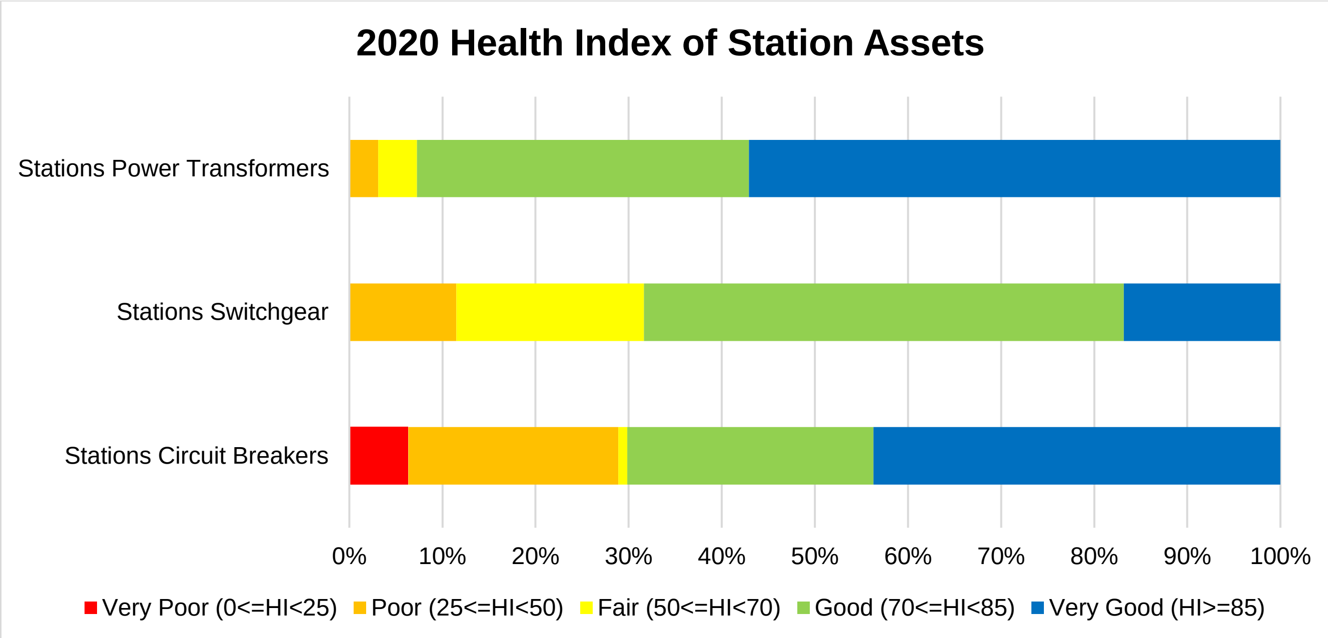

Figure 2 Station Asset Health Index Results Summary for 2020

Station assets HI results are compiled on a per station basis and published to SMEs for evaluation. Grouping assets by station facilitates a station-centric approach, enabling a thorough review process involving SMEs in multiple departments. SMEs leverage the HI results, along other considerations that include the following: 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. SMEs prepare business cases for station needs and opportunities identified through this exercise and submitted them into Copperleaf C55 for optimization.

1 Introduction

This Asset Condition Assessment ("ACA") report is 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 - 2020 Edition for 2021 Rate Applications".

The 2020 ACA represents an update, incorporating condition and inventory information available as of December 2020 using the same practices that were harmonized in 2018 after Alectra's formation.

This report describes an analytical approach to asset condition assessment using Health Indices for Alectra's distribution and station assets. HI is an input for SMEs when they 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.

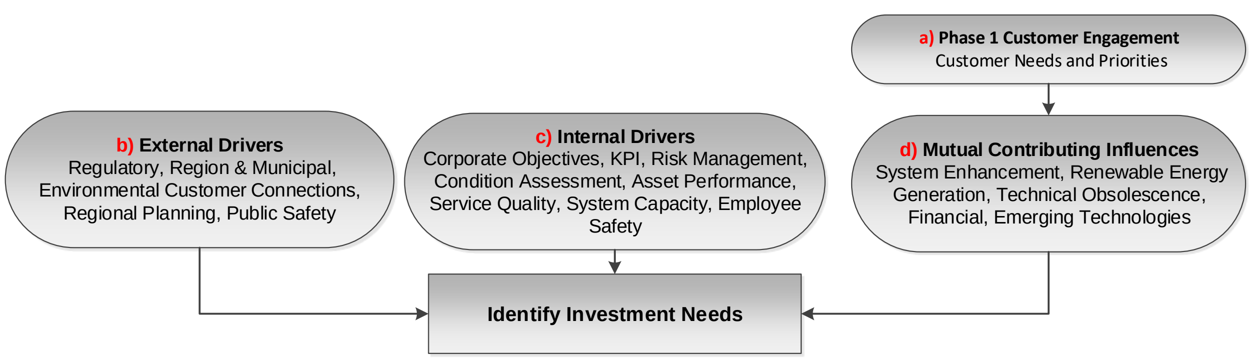

Figure 3 Asset Management Process Investment Drivers and Considerations

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 for each station and provided to SMEs for evaluation. Grouping multiple assets classes by the station facilitates a station-centric approach, enabling a thorough review process with SMEs in multiple departments. SMEs determine the system sustainment needs where HI is one of several considerations considered 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.

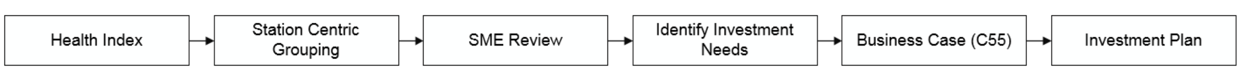

Figure 5 Station Assets Condition Assessment Drivers

Capital investment portfolio optimization is completed in Copperleaf C55, where investments are optimized across all Alectra investment categories. The optimization provides the prioritized allocation and pacing of investments. The optimization considers the risk and benefit in conjunction with financial attributes, such as weighted average cost of capital, and factors in inflation.

2 Health Index Methodology

The Health Index (HI) model quantifies the condition of an asset in a consistent manner. Each asset class has different inputs to inform the HI model. The input weights are based on the asset's characteristics, the extent to which the input reflects asset degradation, industry guidelines, and Alectra Utilities' experience. Health Index model formulas, parameters, inputs, and results are stored in a Relational Database, enabling a unified source for performing HI computations and providing the agility for future enhancements. Figure 6 shows a flowchart summarizing the HI methodology.

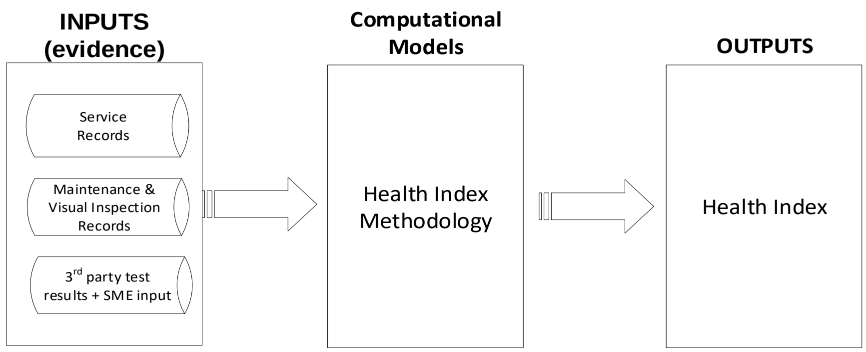

Figure 6 Health Index Methodology: Inputs, Computation, & Outputs

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, or a 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 calculation that are non-continuous. Field inspections are an example. 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 use step scoring for distribution assets have a six-point scoring system (0-5). Table 1 shows the distribution assets step scoring criteria and associated scores in percentage.

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 use step scoring for station assets have a five-point scoring system (0-4). Table 2 shows the station assets step scoring criteria and associated scores in percentage.

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, such as 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 Maximum Useful Life (Max UL) from the same report.

2.2 Condition Multiplier

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 HI inputs 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 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.	$HI < 25\%$

A bar chart displaying the five asset HI categories as a function of HI score is presented in Figure 7.

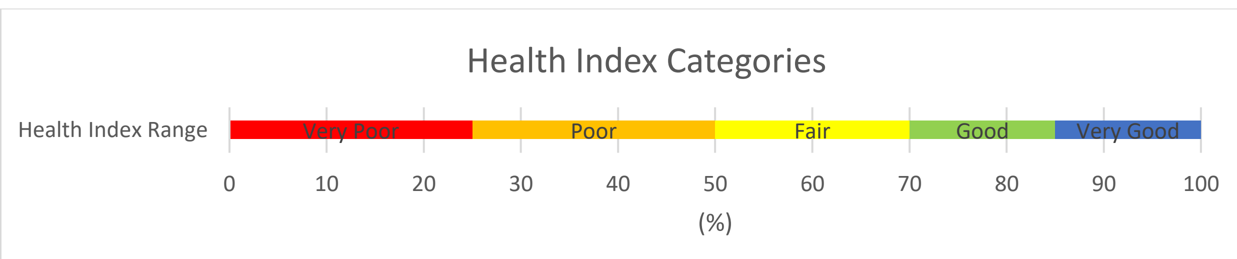

Figure 7 Health Index Categories

2.4 Data Availability

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, that went into calculating the HI of an asset. DAI only represents the completeness and not the quality of data.

$$DAI = \sum_{i=1}^{m} (Input\ Weight_{\,i} \times\ Input\ Data\ Available_{\,i}) \qquad (\mathbf{3})$$

$$,where$$

$$\boldsymbol{m}: number\ of\ inputs\ required\ in\ the\ Health\ Index\ model\ of\ an\ asset\ class$$

$$\boldsymbol{Input\ Weight}: percentage, where \sum_{i=1}^{n} Input\ Weight_{\,i} = 100\%$$

$$\boldsymbol{Input\ Data\ Available}:\ True = 1\ or\ False = 0$$

$$\boldsymbol{DAI}: percentage\ (0 - 100\%)$$

The average DAI is provided in the Health Index results section for each asset class. SMEs use the average DAI in decision-making for assessing overall data availability. However, it is sensitive to model improvements. For example, when the model is enhanced by adding a new input parameter, the average DAI may initially be reduced until new data has been collected.

As Alectra harmonizes its inspection, maintenance, testing and data collection practices over time, asset DAI is expected to increase.

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 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. Monitoring strategies may involve increasing asset inspection cycles and/or installing on-line monitoring, such as on power transformers. Transformer 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, on public or employee safety, and on 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, as shown below.

- **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 asset SMEs use quantities of Very Poor and Poor assets as the needs-driver for business cases. To assist SMEs and ensure smooth transitions between DSP cycles so that sudden increases in rates and resource requirements are avoided, work is strategically paced. A pacing guideline using three scenarios based on the planning outlooks is shown in Table 4.

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 primarily 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

Using this new process methodology for data collection, storage, harmonization. and computation of HI through an SQL database has provided better data management, version control, development agility, and productivity improvements. In 2020, Alectra adopted Alteryx software to assist in data analytics and asset information.

5 Distribution Asset Class Details and Results

Alectra's distribution asset details are described 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

Distribution transformers are a vital component to servicing the end users from the distribution system with utilization voltages. 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, convert 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 (polyphase) transformers.

Vault transformers are similar to overhead transformers in construction but are designed to be placed in chambers, ether below or above grade, or in 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. Therefore, 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 to the environment, a proactive replacement strategy is executed.

5.1.3 Asset Class Demographics

Alectra's distribution system has 125,350 distribution transformers, comprising 81,475 pad-mounted transformers, 31,194 pole-mounted transformers, and 12,681 vault transformers. Figure 8, Figure 9 and Figure 10 show the age demographics of distribution transformers by type in Alectra's distribution system.

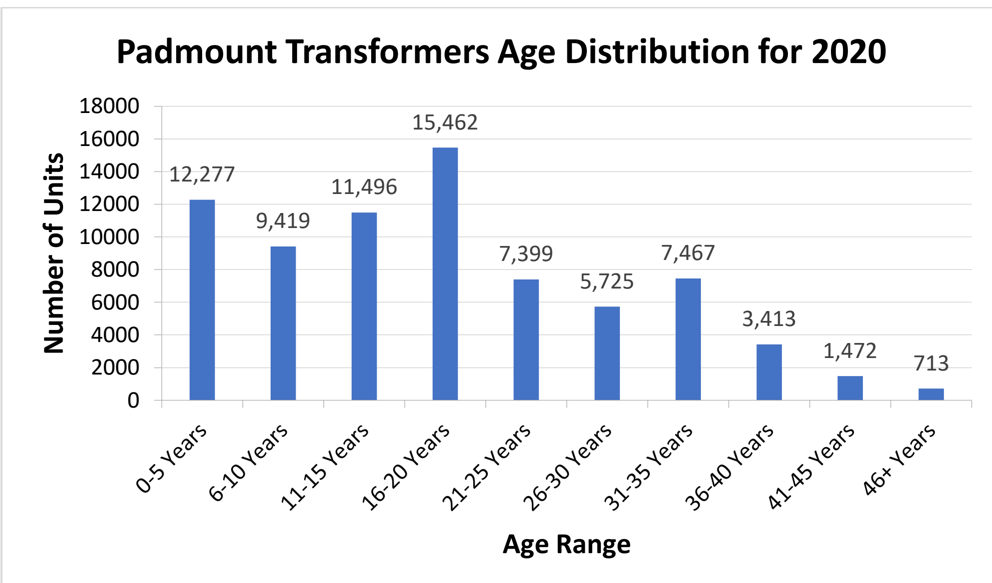

Figure 8 Pad-mounted Transformers Age Distribution for 2020

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.

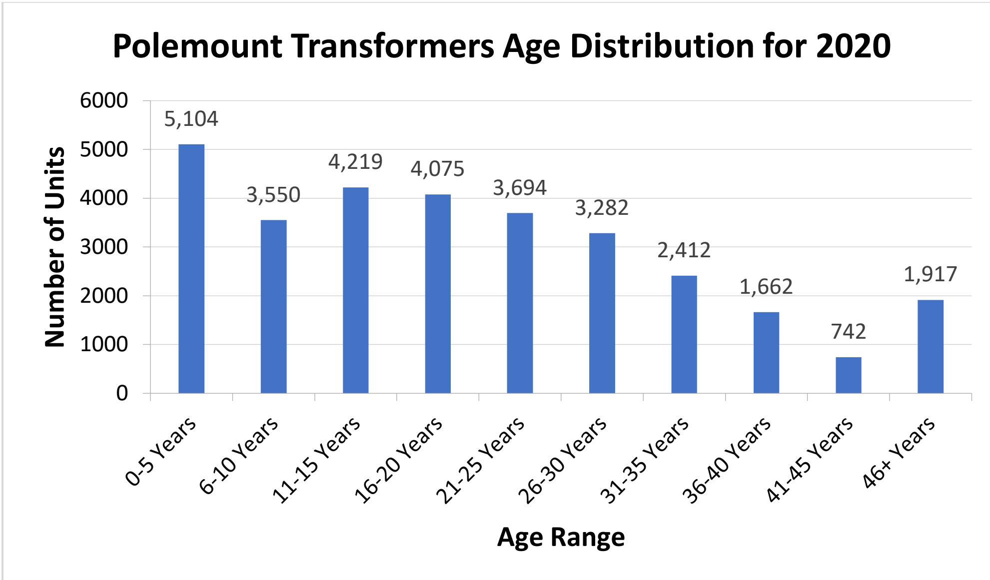

Figure 9 Pole-mounted Transformers Age Distribution for 2020

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.

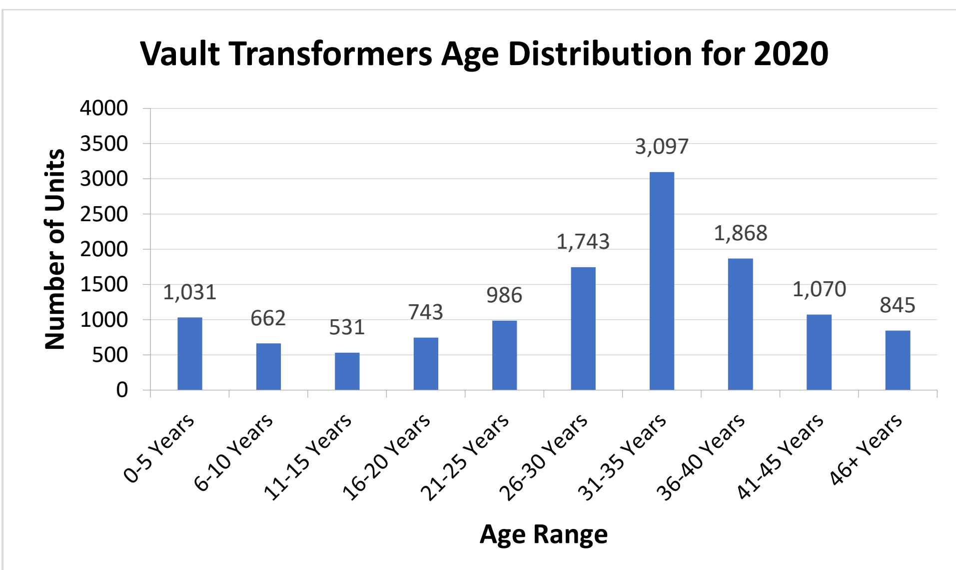

Figure 10 Vault Transformers Age Distribution for 2020

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 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 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 Poor to Very Good. The average DAI is 89.1%.

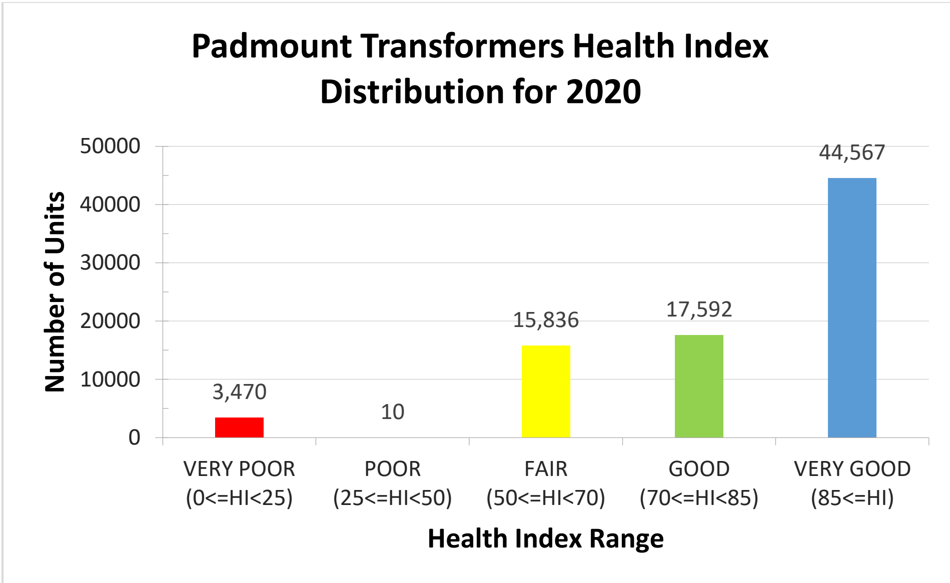

Figure 11 Pad-mounted Transformers Health Index Distribution for 2020

Figure 12 shows the distribution of Health Index values for pole-mounted transformers, classified from Very Poor to Very Good. The average DAI is 74.2%.

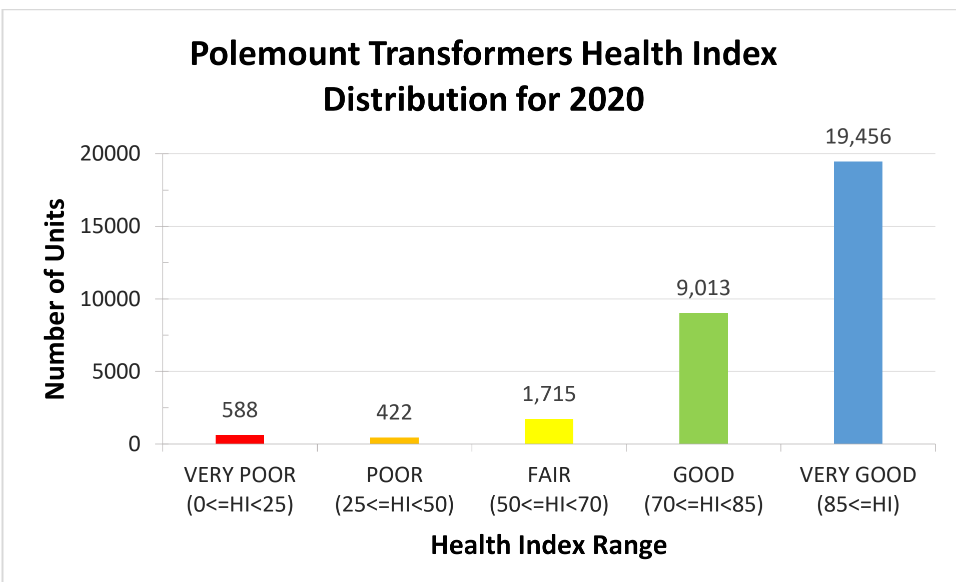

Figure 12 Pole-mounted Transformers Health Index Distribution for 2020

Figure 13 shows the distribution of Health Index values of vault transformers, classified from Very Poor to Very Good. The average DAI is 76.3%.

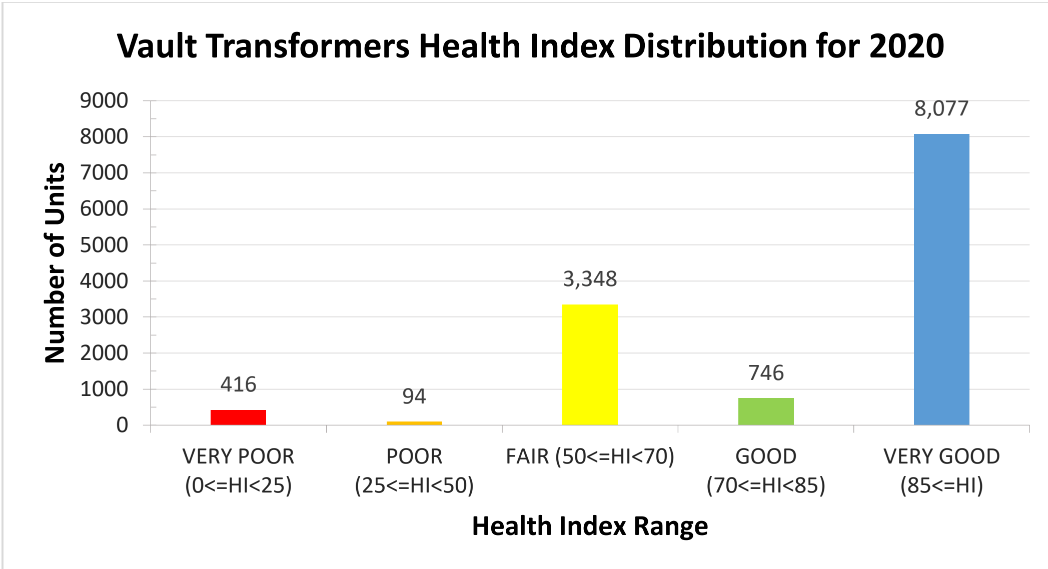

Figure 13 Vault Transformers Health Index Distribution for 2020

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 5,000 units.

Table 6 shows the pacing scenarios, namely, Baseline, Moderate, or Slow, that correspond to sustainment quantities over 5, 7.5, and 10-year intervals, respectively.

Table 6 Distribution Transformer Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 1000\ units$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 667\ units$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 500\ units$

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 provides 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, such as 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, including inspection with thermographic analysis and cleaning with CO_2 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 3,582 pad-mounted switchgear, with varying insulation types, namely, air, solid dielectric, SF_6 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 switchgear 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 switchgear in Alectra's distribution system.

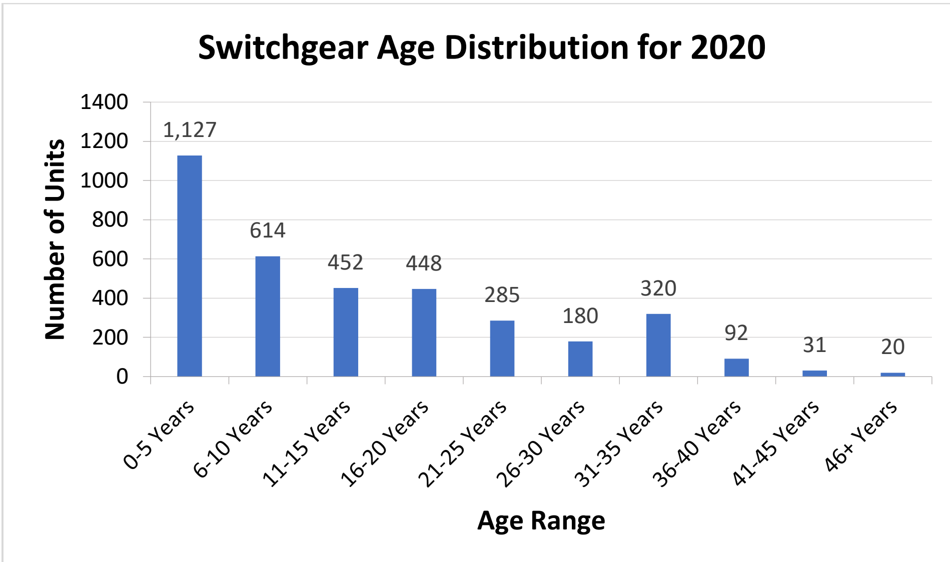

Figure 14 Pad-mounted Switchgear Age Distribution for 2020

5.2.4 Health Index Formula and Results

Health Index of pad-mounted switchgear 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 switchgear), and structural corrosion are quantified during field 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 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 switchgear 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 SF_6 type switchgear is computed by adding the weighted components of: Corrosion, Component Failure (such as signs of damage to mechanical springs, motors in motorized units, and fuse supports), Insulation, and Age, as shown in Table 7.

Table 7 Pad-mounted Air, Solid Dielectric and SF_6 Switchgear Health Index Parameters and Weights

#	Input	Input Weight (AIR, SF_6, 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 Failure (such as signs of damage to mechanical springs, motors in motorized units, and fuse supports), Insulation, Oil Leak, and Age, as shown in Table 8.

Table 8 Pad-mounted Oil-type Switchgear 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 that 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.

$$Aceelerated\ degradation\ multiplier = 50\%$$

Figure 15 shows the distribution of Health Index values of pad-mounted switchgear, classified from Very Poor to Very Good. The average DAI is 84.0%.

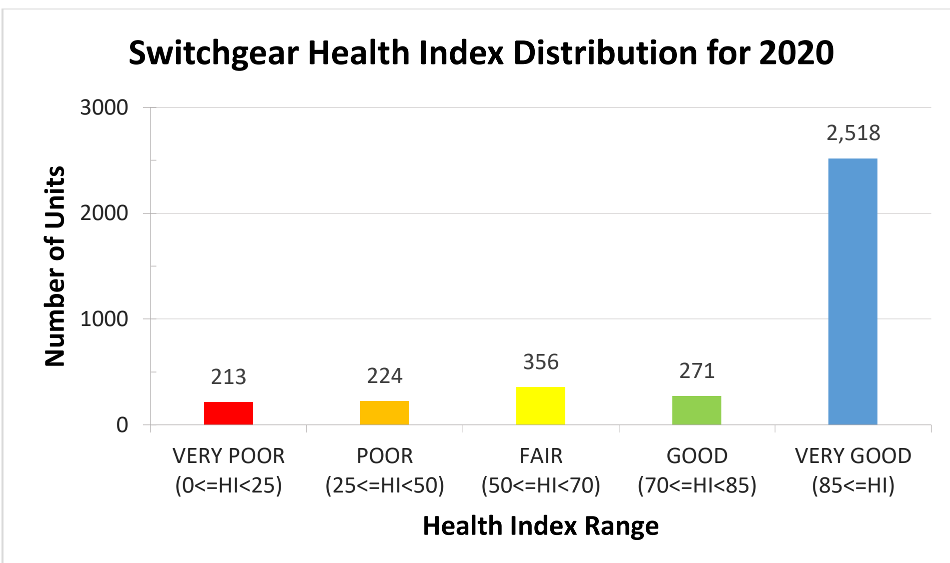

Figure 15 Pad-mounted Switchgear Health Index Distribution for 2020

5.2.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of all pad-mounted switchgear is 437 units.

Table 9 shows the pacing scenarios, namely, Baseline, Moderate, or Slow, that correspond to sustainment quantities over 5, 7.5, and 10-year intervals, respectively.

Table 9 Pad-mounted Switchgear Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 87\ units$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 58\ units$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 44\ units$

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 and to allow isolation of line sections or equipment for maintenance, safety, or other operating requirements. This class of switch is also known as a Load Break Distribution Switch (LBDS), or a Load Interrupting Switch (LIS), and 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 several 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 concerns for operators.

5.3.3 Asset Class Demographics

Alectra's distribution system has 3,098 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 Alectra's distribution system.

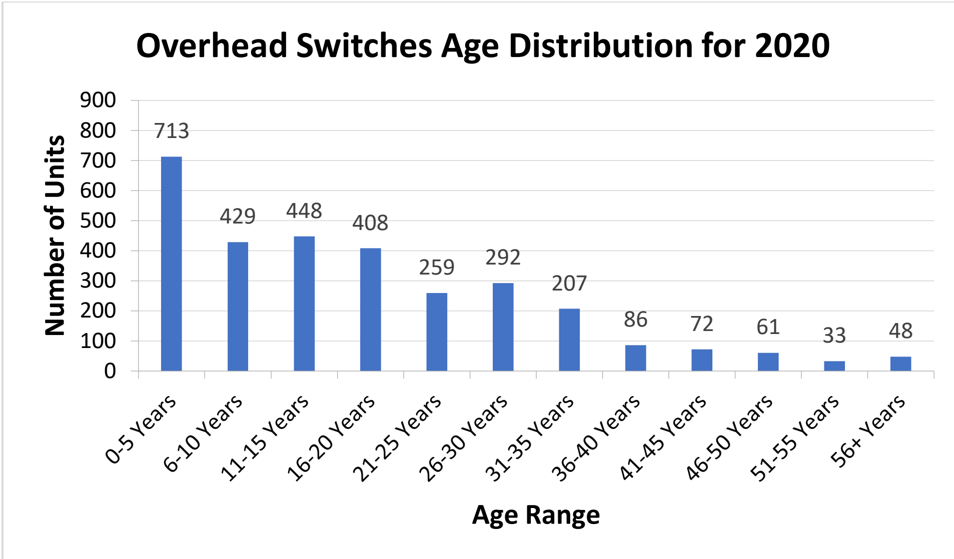

Figure 16 Overhead Switches Age Distribution for 2020

5.3.4 Health Index Formula and Results

Health index of overhead switches assesses the condition according to two components: Age, and Field Inspection. Age represents a proxy measure for switch deterioration over time. Field Inspection is assessed to determine the degree of degradation due to environmental and operational factors. Health Index is computed as a function of Age (i.e., percentage score) and Field Inspection (i.e., step 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 age 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	31%	Percentage Score
Field Inspection	69%	Step Score

Figure 17 shows the distribution of Health Index values of overhead switches, classified from Very Poor to Very Good. The average DAI is 37.0%.

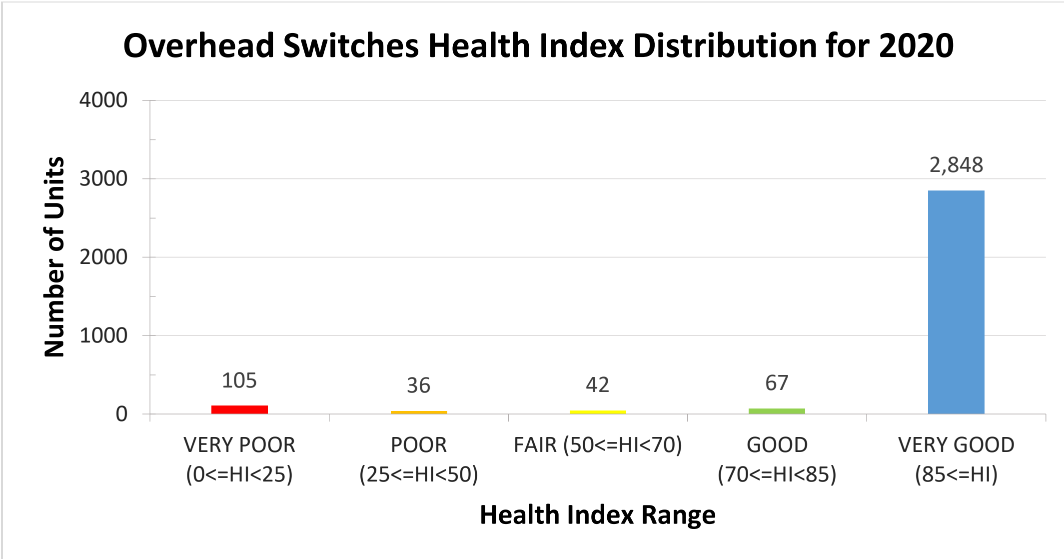

Figure 17 Overhead Switches Health Index Distribution for 2020

5.3.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of overhead switches is 141 units.

Table 11 shows the pacing scenarios, namely, Baseline, Moderate, or Slow, that correspond to sustainment quantities over 5, 7.5, and 10-year intervals, respectively.

Table 11 Overhead Switches Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 28\ units$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 19\ units$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 14\ units$

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 or stranded), 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, as well as 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 17,076 km of overhead conductors with various sizes and ages. 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 Alectra's distribution system.

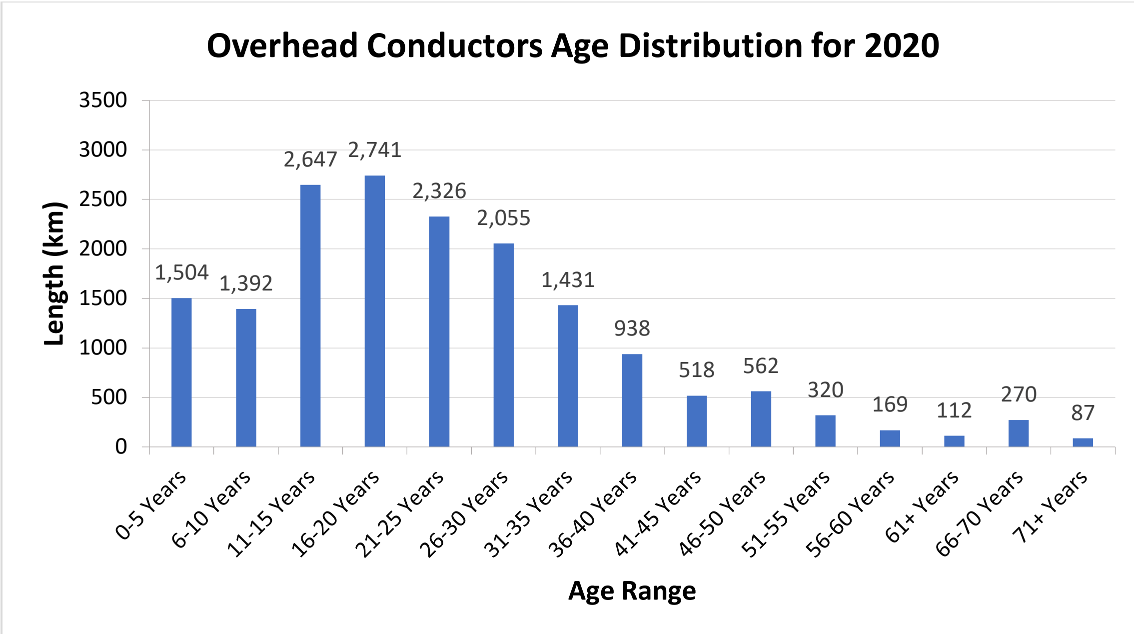

Figure 18 Overhead Conductors Age Distribution for 2020

5.4.4 Health Index Formula and Results

Health Index of overhead conductors assesses the condition based on Age (i.e., percentage score), as shown in Table 12.

Age represents a proxy measure for conductor deterioration over time 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 conductors fall below the acceptable size 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 Poor to Very Good. The average DAI is 100%.

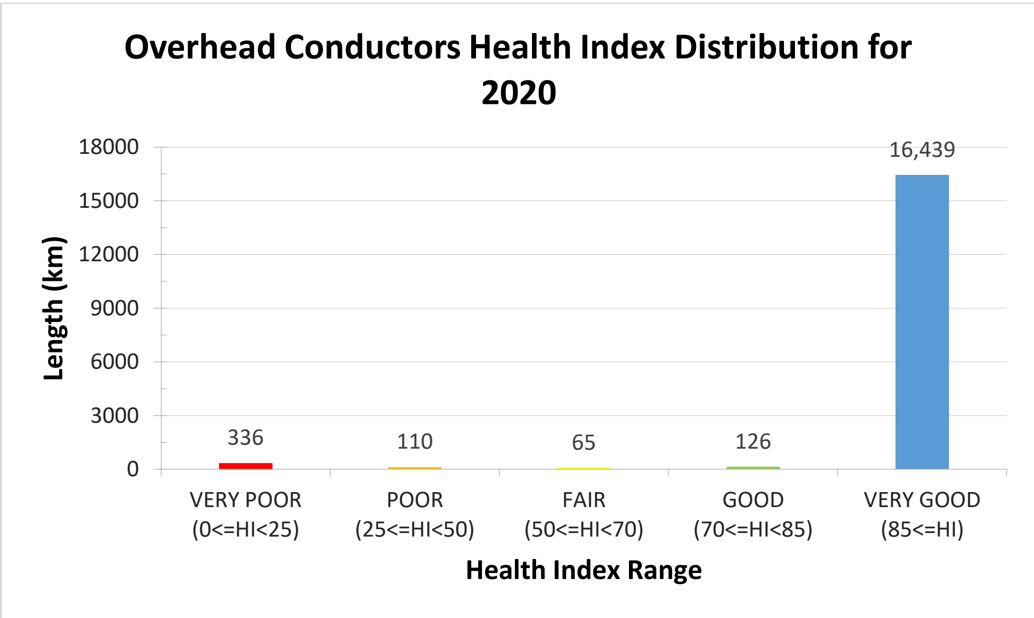

Figure 19 Overhead Conductors Health Index Distribution for 2020

5.4.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of overhead conductors is 446 kilometers.

Table 13 shows the pacing scenarios, namely, Baseline, Moderate, or Slow, that correspond to sustainment quantities over 5, 7.5, and 10-year intervals, respectively.

Table 13 Overhead Conductors Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 89\ km$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 59\ km$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 45\ km$

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, streetlights, 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 testing 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 preservatives, and the environment.

As a structural asset, assessing the condition of a wood pole is based on measuring the remaining structural strength and inspecting for signs of deterioration, such as cracks. Field inspection checks for indicators of decay, such as 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 104,729 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 Alectra's distribution system.

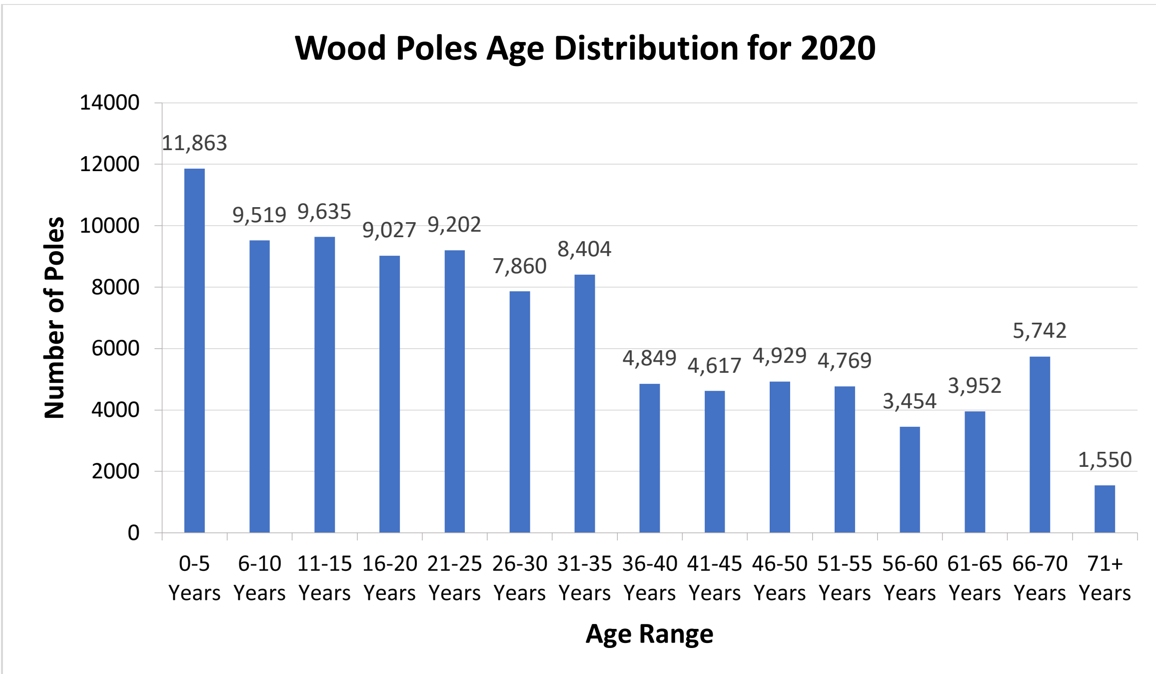

Figure 20 Wood Poles Age Distribution for 2020

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 a wood pole 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, 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	Overall Condition (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

A score of 20% or less on Overall Condition based on field inspection is an indication that a wood pole is exhibiting major degradation or failure is imminent and is 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 Poor to Very Good. The average DAI is 65.9%.

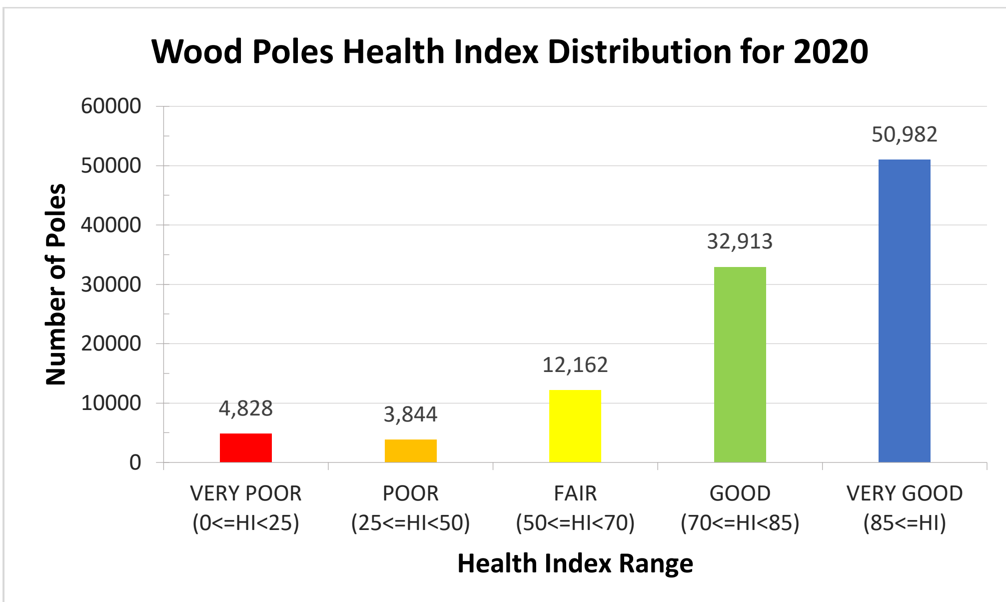

Figure 21 Wood Poles Health Index Distribution for 2020

5.5.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of wood poles is 8,672 poles.

Table 15 shows the pacing scenarios, namely, Baseline, Moderate, or Slow, that correspond to sustainment quantities over 5, 7.5, and 10-year intervals, respectively.

Table 15 Wood Poles Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 1{,}734\ poles$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 1156\ poles$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 867\ poles$

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, streetlights, 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, such as that cased by snowplows or vehicle accidents, or by deterioration over time. 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 26,303 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 Alectra's distribution system.

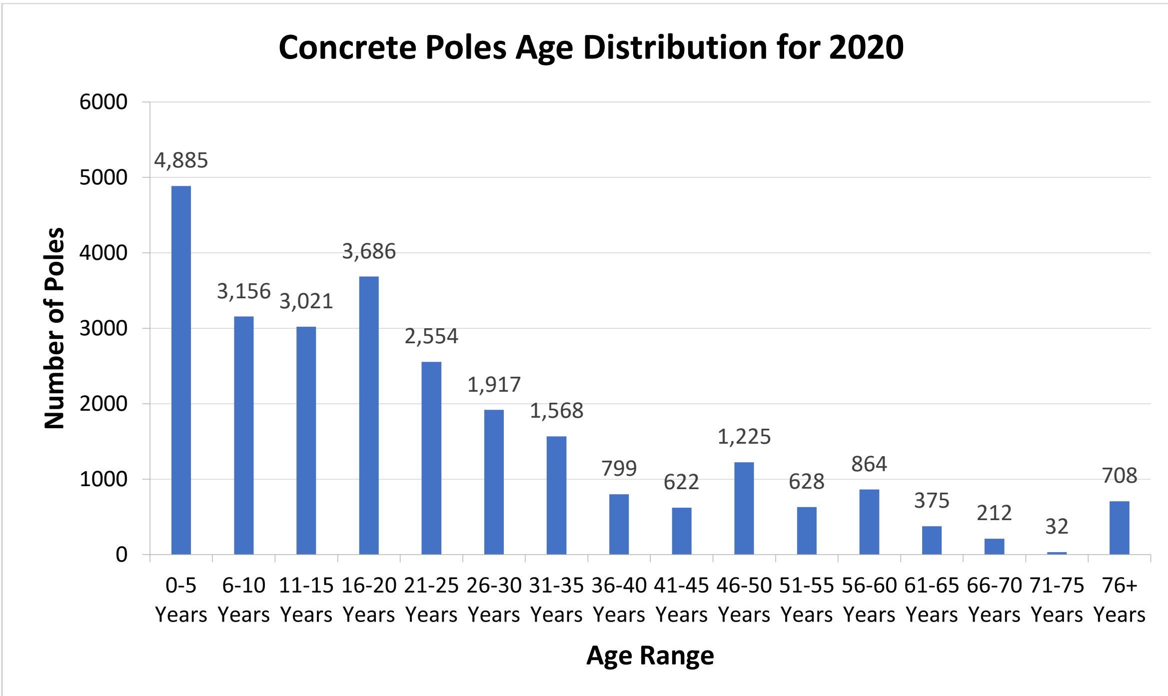

Figure 22 Concrete Poles Age Distribution for 2020

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 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 inspection and Age, as shown in Table 16.

Table 16 Concrete Poles Health Index Parameters and Weights

#	Input	Input Weight	Scoring Method
1	Overall Condition (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 Poor to Very Good. The average DAI is 85.9%.

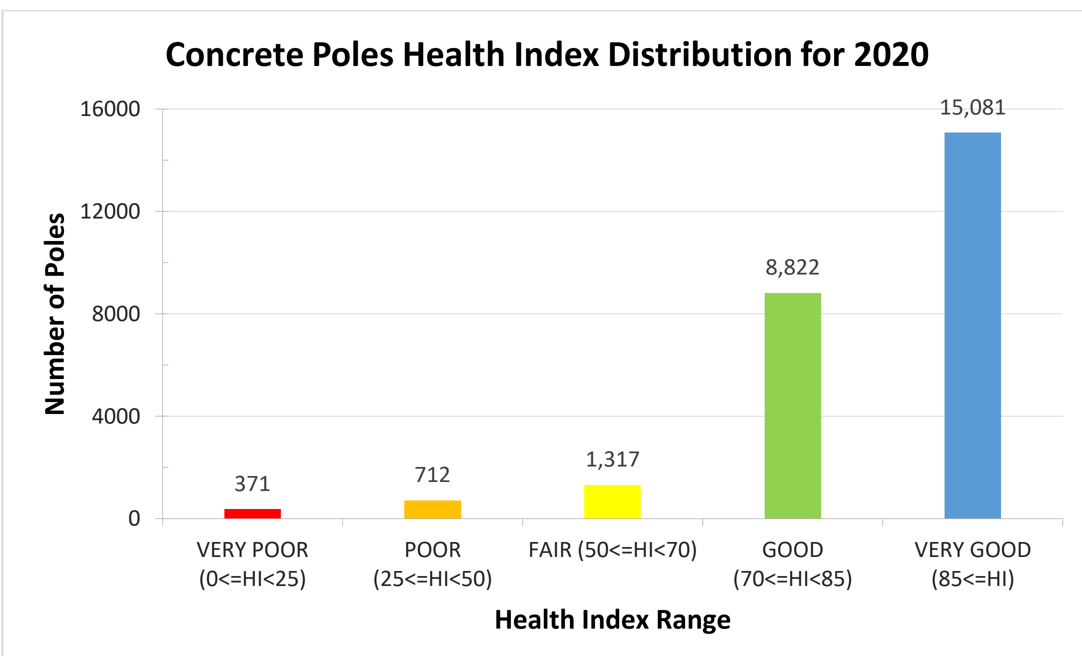

Figure 23 Concrete Poles Health Index Distribution for 2020

5.6.5 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of concrete poles is 1,083 poles.

Table 17 shows the pacing scenarios, namely, Baseline, Moderate, or Slow, that correspond to sustainment quantities over 5, 7.5, and 10-year intervals, respectively.

Table 17 Concrete Poles Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 217\ poles$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 144\ poles$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 108\ poles$

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, and ethylene-propylene rubber (EPR) cables at voltage levels of 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 EPR cables, long term degradation can occur due to mechanical damage, overheating, or the impact of moisture ingress and chemical deterioration.

5.7.3 Cross-Linked Polyethylene (XLPE) Cables

5.7.3.1 Asset Class Demographics

Alectra's distribution system has 22,154 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.

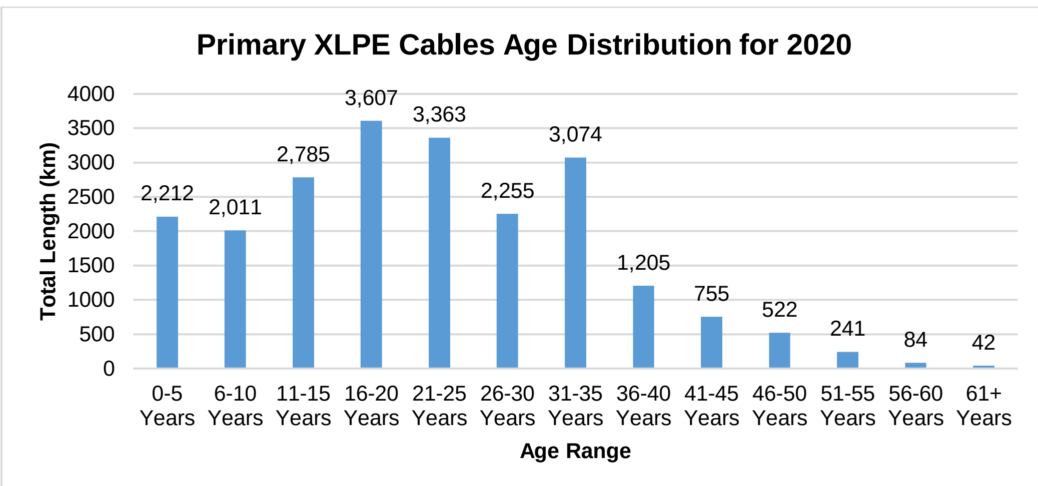

Figure 24 Primary XLPE Cables Age Distribution for 2020

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 cable 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.

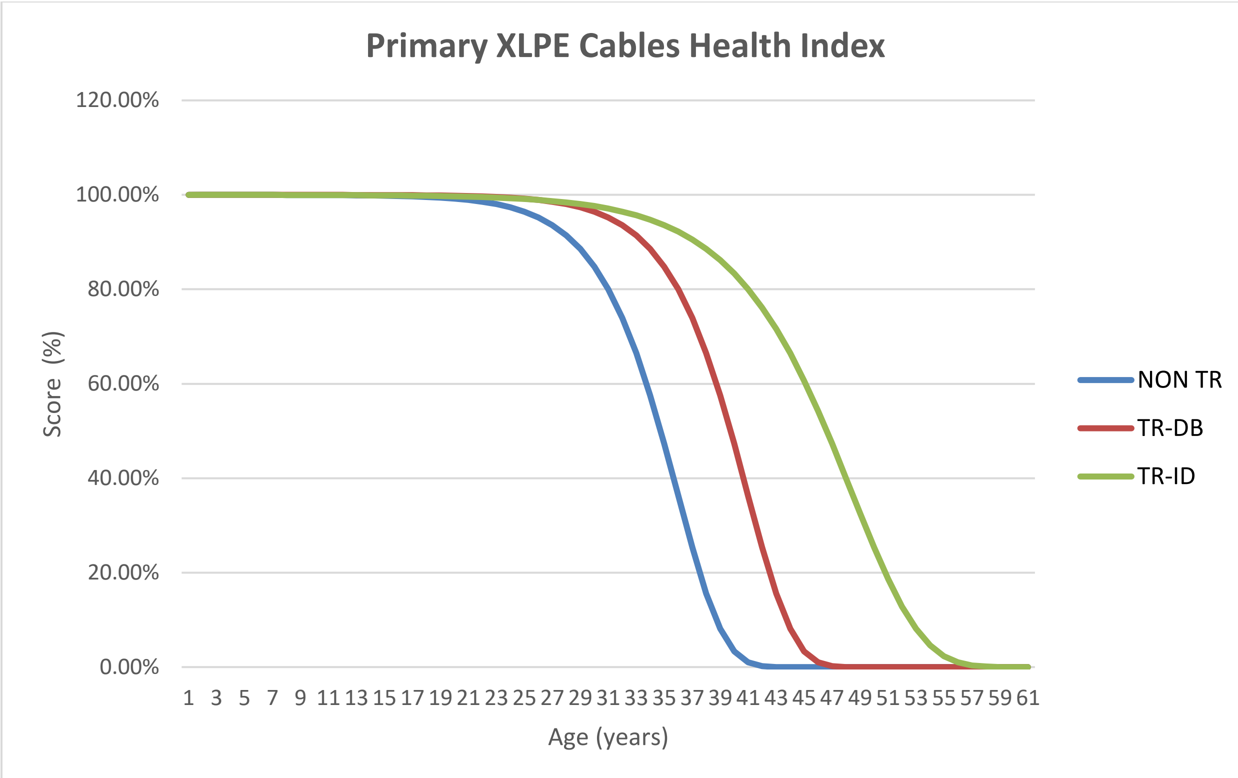

Figure 25 Primary XLPE Cables Health Index as a function of age

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 Poor to Very Good. The average DAI is 100%.

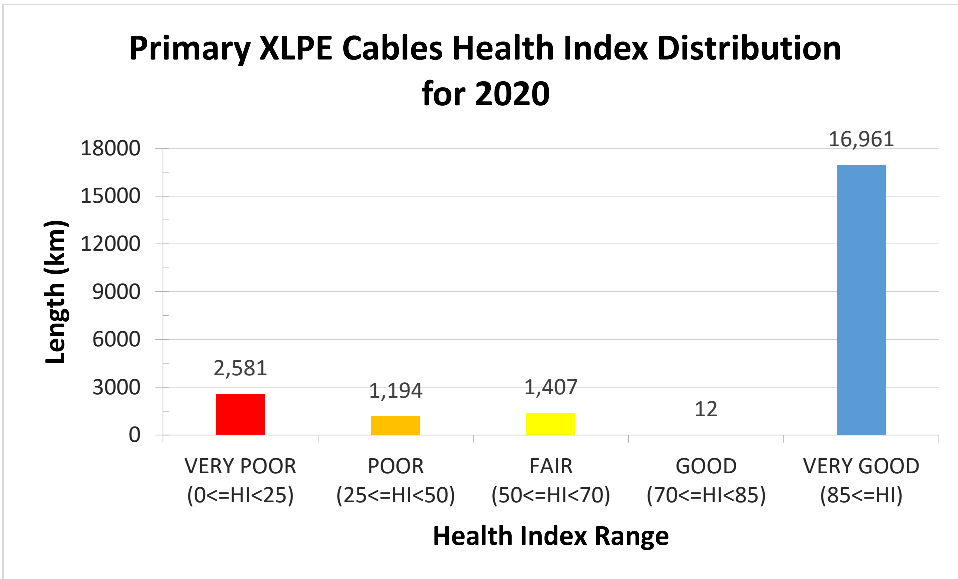

Figure 26 Primary XLPE Cables Health Index Distribution for 2020

5.7.3.3 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of XLPE cables is 3,775 km.

Table 19 shows the pacing scenarios, namely, Baseline, Moderate, or Slow, that correspond to sustainment quantities over 5, 7.5, and 10-year intervals, respectively.

Table 19 XLPE Cable Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 755\ km$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 503\ km$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 378\ km$

5.7.4 Paper Insulated Lead Covered (PILC) Cables

5.7.4.1 Asset Class Demographics

Alectra's distribution system has 412 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.

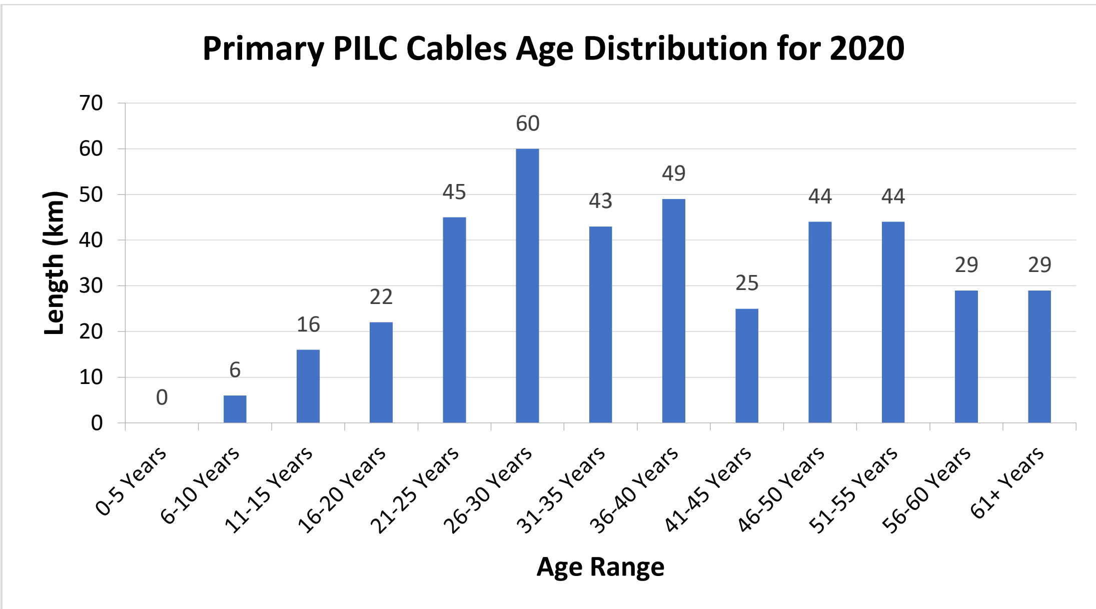

Figure 27 Primary PILC Cables Age Distribution for 2020

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 Poor to Very Good. The average DAI is 100%.

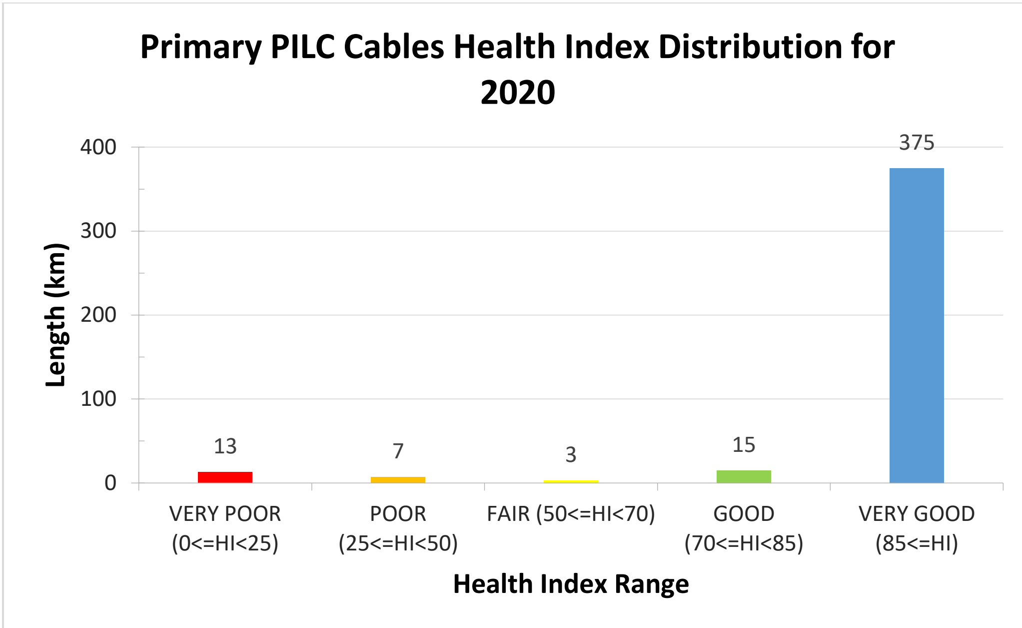

Figure 28 Primary PILC Cables Health Index Distribution for 2020

5.7.4.3 Sustainment Pacing

The total quantity in the Very Poor & Poor categories of PILC is 20 km.

Table 21 shows the pacing scenarios, namely, Baseline, Moderate, or Slow, that correspond to sustainment quantities over 5, 7.5, and 10-year intervals, respectively.

Table 21 PILC Pacing Scenarios

Pace	Description	Quantity per year
Baseline	Sustainment strategy targeting Very Poor & Poor assets over the **short-term**	$\frac{(Very\ Poor + Poor)}{5\ years} = 4\ km$
Moderate	Sustainment strategy targeting Very Poor & Poor assets over the **medium-term**	$\frac{(Very\ Poor + Poor)}{7.5\ years} = 3\ km$
Slow	Sustainment strategy targeting Very Poor & Poor assets over the **long-term**	$\frac{(Very\ Poor + Poor)}{10\ years} = 2\ km$

5.7.5 Ethylene-Propylene Rubber (EPR) Cables

5.7.5.1 Asset Class Demographics

Alectra's distribution system has 90 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.

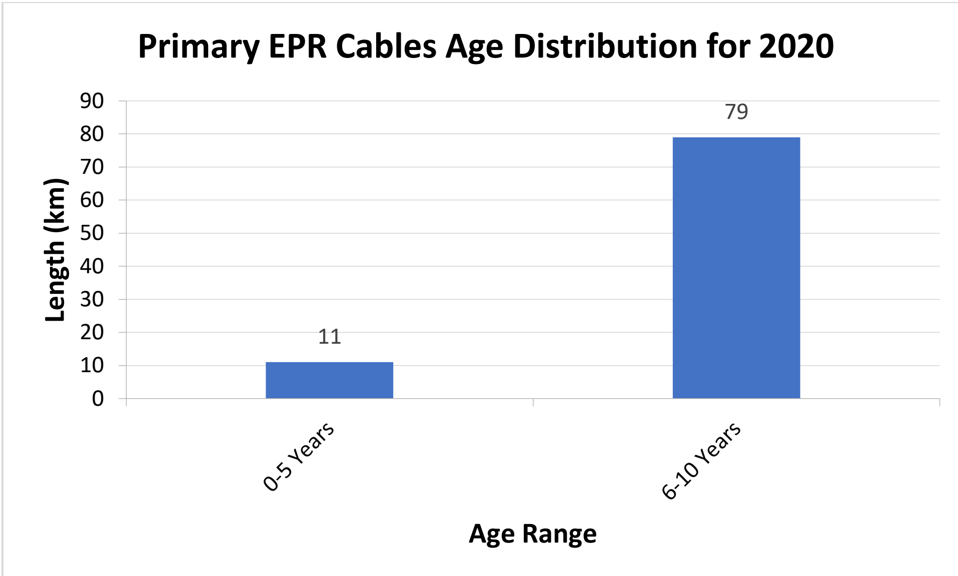

Figure 29 Primary EPR Cables Age Distribution for 2020

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 Poor to Very Good. The average DAI is 100%.

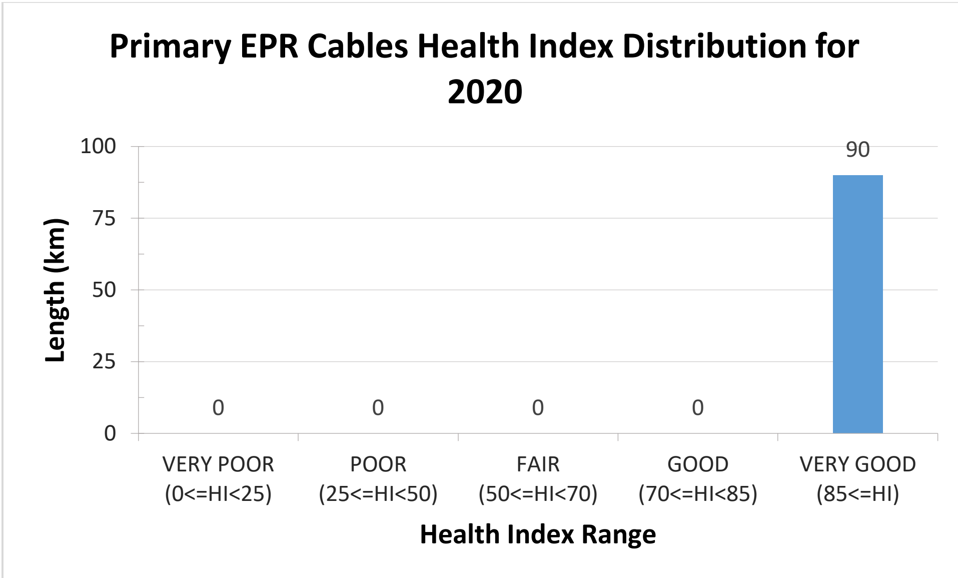

Figure 30 Primary EPR Cables Health Index Distribution for 2020

5.7.5.3 Sustainment Pacing

There are no EPR cables in the Very Poor and Poor categories.

Table 23 shows the pacing scenarios, namely, Baseline, Moderate, or Slow, that correspond to sustainment quantities over 5, 7.5, and 10-year intervals, respectively.

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 from transformer stations owned by Hydro One. Alectra's system has 14 transformer stations and 150 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.

- Station power transformers
- Station circuit breakers
- Station class switchgear

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. In most power transformers, mineral oil serves as the insulating medium, providing insulation of energized coils, as well as the coolant. Some power transformers use a natural ester oil, such as FR3. 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 can 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 an acceptable range. Multiple cooling stages allow for increases 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 to the paper, hence accelerating 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 by-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 289 power transformers, including 26 spare units. These are comprised of 31 TS transformers, three of which are spares, and 258 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 as of the summer of 2020.

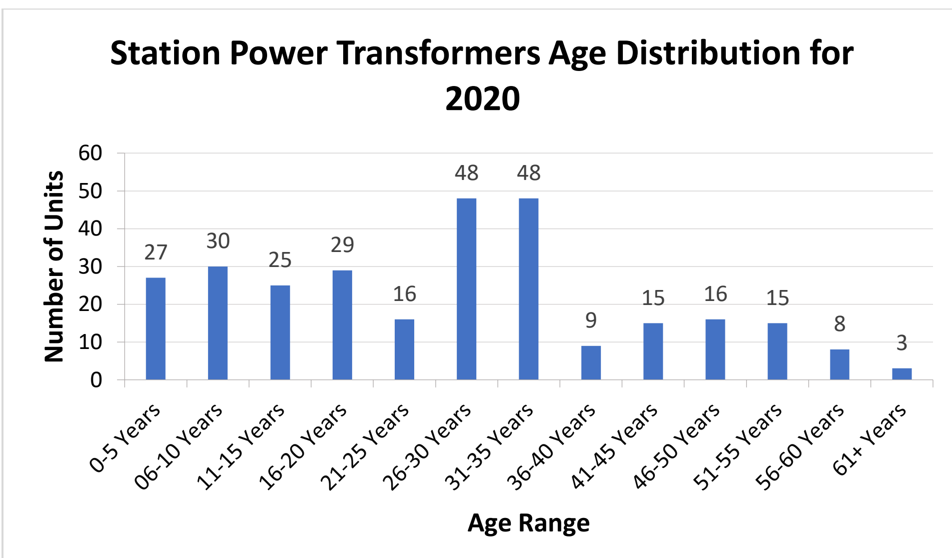

Figure 31 Station Power Transformers Age Distribution for 2020

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 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	10%	Step Score
3	Sealing and Connection	10%	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 acetylene 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 acetylene will be considered as a candidate for replacement and will have a maximum Health Index of 10%.

$$Explosive\ Gas\ multiplier = 10\%$$

Where both multipliers (Explosive Gas and DGA) are triggered, the lower of the two applies (i.e. the Explosive Gas multiplier).

Figure 32 shows the distribution of Health Index values of power transformers, classified from Very Poor to Very Good. The average DAI is 89.8%.

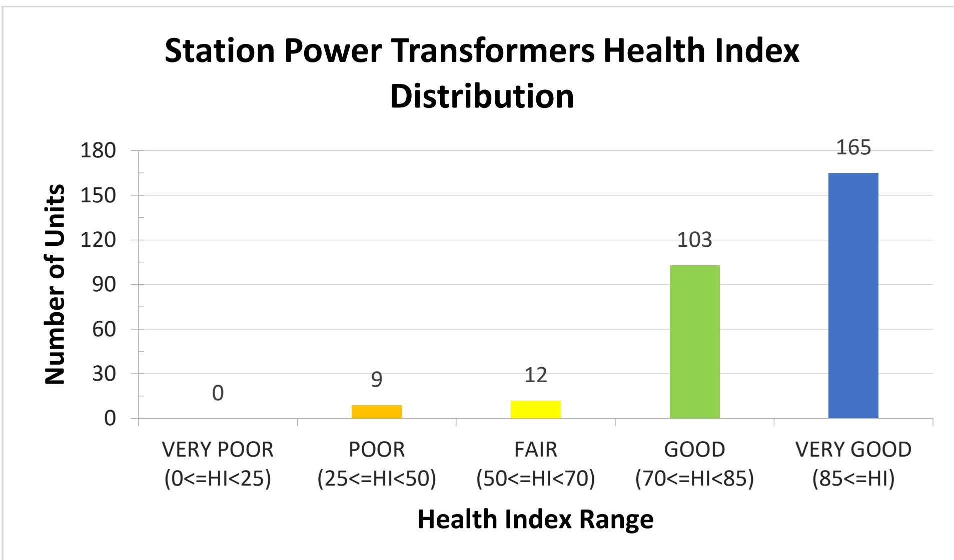

Figure 32 Station Power Transformers Health Index Distribution for 2020

6.2 Circuit Breakers

6.2.1 Summary of Asset Class

Circuit breakers are used to sectionalize and isolate circuits or other assets. They are often categorized by the insulation medium used in the breaker and by 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.

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.

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.

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. Additional degradation factors for outdoor-mounted circuit breakers include corrosion, effects of moisture, and bushing, insulator, and mechanical deterioration.

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, and 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 breaker stability.

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, four to eight 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 1,263 installed circuit breakers at its stations, 232 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 as of the summer of 2020.

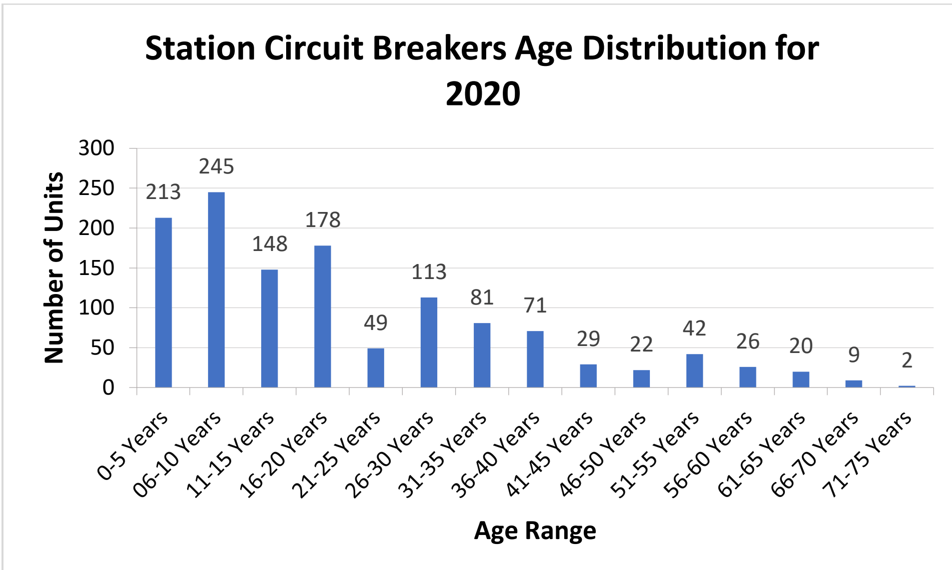

Figure 33 Station Circuit Breakers Age Distribution for 2020

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 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 (SF_6)	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

A circuit breaker may be deemed obsolete if it is no longer supported by the manufacturer, parts are no longer readily available, and/or no longer meet current safety or performance standards. If a circuit breaker is deemed to be obsolete, 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 Poor to Very Good. The average DAI is 88.2%.

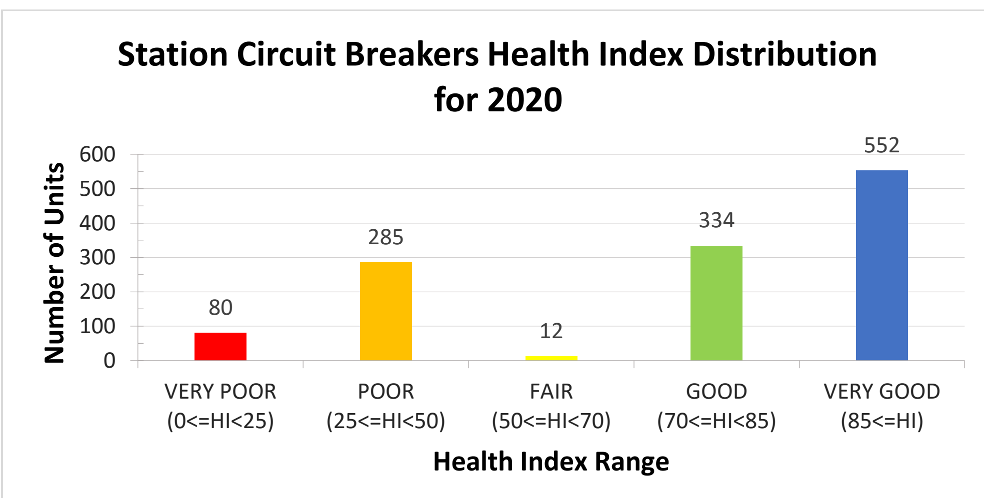

Figure 34 Station Circuit Breakers Health Index Distribution for 2020

6.3 Station Switchgear

6.3.1 Summary of Asset Class

Station switchgear consists of an assembly of retractable/racked 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 busbars associated with each cell. (Circuit breakers are analyzed separately.)

6.3.2 Asset Degradation

Station switchgear degradation is a function of several factors: mechanism operation and performance, degradation of solid insulation, general degradation/corrosion, environmental factors, and 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 air-insulated and gas-insulated switchgear types.

The greatest cause of maloperation 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, such as 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, resulting 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 357 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.

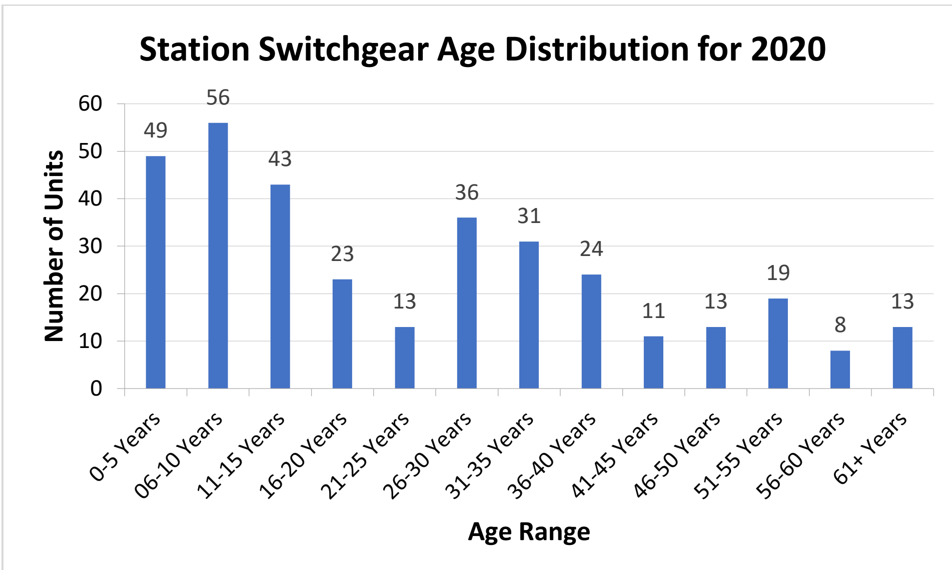

Figure 35 Station Switchgear Age Distribution for 2020

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 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 Poor to Very Good. The average DAI is 86.3%.

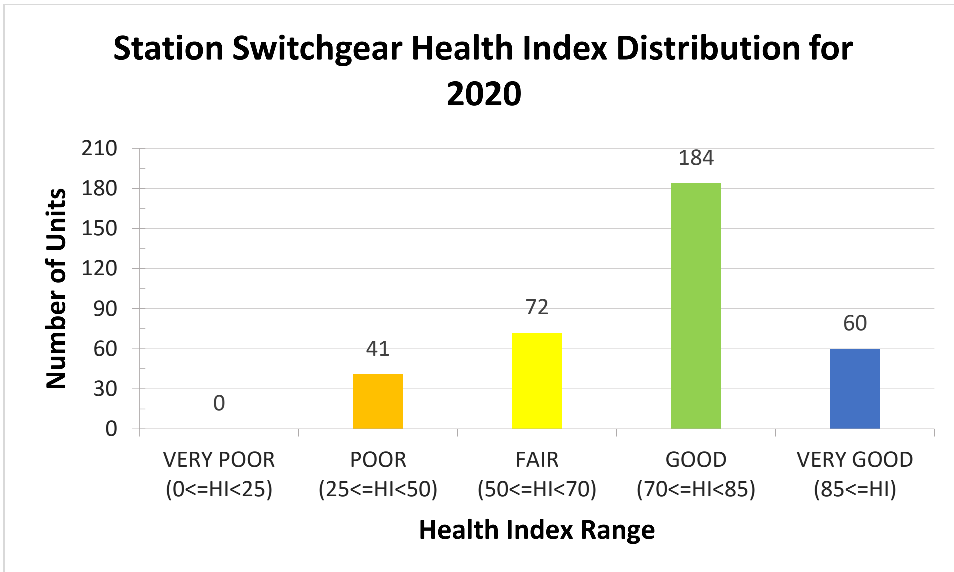

Figure 36 Station Switchgear Health Index Distribution for 2020

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Attachment 2
2021 Asset Utilization

alectra utilities

Discover the possibilities

MEMO

To: Mike Matthews

From: Tom Wasik, Riaz Shaikh

Date: Friday, January 28, 2022

Subject: **2021 Asset Utilization Results**

Alectra Utilities plans, designs and operates the distribution system to provide the most efficient service. A measure of system-wide efficacy of planning and design for electrical systems is the utilization factor of assets. With the prospect of disruptive forces on the horizon, Alectra Utilities practices are focused on ensuring the highest degree of utilization to mitigate the potential of stranding assets while maintaining reasonable flexibility in the system to address problems and growth opportunities. The utilization factor, a ratio between the system peak demand to available system delivery capacity, is a reasonable proxy for the overall effectiveness of how the system is being planned and designed.

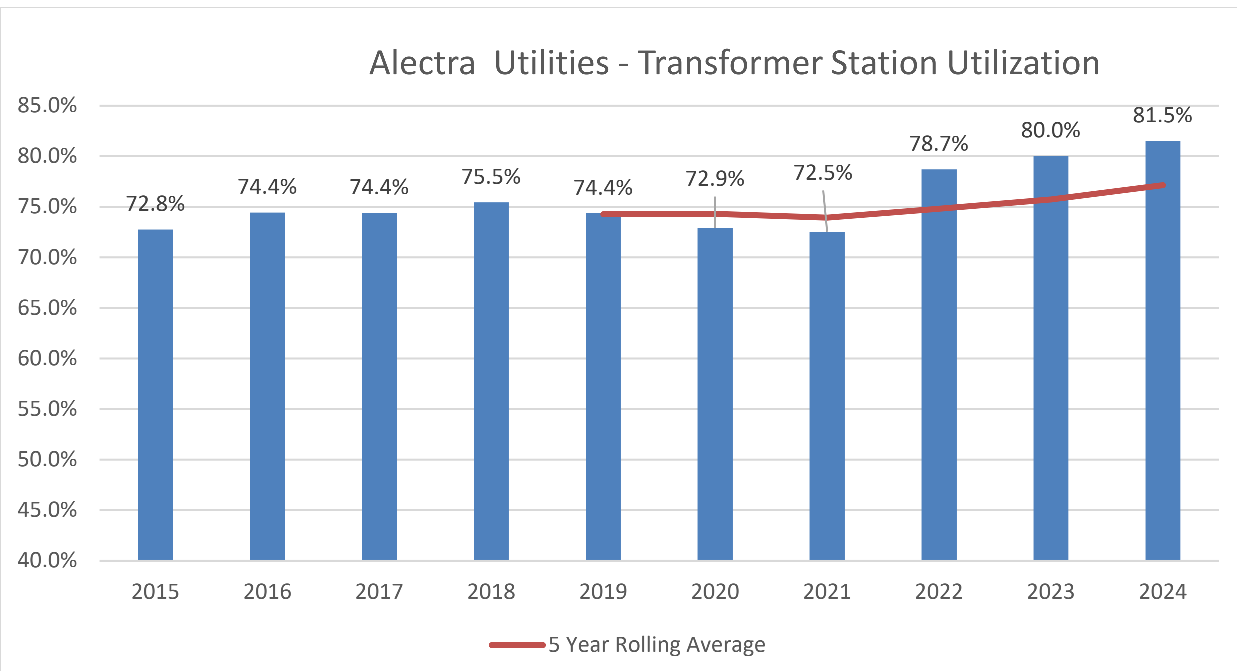
The persistence of the COVID-19 global pandemic has continued into 2021, resulting in reduced system demand from institutional, commercial and industrial (ICI) customers offset slightly by increased residential demand resulting from continued work from home practices. Impacts to reduced ICI demand resulted from provincially instituted public health measures to restrict capacity and size of gatherings and increasing delays on production due to global supply chain issues. Alectra Utilities identified the impact of the COVID pandemic on ICI peak demand as a reduction of 3.5% in 2020 and 3.7% in 2021 relative to forecast.

Based on each operating region's peak system demand and consistent application of the methodology used to develop the Asset Utilization target, Alectra Utilities asset utilization factor at year-end 2021 was 72.5% utilization, which was 2.8% below the 2019-2021 target of 75.3%.

	Grid Utilization			
	2021	Threshold	Target	Outstanding
2019-2021	72.5%	73.8%	75.3%	76.80%

Due to the COVID pandemic, Alectra Utilities system peak demand has experienced a reduction resulting in lower system utilization. Management continues to monitor the pace and rate of economic recovery as the Province of Ontario returns to normalcy and has deferred plans for further system expansion accordingly.

Measure	2021 Result
Coincident System Peak	5,326 MW
Power Factor Adjusted Peak (PF = 0.93)	5,727 MVA
Weather Correction Adjustment	489 MVA
Non-Coincident Peak Adjustment (2%)	115 MVA
Global Adjustment (Actual)	253 MVA
Non-Coincident Weather Adjusted System Peak [A]	**6584 MVA**
Total System Delivery Capacity	8,440.45 MW
Power Factor Adjusted Total System Capacity (PF = 0.93) [B]	**9,075.76 MVA**
Asset Utilization Factor [A:B]	**72.5%**



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Attachment 3
T1 Consolidated Schedule

T1 Tables

Category	Actual 2017	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Forecast 2022	Budget 2023	Budget 2024
System Access	$62.6	$67.0	$79.7	$63.0	$67.4	$64.8	$69.2	$68.3
System Service	$44.2	$24.3	$19.0	$26.8	$28.4	$27.2	$24.4	$22.0
System Renewal	$136.0	$129.5	$133.7	$135.5	$136.5	$125.4	$150.1	$162.9
General Plant	$18.1	$23.0	$21.6	$30.8	$29.6	$41.9	$44.1	$40.3
Total	**$260.9**	**$243.8**	**$253.9**	**$256.1**	**$261.9**	**$259.3**	**$287.8**	**$293.5**

System Access	Actual 2017	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Forecast 2022	Budget 2023	Budget 2024
Network Metering	$12.2	$10.8	$12.1	$17.0	$14.3	$12.9	$12.4	$12.7
Customer Connections	$26.9	$25.2	$48.5	$33.8	$39.4	$36.8	$39.1	$39.8
Road Authority & Transit Projects	$23.5	$31.0	$18.4	$12.4	$13.5	$13.8	$16.5	$15.7
Transmitter Related Upgrades	$0.0	$0.0	$0.7	-$0.2	$0.2	$1.3	$1.2	$0.1
Total	**$62.6**	**$67.0**	**$79.7**	**$63.0**	**$67.4**	**$64.8**	**$69.2**	**$68.3**

System Service	Actual 2017	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Forecast 2022	Budget 2023	Budget 2024
SCADA & Automation	$6.0	$4.5	$5.4	$3.4	$9.0	$4.7	$2.4	$2.8
Capacity (Lines)	$23.8	$13.4	$3.1	$11.2	$7.0	$11.2	$12.2	$11.7
Capacity (Stations)	$10.3	$2.4	$1.1	$0.7	$5.3	$2.6	$0.7	$0.8
System Control, Communications & Performance	$2.9	$3.1	$6.3	$5.5	$4.2	$5.9	$6.1	$4.0
Safety & Security	$1.2	$0.9	$3.1	$5.6	$2.6	$1.6	$1.6	$1.4
Distributed Energy Resources (DER) Integration	$0.0	$0.0	$0.0	$0.4	$0.3	$1.2	$1.4	$1.3
Total	**$44.2**	**$24.3**	**$19.0**	**$26.8**	**$28.4**	**$27.2**	**$24.4**	**$22.0**

System Renewal	Actual 2017	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Forecast 2022	Budget 2023	Budget 2024
Overhead Asset Renewal	$43.0	$39.5	$45.0	$32.8	$39.8	$36.7	$39.7	$46.8
Underground Asset Renewal	$51.8	$43.6	$47.0	$61.5	$55.6	$55.3	$75.9	$80.6
Reactive Capital	$15.6	$20.5	$22.3	$22.5	$26.8	$21.1	$21.8	$22.3
Rear Lot Conversion	$3.4	$0.0	$4.5	$2.4	$0.1	$1.1	$0.5	$1.0
Substation Renewal	$9.1	$10.4	$5.4	$10.5	$7.3	$4.8	$5.0	$4.7
Transformer Renewal	$11.5	$14.0	$9.4	$5.8	$6.9	$6.4	$7.2	$7.5
Other System Renewal	$1.6	$1.5	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0
Total	**$136.0**	**$129.5**	**$133.7**	**$135.5**	**$136.5**	**$125.4**	**$150.1**	**$162.9**

General Plant	Actual 2017	Actual 2018	Actual 2019	Actual 2020	Actual 2021	Forecast 2022	Budget 2023	Budget 2024
Facilities Management	$5.2	$1.4	$2.5	$7.4	$2.6	$3.4	$4.3	$5.9
Information Technology	$5.0	$4.8	$9.0	$13.8	$13.8	$29.3	$29.4	$21.8
Fleet Renewal	$3.2	$6.7	$8.0	$8.1	$6.6	$7.3	$7.7	$10.6
Connection and Cost Recovery Agreements	$0.0	$6.8	$0.5	$0.0	$5.5	$0.4	$0.6	$0.0
Other General Plant	$4.7	$3.3	$1.6	$1.5	$1.1	$1.5	$2.1	$2.0
Total	**$18.1**	**$23.0**	**$21.6**	**$30.8**	**$29.6**	**$41.9**	**$44.1**	**$40.3**

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Attachment 4
Narrative Summaries

Narrative Summaries – Post EB-2019-0018 Decision Impacts

APX A01 – Network Metering

Actual expenditures in 2020 were required to complete a metering project deferred from 2019 into 2020. The cause of the deferral stemmed from challenges with scheduling deployment of meters. During the harmonization of practices, it was discovered that several systems and process were not as robust in ensuring effective and accurate data collection. To ensure a high degree of accuracy especially with new service connections increasing due to subdivision development additional funding was required in 2022. Table A01-9 provides both historical and proposed spending from 2020-2024.

Table A01 - 9: Historical & Proposed Investment Spending Post EB-2019-0018

Network Metering	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$14.8	$14.3	$10.2	$11.6	$12.2	$63.1
Actuals/Forecast ($MM)	$17.0	$14.3	$13.0	$12.4	$12.7	$69.4

APX A02 – Customer Connections

Starting in 2019, Alectra experienced increased demand for customer work requiring system expansion. While contributions are collected, not all customer work requires a contribution. Work covered by an expansion deposit is returned to the customer if their load forecast materializes. While Alectra Utilities does earn revenue on these the initial upfront funding is from rate base. Major customer projects in HRZ for 2020, in ERZ and PRZ in 2021, and PRZ and HRZ in 2022 and 2023 contribute to $13MM of the $15.6M increase relative to the DSP. Table A02-16 provides the historical and proposed spending under Customer Connections.

Table A02 - 16: Historical & Proposed Investment Spending Post EB-2019-0018

Customer Connections	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$31.4	$33.1	$34.8	$36.3	$37.7	$173.3
Actuals/Forecast ($MM)	$33.8	$39.4	$36.8	$39.1	$39.8	$188.9

APX A03 – Road Authority

Road Authority projects are governed under the Public Service Works on Highways act (PSWHA). The scope and timing of road widening projects are fully under the jurisdiction of the Road Authority which Alectra Utilities does not control. In 2020 Alectra Utilities noticed a significant reduction in Road Authority spending, this trend continued in 2021 and 2022. Alectra Utilities forecasts that investments in Road Authority and Transit Project work will increase in 2023 and 2024, but continue below levels planned in the DSP. Table A03-10 provides the historical and planned investment post EB-2019-0018 and displays the reduction in road work over the 5-year period.

Table A03 - 10: Historical & Proposed Investment Spending Post EB-2019-0018

Road Authority & Transit Projects	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$19.7	$17.3	$18.2	$19.2	$20.3	$94.7
Actuals/Forecast ($MM)	$12.4	$13.5	$13.8	$16.5	$15.6	$71.8

APX A04 – Transmitter Upgrades

Since the M-Factor application the only major change against the DSP plan have been delays on the Hydro One Networks Inc. (HONI) project to rebuild circuit E3/4B to 230 kV (Essa to Barrie TS project) and the subsequently the upgrade of 75/125 MVA rated transformers. Work required by Alectra Utilities to support these investments was deferred from 2021 to 2022/2023. HONI received the approval for its application (EB-2018-0117) for leave to upgrade existing transmission line facilities in the Barrie area in April 2020. As per the latest project plans obtained from HONI, Alectra Utilities is required to relocate 23M24 Midhurst TS feeder in 2022 and relocate the six feeders from Barrie TS along with the corresponding primary metering infrastructure in 2023.

Table A04 - 6: Historical & Proposed Investment Spending Post EB-2019-0018

Transmitter Related Upgrades	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$0.6	$2.2	$0.0	$0.0	$0.0	$2.8
Actuals/Forecast ($MM)	-$0.2	$0.2	$1.3	$1.2	$0.1	$2.6

APX A05 – OH Asset Renewal

Stemming from the denial of the M-Factor application seeking incremental funds to bridge the gap between the level of investment required to support the DSP and funding available from base rates, Alectra Utilities adjusted the capital investment for Overhead Asset Renewal projects. Following the announcement in March 2020 by the Province of Ontario, declaring a province-wide state of emergency in order to protect the public and help contain the spread of COVID-19, the capital program was executed on an emergency basis. During emergency mode operations, capital work was limited to construction work related to essential services such as transit projects, hospital and related construction, as well as residential developments already in progress. This resulted in a reduced level of customer driven construction work in customer connections, road authority and customer driven expansion work. Alectra Utilities reallocated available funding due to deferrals of customer driven work into necessary and urgent system renewal investments in overhead distribution infrastructure.

With an increased emphasis on expansion of telecommunications and availability of fast internet infrastructure, Municipal and Regional Governments imposed increased requirements on Alectra Utilities to expeditiously make available and remove redundant overhead infrastructure previously utilized by telecommunication companies. Such increased requirements by Municipal Governments and Regional Authorities required Alectra Utilities to increase the level of investment in joint use capital work above levels planned in the DSP.

With an increased emphasis on expansion of telecommunications and availability of fast internet infrastructure, Municipal and Regional Governments imposed increased requirements on Alectra Utilities to expeditiously make available and remove redundant overhead infrastructure previously utilized by telecommunication companies. Such increased requirements by Municipal Governments and Regional Authorities required Alectra Utilities to increase the level of investment in joint use capital work above levels planned in the DSP.

Given other Reliability needs within the system, especially towards Underground Cable remediation, Voltage Conversion projects were deferred, with investments limited to completion of ongoing projects in order to re-allocate investment funds towards Underground Renewal. While this was successful in the 2020-2022 period, delay of these investments has reached the point where Alectra Utilities must now accelerate plans in 2023 and 2024, which are now also more expensive due to inflation, in order to manage both deteriorating line and station assets.

Table A05-22 provides a comparison of DSP investment levels to expenditures in 2020 and 2021 along with forecast expenditures for 2022 to 2024 for the Overhead Asset Renewal.

Table A05 - 22: Historical & Proposed Investment Spending Post EB-2019-0018

Overhead Asset Renewal	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	***$34.3***	***$34.7***	***$39.3***	***$30.9***	***$37.6***	$176.8
Actuals/Forecast ($MM)	***$32.8***	***$39.7***	***$36.7***	***$39.7***	***$46.8***	$195.7
DSP Plan - Deteriorated Assets ($MM)	$22.5	$24.1	$25.2	$25.8	$26.3	$123.9
Actuals/Forecast - Deteriorated Assets ($MM)	$22.5	$25.4	$22.5	$26.0	$26.1	$122.5
DSP Plan - Voltage Conversions ($MM)	$11.1	$9.9	$13.4	$4.4	$10.6	$49.4
Actuals/Forecast - Voltage Conversions ($MM)	$9.3	$10.2	$9.8	$8.5	$15.1	$52.9
DSP Plan - Joint Use ($MM)	$0.7	$0.7	$0.7	$0.7	$0.7	$3.5
Actuals/Forecast - Joint Use ($MM)	$1.0	$4.1	$4.4	$5.2	$5.6	$20.3

APX A06 – Reactive Renewal

Stemming from the denial of the M-Factor application seeking incremental funds to bridge the gap between the level of investment required to support the DSP and funding available from base rates, Alectra Utilities deferred capital investment of numerous planned renewal projects. As a result of reduced investment in planned capital work, Alectra Utilities was required to address an increasing volume and severity of equipment failures through reactive and emergency renewal. As stated in Section 4.2 above, Alectra Utilities has experienced an increasing trend in reactive renewal from 2019 to 2021 relative to historical levels. With reduced funding available to proactively address deteriorated assets in poor and very poor condition, Alectra Utilities managed the growing backlog of deteriorated and failing assets through increased expenditures in Reactive Capital. Table A06-6 provides a comparison of DSP investment levels to expenditures in 2020 and 2021 along with forecast expenditures for 2022 to 2024 for the Reactive Renewal.

Table A06 - 6: Historical & Proposed Investment Spending Post EB-2019-0018

Reactive Renewal	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$18.8	$19.2	$19.6	$20.0	$20.4	$98.0
Actuals/Forecast ($MM)	$22.5	$26.8	$21.1	$21.8	$22.3	$114.5

APX A07 – Rear Lot

Stemming from the denial of the M-Factor application seeking incremental funds to bridge the gap between the levels of investment required to support the DSP and available funding available from base rates, Alectra Utilities adjusted the capital investment for Rear Lot conversion projects. With limited funds, Alectra Utilities allocated available funds to more urgent reliability driven investment, especially towards Underground Cable remediation. Where safe and feasible, Rear Lot conversion projects have been deferred beyond 2024. Table A07-7 provides a comparison of DSP investment levels to expenditures in 2020 and 2021 along with forecast expenditures for 2022 to 2024 for the Rear Lot conversion projects.

Table A07 - 7: Historical & Proposed Investment Spending Post EB-2019-0018

Rear Lot Conversions	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$4.8	$1.2	$1.2	$4.2	$8.5	$20.0
Actuals/Forecast ($MM)	$2.4	$0.1	$1.1	$0.5	$1.0	$5.2

APX A08 – Substation Renewal

Stemming from the denial of the M-Factor application seeking incremental funds to bridge the gap between the level of investment required to support the DSP and funding available from base rates, Alectra Utilities deferred capital investment for numerous planned Substation Renewal projects. Despite this decrease, to support the increase in distribution automation, driven by reliability, investment in substation communication equipment was required. Alectra Utilities identified station communication equipment for renewal required to ensure the successful implementation of distribution automation. This additional investment resulted in a net increase in Substation Renewal spending by $1.6MM from 2022-2024. Other major substation rebuilds have been deferred in order mitigate this expenditure increase. For the 2022-2024 period 60% of the Substation Renewal budget is allocated to reactive or capital corrective work. Table A08-6 provides a comparison of DSP investment levels to expenditures in 2020 and 2021 along with forecast expenditures for 2022 to 2024 for the Substation Renewal projects.

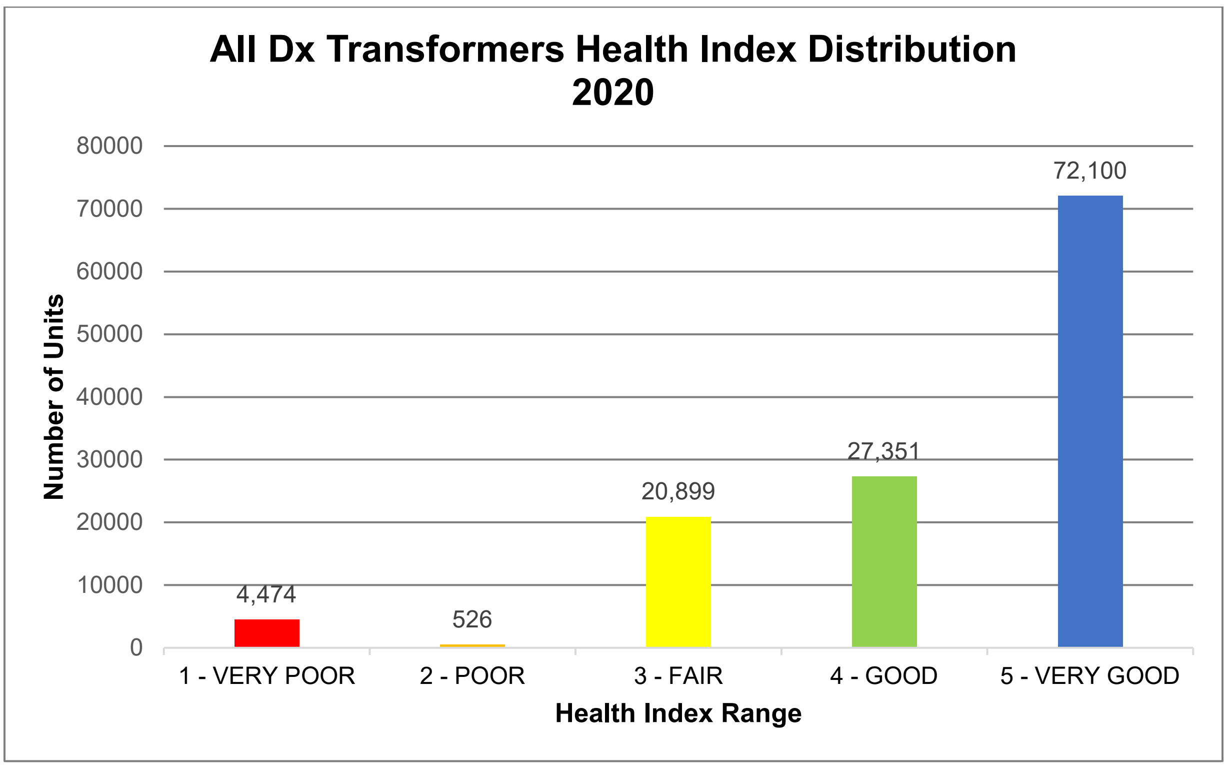
Table A08 - 6: Historical & Proposed Investment Spending Post EB-2019-0018

Substation Renewal	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$12.8	$4.4	$2.8	$3.2	$5.5	$28.7
Actuals/Forecast ($MM)	$10.5	$7.3	$4.8	$5.0	$4.7	$32.4

APX A09 – TX Renewal

Figure A09-5 illustrates the health index distribution generated through the 2020 ACA process. Alectra Utilities identified 5,000 transformers in the Very Poor and Poor category as of 2020.

Figure A09 - 5: Distribution Transformer Condition Demographics (2020)



There are 2,002 more units in the Very Poor and Poor category in 2020 than in 2018. As forecasted in Section 3.1, page 6, Lines 6-13, more than 2,000 transformers would be found to be in Very Poor and Poor category within three years of inspection.

Alectra Utilities is continuing with the Transformer Renewal strategy as planned in the DSP as there is no significant change from the forecast. Alectra Utilities will prioritize the replacement of leaking transformers and transformers with PCB oil content and significant corrosion. This revised plan accounts for the discrepancy between the DSP spend and the forecast spend in Table A09-7.

Table A09 - 1: Historical & Proposed Investment Spending Post EB-2019-0018

Transformer Renewal	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$5.5	$6.3	$7.0	$7.4	$7.8	$34.0
Actuals/Forecast ($MM)	$5.8	$6.9	$6.4	$7.2	$7.5	$33.8

APX A10 – UG Renewal

Following the decision on the M-factor application by Alectra Utilities, adjustments to the capital portfolio had to be undertaken. Additionally, COVID had a substantial impact on System Access expenditures allowing for Alectra Utilities to refocus its spending. This resulted in 2020 being largely aligned with the DSP projected spend. However, in 2021 onwards, there is a reduction in the proposed spend relative to the DSP. This variance is driven by increases in IT, the increase in joint use spending under Overhead Renewal, Reactive Capital and Customer Connections (driven by customer-initiated work). The increase in spending in these areas have impacted Alectra Utilities ability to ability to fund planned capital work on Underground Renewal, specifically Cable and Cable Accessories.

While Alectra Utilities has decreased planned work on switchgear replacement, over the 2020-2024 period unfortunately, costs have increased on 'near term' projects.

Near Term projects are projects that are required to address an urgent issue that must be dealt with in the current year and were previously unplanned, as they arise during the year. These 'near term' projects are largely cable related, cable renewal accounts for 68% of the spend in 2020, and 55% of the 2021 total near term spend. Cable projects under this category are executed based on immediate need to address significant reliability impacts which can not be repaired, and do not meet the criteria for reactive replacement. These cables fall into what Alectra Utilities has categorized as 'near term' projects.

A complete breakdown of the Underground Renewal spend by subcategory is also provided in Table A10-6 to align with the information provided within the DSP.

Table A10 - 2: Historical & Proposed Investment Spending Post EB-2019-0018

UG Renewal	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$61.1	$74.5	$82.2	$88.5	$95.5	$401.8
Actuals/Forecast ($MM)	$61.5	$55.6	$55.3	$75.9	$80.6	$328.9
Cable & Cable Accessories - DSP Plan ($MM)	$48.0	$61.1	$68.3	$74.2	$81.0	$332.6

Cable & Cable Accessories - Actuals/Forecast ($MM)	$46.9	$38.9	$40.4	$60.1	$65.3	$251.6
Switchgear - DSP Plan ($MM)	$7.4	$7.6	$7.9	$8.1	$8.3	$39.3
Switchgear - Actuals/Forecast ($MM)	$5.5	$5.4	$6.1	$6.5	$6.9	$30.4
Civil Structures - DSP Plan ($MM)	$0.8	$0.8	$0.8	$0.8	$0.9	$4.1
Civil Structures - Actuals/Forecast ($MM)	$1.1	$1.2	$1.9	$2.1	$2.1	$8.4
Near Term projects - DSP Plan ($MM)	$4.9	$5.0	$5.2	$5.4	$5.3	$25.8
Near Term projects - Actuals/Forecast ($MM)	$8.0	$10.1	$6.9	$7.2	$6.3	$38.5

APX A11 – SCADA Automation

Stemming from the denial of the M-Factor application seeking incremental funds to bridge the gap between the level of investment required to support the DSP and funding available from base rates, Alectra Utilities deferred capital investment for numerous planned renewal projects. As a result, Alectra Utilities is managing a growing backlog of deteriorated assets, prone to failure. To mitigate the impact on the duration of outages, Alectra Utilities has increased focus on the deployment of distribution automation.

Alectra Utilities set a corporate target to add new distribution automation devices in the system each year from 2021-2025 (Number of Devices Per Year: 85, 88, 91, 94, 97). To support this initiative, Alectra Utilities applied for funding from Natural Resource Canada (“NRCan”) in connection with their Smart Grid Program which will offset the cost of this project, if approved. This investment will improve reliability, increase grid flexibility, reduce GHG emissions and improve utilization of system capacity. The funding from NRCan, if approved, will offset a portion of Distribution Automation investments in the DSP such that Alectra Utilities will have reduced budgets for years 2022 to 2025.

Table A11-6 provides a comparison of DSP investment levels to expenditures in 2020 and 2021 along with forecast expenditures for 2022 to 2024 for the SCADA & Automation projects. Increased investment in Automation for 2021 relative to investment planned of the DSP reflect the increased number of automation devices installed. The Forecast for 2022 to 2024 time period includes capital contributions applied to NRCan under the Smart Grid Program.

Table A11-6 – Historical and Proposed Investment Spending

SCADA & Automation	2020	2021	2022	2023	2024	Total

DSP Forecast ($M)	$3.4	$3.6	$3.7	$3.8	$4.7	$19.1
Actuals/Forecast ($MM)	$3.4	$9.0	$4.7	$2.4	$2.8	$22.3

APX A12 – Lines Capacity

The amount of investment in Lines Capacity each year is now paced to match timing of known and committed development, considering available capacity, and expected load growth, net of conservation and demand side management persistence.

Alectra Utilities completed a comprehensive review of the all the projects following the denial of the M-Factor application. Investments in the line capacity projects were deferred to meet the need for investment in underground asset renewal starting in 2019.

Alectra Utilities' network design is an open grid with multiple feeders interconnected via normally open points. Feeders are designed for full backup capability over peak summer loading conditions through the switching of load to an adjacent feeder or multiple adjacent feeders to account for contingency conditions. Each feeder on average serves 400-2500 customers depending on the voltage class of the feeder. To facilitate restoration capability, Alectra Utilities plans the feeder load to be 2/3 the lesser of the egress cable rating or the 600 amp contingency rating.[1] For example, 27.6 kV feeder loading will be planned to a maximum of 400 amps under normal operation; 2/3 of 600 amp contingency rating.

Alectra Utilities has deferred investment in the lines capacity and is currently operating the feeders over the planning limit. This leads to following undesirable situation.

- Feeders which are over the planning limit cannot back up other feeders during the planned outage or contingency conditions which may lead to extended outage time and impact reliability.
- Feeders which are over the planning limit cannot accommodate new load or support existing customer expansions. Bringing additional feeder to support new growth requires minimum of 2-3 years depending on the location of station or 1-2 years for a feeder extension. This creates challenges in meeting customer timelines and may result in substantial capital contribution from the customers. As Alectra Utilities may be unable to meet the customer timelines business seek opportunities elsewhere which is detrimental to growth in communities. In case of residential developments this delay result in exacerbating the housing problem faced in the GTA.

[1] The "egress rating" is the maximum capacity of the underground cable emanating from the station. The contingency rating is the maximum load on the feeder during an N-1 contingency situation. Typically the overhead feeders are sectionalized such that during contingency condition half the load of the feeder (approximately. 200A) can be transferred to another to another feeders.

Table A12-7 identifies the historical investments in 2020 and 2021 and forecast for 2022 to 2026.

Table A12-7 – Historical and Proposed Investment Spending

Capacity (Lines)	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$21.1	$24.0	$23.9	$26.4	$14.8	$110.1
Actuals/Forecast ($MM)	$11.2	$7.0	$11.2	$12.2	$11.7	$53.4

APX A13 – Stations Capacity

The amount of investment in stations capacity (station land purchases and construction) are determined based on the load growth, future CDM/DG contributions and known and forecasted development.

Table A13-13 identifies the historical investment in 2020 and 2021 and forecast for 2022 to 2026.

Table A13-13 – Historical and Forecast Investment Spending

Capacity (Stations)	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$0.8	$0.8	$0.8	$5.2	$12.0	$19.6
Actuals/Forecast ($MM)	$0.7	$5.3	$2.6	$0.7	$0.8	$10.1

Alectra Utilities completes an annual load forecasting and system adequacy assessment and reviews its infrastructure plans in light of the annual forecast and new developments. COVID-19 has impacted the pace of the developments; subsequently Alectra Utilities has adjusted the capital plan for Station Capacity to reflect the pace of the developments.

The following are the changes from the original plan:

- Alectra Utilities has deferred the station build in Alliston (projects: 101569,101570,101571) and land purchase and design for the Barrie substation (projects: 101542,100461,101542)
    - The industrial load underpinning the station in Alliston and Barrie has not materialized and hence the station land purchase, design and preconstruction has been deferred. The total deferral amount is $5.34MM.
- The 2020-2024 DSP outlined the need for two new stations in downtown Mississauga: Duke MS and Webb MS. The DSP proposed in service date of Duke MS was 2024 of Duke MS while the Webb MS was 2027.
    - The forecasted land purchase for the Webb and Duke MS have been completed.

- Alectra Utilities has received development applications for 22 high rise buildings which will require approximately 35MW. The growth in the downtown Mississauga continues with the pace of the developments in south end exceeding the North. Webb MS serves the south of downtown Mississauga while Duke will serve the North.

Based on the available station capacity and timing of developments; Alectra Utilities has reassessed the timing and requires Webb MS to be in-service by 2026 while Duke MS will require to be in-service by 2028. Subsequently, Alectra Utilities directed the Duke MS funding new Webb MS.

APX A14 – System Control, Communications & Performance

In the subsequent years after the M-Factor decision Alectra Utilities has been required to review investment pacing as a result of funding below that proposed by its DSP. Table A14-6 provides the historical actual spend and proposed spending in the 2020-2024 period.

Due to the increasing expenditures on reactive renewal and a commitment to maintain reliability Alectra Utilities decided that increased funding in distribution automation was required. However, while increased automation assists in reducing outage duration it also requires additional communication infrastructure to support it. This increased spending is reflected in the 2022-2024 forecast and accounts for the significant difference from the DSP plan.

Table A14 - 6: Historical & Proposed Investment Spending Post EB-2019-0018

System Control, Communications & Performance	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$6.6	$5.8	$4.7	$4.1	$2.8	$23.9
Actuals/Forecast ($MM)	$5.5	$4.2	$5.9	$6.1	$4.0	$25.7

APX A15 – Safety & Security

Alectra Utilities has completed replacement of #6 Overhead conductors in all of the high priority areas. The concern with #6 conductor is the extremely high likelihood of failure resulting in a wire down and serious public safety risk. While this wire still exists in Alectra Utilities service territory the high priority areas have been addressed. For the remaining areas, Alectra Utilities has paced out the replacement for a longer period to manage funding (Table A15-5), however this puts Alectra Utilities in a difficult situation. The longer the #6 conductor stays in the system, the more likelihood failure will occur which poses safety risks to the public and to Alectra Utilities staff. The funding currently allocated for 2022-2024 is for

Sorbwed Oil Containment at municipal stations for environmental protection of a station transformer oil containment failure.

Table A15 – 5: Historical & Proposed Investment Spending Post EB-2019-0018

Safety & Security	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$5.4	$2.0	$2.0	$2.0	$2.0	$13.4
Actuals/Forecast ($MM)	$5.6	$2.6	$1.6	$1.6	$1.4	$12.8

APX A16 – Distributed Energy Resources (DER)

As a result of the COVID-19 global pandemic in 2020 and 2021 Alectra Utilities was unable to complete investment under the DER category. As a result the timing of these investments have been pushed into the 2022-2024 time frame. Additionally pushing these investments out has also been impacted by inflation (also tied to the pandemic) ultimately causing an increase in spend relative to the DSP. Table A16-6 provides the breakdown from 2020-2024 highlight the information provided above.

Table A16 - 6: Historical & Proposed Investment Spending Post EB-2019-0018

Distributed Energy Resources (DER) Integration	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$0.7	$0.7	$0.9	$0.9	$0.9	$4.1
Actuals/Forecast ($MM)	$0.4	$0.3	$1.2	$1.4	$1.3	$4.6

APX A17 – Facilities

Due to COVID-19 additional costs were incurred in 2020 to update facilities to create a safe work environment. These were completed based on Government COVID-19 guidelines and protocols. Examples: UV Light filtration systems in all HVAC Units for all sites, plexiglass dividers for (hallways, cubicles, desks, meetings rooms), etc. Additionally, this impacted the schedule of planned investments pushing costs further out to 2024. For example, the Derry Road generator originally scheduled for 2021 is now in 2024. Similarly, investments in Alectra West and Southwest were pushed to 2024 increasing the spend by an additional $1MM.

Table A17 - 6: Historical & Proposed Investment Spending Post EB-2019-0018

Facilities	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$4.2	$2.6	$2.9	$4.6	$3.5	$17.8
Actuals/Forecast ($MM)	$7.4	$2.6	$3.4	$4.3	$5.9	$23.6

APX A18 – Information Technology

As a result of the COVID-19 global pandemic, Alectra Utilities shifted the majority of its staff to working remotely. This change in day to day operations shifted the focus for IT to enable that effort to take place, ensuring resources had the equipment to work remotely, and securely to the corporate network.

Working on ensuring this transition of remote work occurred resulted in IT resources pausing previously scheduled projects. Additionally, with many external resources and support companies for IT related projects also working remotely the ability to effective execute these projects, especially ones that are hardware dependent became extremely difficult to complete. This resulted in lower IT expenditures in the 2020 and 2021 time period.

As the COVID-19 pandamic wanes and the relaxation of safety measures from Health Authorities, resources are returning back to the office which enables Alectra to complete the paused investments, which adds additional pressure on the 2022-2024 budget. The increase in expenditure relative to the DSP is primarily driven by the need to enhance information systems to improve efficiency and advance innovative technology into practice. Specifically, the increase in IT investments over the 2020-2024 period due to:

- The implementation of customer experience applications and processes. This project will enhance the customer experience and customer satisfaction through digital transformation by applying a "one-window" approach to provide a unified and personal solution for all customer interactions;
- Enhancements to Alectra's investment portfolio planning system to align investment planning, optimization and resource allocation. This includes the addition of modules to manage assets throughout the operational lifecycle and updating of the investment criteria model to ensure traditional and emerging investments are appropriately evaluated and incorporated into future capital investment plans;
- Additional investment in Cyber Security, IT infrastructure hardware and software to support efficient business operations and communications (e.g., support WFH requirements during the pandemic);
- Planned purchases of additional application licences and implementation of Robotic Process Automation to advance artificial intelligence technology onto high volume, and repeatable tasks; and

- Enhancements to systems to enable business optimization/business processes (customer connections process; IVR enhancements; tablets for inspection and maintenance; upgrades to the Outage Management System etc.).
- Investment to support the centralization and enterprise sharing of data (Data Analytics)

Table A18 - 15: Historical & Proposed Investment Spending Post EB-2019-0018

Information Technology	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$15.1	$18.2	$19.8	$12.3	$8.4	$73.8
Actuals/Forecast ($MM)	$13.8	$13.8	$29.3	$29.4	$21.8	$108.1

APX A19 – Fleet

Following the decision, Alectra Utilities undertook an additional asset condition assessment on fleet vehicles, and undertook two additional levels of analysis on risk and condition impacts to operations. The first assessment determined which vehicles had the lowest risk of failure, while the second analysis sorted those by impact on operations if they failed. As can be seen in Table A19-17 the result was Alectra Utilities, due to lack of funding, accepted an additional $8.4MM in risk from deferred fleet investments.

Table A19 - 17: Historical & Proposed Investment Spending Post EB-2019-0018

Fleet	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$8.9	$9.5	$9.9	$10.3	$10.2	$48.7
Actuals/Forecast ($MM)	$8.1	$6.6	$7.3	$7.7	$10.6	$40.3

Additionally, COVID has impacted vehicle supply chain and costs. This additional impact, along with the deferred investment has resulted in Alectra Utilities leasing vehicles to maintain operations over the past few years. Vehicle reliability and availability is extremely important to maintain and support systems projects, maintenance programs and responding to customers. Without it, capital projects cannot be executed or completed on time, customer response times would be longer and planned systems maintenance programs would be reduced, ultimately increasing system failures. Due to the impacts of COVID on vehicle supply chain, funding certainty for fleet investments is required. Without these funds vehicle purchases may be delayed increasing costs, and risks above what Alectra Utilities, and its customers can tolerate.

APX A20 – CCRA

CCRA payments are bound contractual agreements with HONI. Alectra Utilities continues to work with HONI in settling these CCRA true-up payments. COVID has impacted the settlement timing of these CCRAs, as resources from both Alectra Utilities and HONI were directed to essential work. The original timing of settling the Goreway and Midhurst CCRA was 2020. In 2021, Alectra Utilities settled the Goreway CCRA with HONI at amount of $5.54MM. Alectra Utilities plan to settle the Midhurst CCRA in 2022 and Vansickle CCRA in 2023. Alectra Utilities plan to settle the Midhurst CCRA and Vansicle CCRA in 2023.

Table A20 – 6: Historical & Proposed Investment Spending Post EB-2019-0018

Connection and Cost Recovery Agreements	2020	2021	2022	2023	2024	Total
DSP Plan ($MM)	$8.7	$1.6	$0.0	$0.5	$0.0	$10.8
Actuals/Forecast ($MM)	$0.0	$5.5	$0.4	$0.6	$0.0	$6.5

SEC-11

Attachment 5
Variance to DSP Schedule

Variance by Material Investment Category ($MM)	2020	2021	2022	2023	2024	Total	Percentage Change Relative to DSP for Category
A01 — Network Metering	2.2	0.0	2.8	0.8	0.5	6.3	9.98%
A02 — Customer Connections	2.4	6.3	2.0	2.9	2.0	15.6	9.00%
A03 — Road Authority & Transit Projects	(7.3)	(3.8)	(4.4)	(2.7)	(4.7)	(22.9)	-24.18%
A04 — Transmitter Related Upgrades	(0.8)	(2.0)	1.3	1.2	0.1	(0.2)	7.14%
A05 — Overhead Asset Renewal	(1.5)	5.0	(2.6)	8.8	9.2	18.9	10.69%
A06 — Reactive Capital	3.6	7.6	1.5	1.8	1.9	16.5	16.85%
A07 — Rear Lot conversion	(2.4)	(1.0)	(0.1)	(3.7)	(7.5)	(14.8)	-74.17%
A08 — Substation Renewal	(2.2)	2.9	2.0	1.8	(0.8)	3.6	12.58%
A09 — Transformer Renewal	0.3	0.6	(0.6)	(0.2)	(0.3)	(0.2)	-0.69%
A10 — Underground Asset Renewal	0.4	(18.9)	(26.9)	(12.6)	(14.9)	(72.9)	-18.14%
A11 — SCADA & Automation	0.0	5.5	1.0	(1.4)	(1.9)	3.3	17.14%
A12 — Lines Capacity	(9.9)	(16.9)	(12.7)	(14.2)	(3.1)	(56.8)	-51.55%
A13 — Stations Capacity	(0.1)	4.6	1.8	(4.5)	(11.2)	(9.5)	-48.39%
A14 — System Control, Comunications & Performance	(1.1)	(1.6)	1.2	2.0	1.2	1.8	7.36%
A15 — Safety & Security	0.2	0.5	(0.4)	(0.4)	(0.6)	(0.7)	-4.99%
A16 — DER Integration	(0.3)	(0.4)	0.3	0.5	0.4	0.5	13.30%
A17 — Facilities Management	(1.2)	3.2	0.0	0.5	(0.3)	2.2	12.36%
A18 — Information Technology Systems	(1.3)	(4.4)	9.5	17.1	13.4	34.3	46.48%
A19 — Fleet Renewal	(0.7)	(2.9)	(2.6)	(2.6)	0.4	(8.4)	-17.20%
A20 — CCRA	(8.7)	3.9	0.4	0.1	0.0	(4.3)	-39.81%

SEC-12

Reference: Exhibit 4, Tab 1, Schedule 1, Attachment 12, p.7

Please provide details regarding the weighted inspection scores, including scoring categories and their weights.

Response:

Please see Alectra Utilities' response to SEC-11, Attachment 1. The 2020 ACA report contains all the weighted inspection scores, categories and weights for each asset class provided in the report.

SEC-13

Reference: Exhibit 4, Tab 1, Schedule 1, Attachment 12, p.8

Please confirm if the Applicant's ACA has taken into account only the age of the assets in assessing the condition of any category of its assets.

Response:

Age is not the only input in determining the cable condition using the Health Index. Alectra Utilities tracks cable failures as part of its reliability statistics and investigates cable failure events to understand causes. Alectra Utilities performs cable testing on selected segments and tracks age, cable type (XLPE, Tree Retardant ("TR") XLPE, PILC, EPR), construction type (in-duct, direct buried) for each cable segment. Alectra Utilities also tracks cable segments that have been injected and the date of injection (rejuvenation). All of these factors are considered in the Health Index calculation. Other factors such as reliability, loading, civil asset condition, etc. also impact Alectra Utilities' evaluation of assets during project development. Please also see Alectra Utilities' response to SEC-11 (Attachment 1, pp.49-50) and AMPCO-16 h).

SEC-14

Reference: Exhibit 4, Tab 1, Schedule 1, Attachment 12, p.19

Please explain the forecasted significant increase in the general plant category in 2023 and 2024 in comparison to the average from 2020 to 2022, especially in light of this ICM application seeking additional system renewal capital funding.

Response:

Based on Tables 1 and 2 from Exhibit 4, Tab 1, Schedule 1, Attachment 12, pp.19-20, the increase in General Plant investments projected in 2023 and 2024 compared to the average spend from 2020 to 2022, is primarily due to an increase in Information Technology (”IT”) investments.

As provided in Exhibit 3, Tab 1 Schedule 1, pp.8-9, the increase in IT is driven by investments in customer experience applications and processes; enhancements to systems to enable business optimization; and investments in ongoing IT infrastructure to support efficient business operations and communications.

Table 1 summarizes the material changes in the 2020 to 2024 Adjusted Capital Plan for IT investments, relative to the DSP.

Table 1 – Summary of Material IT Changes ($MM)

Summary of Material Changes - IT	2020	2021	2022	2023	2024	Total
Implementation of Customer Experience applications and Processes	0.0	0.6	3.2	4.2	1.6	9.5
Business process and application optimization	(2.3)	(4.9)	2.0	8.8	2.7	6.2
Operational technology	0.1	(0.8)	1.7	0.7	4.2	5.8
Enhancements to Utility investment portfolio planning system (Copperleaf)	(0.1)	1.2	1.6	1.7	0.5	4.8
IT Client Computing, Server and Network	1.3	(0.1)	0.0	0.4	1.6	3.2
Enhancements to security/data platforms and network architecture for Grid Modernization	(0.3)	(0.2)	1.4	0.8	0.6	2.2
Workforce Management System	0.0	0.0	(1.6)	0.5	2.5	1.5
Security cost increases	0.1	(0.2)	1.3	0.1	(0.2)	1.1
Total	**(1.3)**	**(4.4)**	**9.5**	**17.1**	**13.4**	**34.3**

Customer Experience

Based on research Alectra Utilities conducted in late 2019 to understand the customer experience, the urgency for this project is to address areas that were identified by customers as requiring improvement, including eliminating disjointed interfaces, improving energy management insights, improving self-service options, adding flexibility to payment and billing presentation and options, eliminating multiple interactions, improving outage communications, delivering added value to commercial and industrial (C&I) customers and improving communications for new customers.

Timely execution of the project will allow Alectra Utilities to optimize the operation of assets and related processes and enhance the customer experience. The project will be delivered in three phases: i) Leverage the existing systems (unified presentation layer, expand self-service, enhance e-Billing services, enhance collections, and deliver power outage notifications) and enhance New Services portal; ii) Enhancing Beyond (automate processes, deliver insights and analytics, introduce Welcome Packages, Hyper-Personalize Interactions, Introduce Signature Services); and iii) Growth (new products, value offerings).

Business Process Optimization

Investments to enhance Business and IT applications and hardware increased by $6.2M over the 2020 to 2024 period, compared to the original DSP submission. The primary driver of the increase in these costs is attributable to additional system functionality to accommodate business needs and security standards as processes are now being optimized on integrated systems at Alectra. System upgrade costs have increased on software applications to address the need for improved system security and to prevent any application vulnerability.

Operational technology

Operational technology (“OT”) primarily includes investments in Alectra Utilities’ Outage Management System (“OMS), Supervisory Control and Data Acquisition (“SCADA”), and Geographical Information System (“GIS”) systems. OT enables the monitoring, control and operation of the distribution networks. For example, the Adjusted Capital Plan includes investment to incorporate additional linkages, ties, monitoring and automation to improve grid flexibility, reduce outage restoration times, balance feeder loading and mitigate the need for system expansion. System Service investments in SCADA, Automation, System Control and Communications infrastructure have increased $4.5MM to modernize the distribution system (please also see Alectra Utilities' response to 1-Staff-17). These SCADA-enabled assets in the field must be supported by the corresponding IT operational software and hardware, which includes the backbone servers of data associated with the OMS and SCADA systems.

Enhancements to Utility investment portfolio planning system (Copperleaf)

The increase of expenditure in the Copperleaf investment planning system is driven by the need to evolve from condition-based asset management to predictive asset management practices. Additional system modules including the Enterprise Asset Management, when combined with the Asset Analytics Platform, enable Alectra Utilities to manage asset Lifecyle processes to maximize the utilization of assets, minimize risk of failure and pace the renewal of assets through predictive analytics. Alectra Utilities has identified the need for further enhancements of the Copperleaf system to integrate with project management, data analytics, grid modernization and work program delivery systems to share information in real-time to plan, monitor and report on work completion. In addition, the tool will become the single repository for all business case needs to be utilized for purposes of the change management and project management teams in terms of labour resource allocation.

IT Client Computing, Server and Network

Investment is required to replace aging, out of warranty and end-of-life end user computing devices (laptops, desktops, field devices). New equipment 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 posture. IT Hardware assets support systems that are used to manage field crews and respond to outages, and are critical to the utility's ability to meet operational outcomes, including reliability. The COVID requirement to move staff to a laptop standard and the obligation to respond to the changing technical requirements from business departments also contributes to this investment. As a result, there was a need to upgrade network infrastructure to monitor network resources to ensure the availability of sufficient network bandwidth and upgrade network security to protect the increased number of users from cyberattacks.

Grid Modernization

Enabling a more sustainable electricity grid, by preparing for the potential of grid modernization technologies and integrating distributed energy resources ("DERs") into local electricity grid, is a strategic area of focus for Alectra. IT infrastructure is required to support the three key focus areas of Grid Edge Interfaces, Grid Technologies and Process Optimization. Specifically, Alectra Utilities will invest in data modelling, data analytics and business intelligence. Data Analytics involves the centralizing, management, and storage of shared data. Defining Alectra business processes to store and share data will drive efficiencies, support process automation, allow for quicker and data-driven decision-making. By implementing the data analytics initiatives described above, Alectra will be able to better evaluate the existing capacity and asset utilization, the efficiencies of our current cyclical vegetation management and its impact on Alectra's reliability performance. The use of predictive maintenance to reduce the cost of asset maintenance by switching to condition-based maintenance and draw valuable insights from historical data to identify problem areas and determine strategies to improve performance are also outputs of data programs as part of grid modernization.

Workforce Management ("WFM") System

The WFM solution will digitize job scheduling, resource crew allocations, and computerize the dispatch of grid work to field crews. WFM will also provide route optimization, and improve response time to short-duration field work which includes capital, maintenance, and reactive work. This project is a high priority because the volume and variety of capital and maintenance activity at Alectra Utilities has reached levels where a computerized 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 this tool will facilitate process automation, streamlining, and improvement. The new tool will allow jobs to be scheduled (or rescheduled) and dispatched more efficiently.

Security

The Investment in the Enterprise System Access of $0.5MM in 2021 and in Operational Technology Threat Detection of $0.3MM in 2020 are the primary drivers of the increased Security cost of $1.1MM over the 2020 to 2024 period compared to the DSP. Alectra Utilities invested in Enterprise System Access to ensure all privileged accounts are managed, tracked, and monitored with primary focus being all business-critical applications such as: JDE (Alectra's ERP), CC&B (Alectra's CIS), SCADA, GIS & OMS (Operational Technology platforms). The increase in these investments (OT Threat Detection and Enterprise System Access) were necessary to protect employee, customer information as well as the OT environment to align Alectra Utilities' systems with the requirements of the Ontario Cyber Security Framework.