EXHIBIT 2

RATE BASE

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RATE BASE OVERVIEW

1.1 RATE BASE OVERVIEW

Overview

The rate base used for the purpose of calculating the revenue requirement in this Application follows *Chapter 2 of the Filing Requirements for Electricity Distribution Applications* issued by the Ontario Energy Board ("Board") on June 24, 2021 (the "Filing Requirements"). In accordance with the Filing Requirements, Grimsby Power Incorporated (GPI) has calculated the rate base as an average of the net capital balances at the beginning and the end of the 2022 Test Year plus a working capital allowance, which is 7.5% of the sum of the cost of power and controllable expenses.

The net fixed assets include distribution assets that are associated with activities that enable the conveyance of electricity for distribution purposes. Contributed capital from third parties has been included in the average net book value calculation. For purposes of this Exhibit, distribution assets refer to those assets that are most directly related to the distribution system, such as poles, overhead and underground lines, and transformers. General plant refers to assets that support the operation of the distribution system such as computer hardware and software, vehicles, buildings, and equipment. Capital assets include property, plant and equipment ("PP&E") and intangible assets; these are referred to as "capital" or "fixed" assets throughout this evidence. The rate base calculation excludes any non-distribution assets.

Controllable expenses include operations and maintenance, billing and collecting, community relations and administration expenses.

Since its last Cost of Service application for 2016 rates, Grimsby Power has not applied for, nor received, any Incremental Capital Module ("ICM") adjustments.

For rate setting purposes, Grimsby Power has filed 2016 to 2022 Test year information using modified IFRS (MIFRS).

Grimsby Power has provided its rate base calculations for the years 2016 OEB Approved, 2016, 2017, 2018, 2019 and 2020 Actual, 2021 Bridge Year and 2022 Test Year in Table 2-1 below:

Table 2-1

Summary of Rate Base

2016 Board Approved to 2022 Test Year

Fixed Assets Description	2016 OEB Approved	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Actual	2021 Bridge Year	2022 Test Year
Gross Fixed Assets, Opening Balance	27,777,831	27,768,627	28,863,524	30,287,264	31,790,298	33,913,829	35,408,506	37,646,622
Gross Fixed Assets, Closing Balance	29,288,011	28,863,524	30,287,264	31,790,298	33,913,829	35,408,506	37,646,622	40,160,087
Average Gross Fixed Assets	**28,532,921**	**28,316,076**	**29,575,394**	**31,038,781**	**32,852,063**	**34,661,168**	**36,527,564**	**38,903,355**
Accumulated Depreciation, Opening Balance	5,488,649	5,479,445	6,471,429	7,456,062	8,474,431	9,519,127	10,657,751	11,849,473
Accumulated Depreciation, Closing Balance	6,522,970	6,471,429	7,456,062	8,474,431	9,519,127	10,657,751	11,849,473	13,093,073
Average Accumulated Depreciation	**6,005,810**	**5,975,437**	**6,963,745**	**7,965,246**	**8,996,779**	**10,088,439**	**11,253,612**	**12,471,273**
Average Net Book Value	**22,527,111**	**22,340,639**	**22,611,649**	**23,073,535**	**23,855,284**	**24,572,728**	**25,273,952**	**26,432,082**
Eligible Working Capital Expenses	**2016 OEB Approved**	**2016 Actual**	**2017 Actual**	**2018 Actual**	**2019 Actual**	**2020 Actual**	**2021 Bridge Year**	**2022 Test Year**
Cost of Power	24,178,909	22,644,068	23,381,553	24,578,974	27,218,144	33,957,950	28,983,124	29,756,512
Operations	699,287	786,475	800,624	876,797	831,139	938,714	940,797	929,860
Maintenance	587,574	661,048	497,770	624,703	640,714	644,984	534,030	628,908
Billing & Collecting	533,068	590,853	587,960	739,770	488,201	585,847	669,081	719,553
Admin & General Expense	1,291,536	1,465,636	1,171,456	1,151,879	1,210,603	1,370,419	1,356,542	1,719,947
Donations - LEAP	7,528	5,375	6,850	6,303	6,303	6,303	6,303	8,485
Property Taxes	27,594	26,113	29,610	32,455	35,547	39,416	39,416	43,800
Total Eligible Working Capital Expenses	**27,325,496**	**26,179,568**	**26,475,821**	**28,010,882**	**30,430,652**	**37,543,634**	**32,529,293**	**33,807,065**
Working Capital Allowance (%)	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%	7.50%
Working Capital Allowance	**2,049,412**	**1,963,468**	**1,985,687**	**2,100,816**	**2,282,299**	**2,815,773**	**2,439,697**	**2,535,530**
Rate Base	**24,576,524**	**24,304,106**	**24,597,335**	**25,174,351**	**26,137,583**	**27,388,501**	**27,713,649**	**28,967,612**

Rate Base Variance Analysis

Based on the Grimsby Power's annual revenue (under ten million) the materiality threshold is set at $50,000.

Table 2-2

Rate Base Materiality

2022 Test Year

Description	2022 Test Year
Distribution Revenue Requirement	$6,541,606
Materiality Threshold under $10,000,000 of Distribution Revenue	$50,000

In order to present a detailed explanation of the annual change in Grimsby Power's rate base from 2016 Board Approved rate base to the 2022 Test Year rate base, the narrative below describes variances in both the average net book value and working capital expenses.

Table 2-3

Variance of Rate Base

2016 Actual vs. 2016 Board Approved

Description	2016 OEB Approved	2016 Actual	Variance from 2016 OEB Approved	Variance from 2016 OEB Approved %
Gross Fixed Assets, Opening Balance	27,777,831	27,768,627	- 9,204	-0.03%
Gross Fixed Assets, Closing Balance	29,288,011	28,863,524	- 424,486	-1.45%
Average Gross Fixed Assets	**28,532,921**	**28,316,076**	**- 216,845**	**-0.76%**
Accumulated Depreciation, Opening Balance	5,488,649	5,479,445	- 9,205	-0.17%
Accumulated Depreciation, Closing Balance	6,522,970	6,471,429	- 51,541	-0.79%
Average Accumulated Depreciation	**6,005,810**	**5,975,437**	**- 30,373**	**-0.51%**
Average Net Book Value	**22,527,111**	**22,340,639**	**- 186,473**	**-0.83%**
Eligible Working Capital Expenses	**2016 OEB Approved**	**2016 Actual**	**Variance from 2016 OEB Approved**	**Variance from 2016 OEB Approved %**
Cost of Power	24,178,909	22,644,068	- 1,534,841	-6.35%
Operations	699,287	786,475	87,188	12.47%
Maintenance	587,574	661,048	73,474	12.50%
Billing & Collecting	533,068	590,853	57,785	10.84%
Admin & General Expense	1,291,536	1,465,636	174,101	13.48%
Donations - LEAP	7,528	5,375	- 2,153	-28.60%
Property Taxes	27,594	26,113	- 1,481	-5.37%
Total Eligible Working Capital Expenses	**27,325,496**	**26,179,568**	**- 1,145,928**	**-4.19%**
Working Capital Allowance (%)	7.50%	7.50%		
Working Capital Allowance	**2,049,412**	**1,963,468**	**- 85,945**	**-4.19%**
Rate Base	**24,576,524**	**24,304,106**	**- 272,417**	**-1.11%**

The variance between the 2016 Actual and 2016 Board approved Rate Base was ($272,417) or 1.11% below OEB approved rate base. The main drivers that explain the variance are:

1. Lower actual Gross Fixed Asset balance of $424,485 was mainly due to underspending in System Access, System Service and General Plan categories. Underspending of $277k in System Access was primarily associated with residential expansion which contains Assumed Plant, Customer Work Order, and Residential subdivisions. GPI energized 22 connections in 2016, which was significantly lower than forecasted plan. GPI works closely with all applicable agencies to forecast approximate number of connections annually, but the actual timing of the connections is dependent on external factors that cannot be controlled by GPI such as development construction progress. System Access overspend of $292k took place in 2017, which was due to the connections forecasted in 2016 but connected in 2017. The underspend variance in System Service was primarily associated with deferral of NW TS

automation improvements, as well as reclosers installation that carried over to 2017. Finally, the underspent of $141k in General Plant investment portfolio was primarily associated with deferral from 2016 to 2017 of purchasing SCADA system. General Plant overspend of $124k took place in 2017 as a result of the SCADA system deferral from 2016.

2. Lower cost of power expenses compared to OEB approved. In the approved cost of power expenses the expected purchases were 194,483,857 kWh. In 2016 GPI only purchases 189,916,010 kWh, 4,567,847 less than 2016 OEB approved.

Table 2-4

Variance of Rate Base

2017 Actual vs. 2016 Actual

Description	2016 Actual	2017 Actual	Variance from 2017 Actual	Variance from 2017 Actual %
Gross Fixed Assets, Opening Balance	27,768,627	28,863,524	1,094,898	3.94%
Gross Fixed Assets, Closing Balance	28,863,524	30,287,264	1,423,739	4.93%
Average Gross Fixed Assets	**28,316,076**	**29,575,394**	**1,259,318**	**4.45%**
Accumulated Depreciation, Opening Balance	5,479,445	6,471,429	991,984	18.10%
Accumulated Depreciation, Closing Balance	6,471,429	7,456,062	984,632	15.22%
Average Accumulated Depreciation	**5,975,437**	**6,963,745**	**988,308**	**16.54%**
Average Net Book Value	**22,340,639**	**22,611,649**	**271,010**	**1.21%**
Eligible Working Capital Expenses	**2016 Actual**	**2017 Actual**	**Variance from 2017 Actual**	**Variance from 2017 Actual %**
Cost of Power	22,644,068	23,381,553	737,485	3.26%
Operations	786,475	800,624	14,149	1.80%
Maintenance	661,048	497,770	- 163,278	-24.70%
Billing & Collecting	590,853	587,960	- 2,894	-0.49%
Admin & General Expense	1,465,636	1,171,456	- 294,181	-20.07%
Donations - LEAP	5,375	6,850	1,475	27.44%
Property Taxes	26,113	29,610	3,497	13.39%
Total Eligible Working Capital Expenses	**26,179,568**	**26,475,821**	**296,253**	**1.13%**
Working Capital Allowance (%)	7.50%	7.50%		
Working Capital Allowance	**1,963,468**	**1,985,687**	**22,219**	**1.13%**
Rate Base	**24,304,106**	**24,597,335**	**293,229**	**1.21%**

The variance between the 2017 Actual and 2016 Actual rate base was $293,229, or 1.21% higher than 2016 actual. The main drivers that explain the variance are:

1. The change in rate base is mainly driven by the change in average net book value due to an increase in capital spending in 2017 compared to 2016.

2. The change in rate base is impacted by $22,219 due to changes in working capital expenses. The main driver is the cost of power expenses. In 2017, GPI

became the market participant for the Niagara West MTS (NWMTS) beginning in March. This added the entire consumption and demand values of the Embedded Distributor to GPI's purchases from the IESO increasing the cost of power expense.

Table 2-5

Variance of Rate Base

2018 Actual vs. 2017 Actual

Description	2017 Actual	2018 Actual	Variance from 2018 Actual	Variance from 2018 Actual %
Gross Fixed Assets, Opening Balance	28,863,524	30,287,264	1,423,739	4.93%
Gross Fixed Assets, Closing Balance	30,287,264	31,790,298	1,503,034	4.96%
Average Gross Fixed Assets	**29,575,394**	**31,038,781**	**1,463,387**	**4.95%**
Accumulated Depreciation, Opening Balance	6,471,429	7,456,062	984,632	15.22%
Accumulated Depreciation, Closing Balance	7,456,062	8,474,431	1,018,369	13.66%
Average Accumulated Depreciation	**6,963,745**	**7,965,246**	**1,001,501**	**14.38%**
Average Net Book Value	**22,611,649**	**23,073,535**	**461,886**	**2.04%**
Eligible Working Capital Expenses	**2017 Actual**	**2018 Actual**	**Variance from 2018 Actual**	**Variance from 2018 Actual %**
Cost of Power	23,381,553	24,578,974	1,197,421	5.12%
Operations	800,624	876,797	76,173	9.51%
Maintenance	497,770	624,703	126,934	25.50%
Billing & Collecting	587,960	739,770	151,811	25.82%
Admin & General Expense	1,171,456	1,151,879	- 19,576	-1.67%
Donations - LEAP	6,850	6,303	- 547	-7.98%
Property Taxes	29,610	32,455	2,845	9.61%
Total Eligible Working Capital Expenses	**26,475,821**	**28,010,882**	**1,535,061**	**5.80%**
Working Capital Allowance (%)	7.50%	7.50%		
Working Capital Allowance	**1,985,687**	**2,100,816**	**115,130**	**5.80%**
Rate Base	**24,597,335**	**25,174,351**	**577,015**	**2.35%**

The variance between the 2018 Actual and 2017 Actual Rate Base was $577,015, or 2.35%. The main drivers that explain the variance are:

1. Higher than planned capital expenditures in 2018 contributed to the variance. A variance in System Service was primarily associated with costs that carried over to 2019 associated with delayed start of protection related upgrades for Niagara West MTS and purchasing of required equipment. Higher than planned General Plant expenditures of $337k were primarily associated with purchase of a new RBD truck.

2. The increase in cost of power was driven by an increase in power purchased by 26,580,319 kWh. The main drive of the increase over 2017 is the

purchases for the Embedded Distributor were for the entire year of 2018 compared to only nine months in 2017.

Table 2-6

Variance of Rate Base

2019 Actual vs. 2018 Actual

Description	2018 Actual	2019 Actual	Variance from 2019 Actual	Variance from 2019 Actual %
Gross Fixed Assets, Opening Balance	30,287,264	31,790,298	1,503,034	4.96%
Gross Fixed Assets, Closing Balance	31,790,298	33,913,829	2,123,531	6.68%
Average Gross Fixed Assets	**31,038,781**	**32,852,063**	**1,813,283**	**5.84%**
Accumulated Depreciation, Opening Balance	7,456,062	8,474,431	1,018,369	13.66%
Accumulated Depreciation, Closing Balance	8,474,431	9,519,127	1,044,697	12.33%
Average Accumulated Depreciation	**7,965,246**	**8,996,779**	**1,031,533**	**12.95%**
Average Net Book Value	**23,073,535**	**23,855,284**	**781,750**	**3.39%**
Eligible Working Capital Expenses	**2018 Actual**	**2019 Actual**	**Variance from 2019 Actual**	**Variance from 2019 Actual %**
Cost of Power	24,578,974	27,218,144	2,639,170	10.74%
Operations	876,797	831,139	- 45,657	-5.21%
Maintenance	624,703	640,714	16,011	2.56%
Billing & Collecting	739,770	488,201	- 251,570	-34.01%
Admin & General Expense	1,151,879	1,210,603	58,724	5.10%
Donations - LEAP	6,303	6,303	-	0.00%
Property Taxes	32,455	35,547	3,092	9.53%
Total Eligible Working Capital Expenses	**28,010,882**	**30,430,652**	**2,419,770**	**8.64%**
Working Capital Allowance (%)	7.50%	7.50%		
Working Capital Allowance	**2,100,816**	**2,282,299**	**181,483**	**8.64%**
Rate Base	**25,174,351**	**26,137,583**	**963,233**	**3.83%**

The variance between the 2019 Actual and 2018 Actual Rate Base was $963,233 or 3.83%. The main drivers that explain the variance are:

1. An increase in capital expenditures compared to 2018 in System Service and General Plant investment categories. A $61k higher than planned expenditure in System Service was primarily associated with the costs that were carried from 2018 due to delayed start of Niagara West MTS work. In addition, overspend of in General Plant expenditures were $209k higher primarily due to the purchase of a new hybrid vehicle for daily use as well as acquisition of a new 40’ bucket truck which replaced an existing 2003 bucket truck.

2. An increase in cost of power expenses mainly due to an increase in the average HOEP and Global Adjustment costs compared to 2018.

Table 2-7
Variance of Rate Base
2020 Actual vs. 2019 Actual

Description	2019 Actual	2020 Actual	Variance from 2020 Actual	Variance from 2020 Actual %
Gross Fixed Assets, Opening Balance	31,790,298	33,913,829	2,123,531	6.68%
Gross Fixed Assets, Closing Balance	33,913,829	35,408,506	1,494,678	4.41%
Average Gross Fixed Assets	**32,852,063**	**34,661,168**	**1,809,104**	**5.51%**
Accumulated Depreciation, Opening Balance	8,474,431	9,519,127	1,044,697	12.33%
Accumulated Depreciation, Closing Balance	9,519,127	10,657,751	1,138,624	11.96%
Average Accumulated Depreciation	**8,996,779**	**10,088,439**	**1,091,660**	**12.13%**
Average Net Book Value	**23,855,284**	**24,572,728**	**717,444**	**3.01%**
Eligible Working Capital Expenses	**2019 Actual**	**2020 Actual**	**Variance from 2020 Actual**	**Variance from 2020 Actual %**
Cost of Power	27,218,144	33,957,950	6,739,806	24.76%
Operations	831,139	938,714	107,574	12.94%
Maintenance	640,714	644,984	4,270	0.67%
Billing & Collecting	488,201	585,847	97,647	20.00%
Admin & General Expense	1,210,603	1,370,419	159,816	13.20%
Donations - LEAP	6,303	6,303	-	0.00%
Property Taxes	35,547	39,416	3,869	10.88%
Total Eligible Working Capital Expenses	**30,430,652**	**37,543,634**	**7,112,982**	**23.37%**
Working Capital Allowance (%)	7.50%	7.50%		
Working Capital Allowance	**2,282,299**	**2,815,773**	**533,474**	**23.37%**
Rate Base	**26,137,583**	**27,388,501**	**1,250,918**	**4.79%**

The variance between the 2020 Actual and 2019 Actual Rate Base was $1,250,918, or 4.79%. The main drivers that explain the variance are:

1. The change in rate base is mainly driven by an increase in gross fixed assets in-service of $1,809,104 compared to 2019.

2. An increase in the cost of power expenses. In 2020 GPI purchased 18,002,680 more kWh's compared to 2019. The high kWh's were due to an extremely hot summer and increased usage due to the Covid-19 pandemic that forced more work and school from home. In 2020 on the average the global adjustment went up 9.46% compared to 2019.

Table 2-8

Variance of Rate Base

2021 Bridge Year vs 2020 Actual

Description	2020 Actual	2021 Bridge Year	Variance from 2021 Bridge	Variance from 2021 Bridge %
Gross Fixed Assets, Opening Balance	33,913,829	35,408,506	1,494,678	4.41%
Gross Fixed Assets, Closing Balance	35,408,506	37,646,622	2,238,116	6.32%
Average Gross Fixed Assets	**34,661,168**	**36,527,564**	**1,866,397**	**5.38%**
Accumulated Depreciation, Opening Balance	9,519,127	10,657,751	1,138,624	11.96%
Accumulated Depreciation, Closing Balance	10,657,751	11,849,473	1,191,722	11.18%
Average Accumulated Depreciation	**10,088,439**	**11,253,612**	**1,165,173**	**11.55%**
Average Net Book Value	**24,572,728**	**25,273,952**	**701,224**	**2.85%**
Eligible Working Capital Expenses	**2020 Actual**	**2021 Bridge Year**	**Variance from 2021 Bridge**	**Variance from 2021 Bridge %**
Cost of Power	33,957,950	28,983,124	- 4,974,826	-14.65%
Operations	938,714	940,797	2,084	0.22%
Maintenance	644,984	534,030	- 110,955	-17.20%
Billing & Collecting	585,847	669,081	83,233	14.21%
Admin & General Expense	1,370,419	1,356,542	- 13,877	-1.01%
Donations - LEAP	6,303	6,303	- 0	-0.01%
Property Taxes	39,416	39,416	- 0	0.00%
Total Eligible Working Capital Expenses	**37,543,634**	**32,529,293**	**- 5,014,341**	**-13.36%**
Working Capital Allowance (%)	7.50%	7.50%		
Working Capital Allowance	**2,815,773**	**2,439,697**	**- 376,076**	**-13.36%**
Rate Base	**27,388,501**	**27,713,649**	**325,148**	**1.19%**

The variance between the 2021 Bridge Year and 2020 Actual Rate Base is $325,148, or 1.19%. The main drivers that explain the variance are:

1. Major contributors to gross fixed assets in this period relate to a forecasted increase of $361k during 2021 in the System Renewal investment portfolio (related to deferral of renewals along Casablanca Blvd to align with road widening project initiated by the Region) along with forecasted increase of spend of $361k during 2021 in System Service investment portfolio (related to deferral of the planned work in 2020 of adding 3rd feeder from NW MTS).

2. Partially offset by a reduction in the working capital allowance due to a reduced global adjustment cost. Effective January 2021 a portion of non-hydro renewable energy contract costs will be paid by the government instead of electricity customers. This movement of cost to the Provincial tax base reduces global adjustment costs by approximately 15%. The reduction of 15% is then reduced by the recovery of the deferred global adjustment charges from April, May and June of 2020 for a total reduction in GA costs by approximately 12%.

Table 2-9

Variance of Rate Base

2022 Test Year vs 2021 Bridge Year

Description	2021 Bridge Year	2022 Test Year	Variance from 2022 Test	Variance from 2022 Test %
Gross Fixed Assets, Opening Balance	35,408,506	37,646,622	2,238,116	6.32%
Gross Fixed Assets, Closing Balance	37,646,622	40,160,087	2,513,465	6.68%
Average Gross Fixed Assets	**36,527,564**	**38,903,355**	**2,375,790**	**6.50%**
Accumulated Depreciation, Opening Balance	10,657,751	11,849,473	1,191,722	11.18%
Accumulated Depreciation, Closing Balance	11,849,473	13,093,073	1,243,600	10.49%
Average Accumulated Depreciation	**11,253,612**	**12,471,273**	**1,217,661**	**10.82%**
Average Net Book Value	**25,273,952**	**26,432,082**	**1,158,130**	**4.58%**
Eligible Working Capital Expenses	**2021 Bridge Year**	**2022 Test Year**	**Variance from 2022 Test**	**Variance from 2022 Test %**
Cost of Power	28,983,124	29,756,512	773,388	2.67%
Operations	940,797	929,860	- 10,938	-1.16%
Maintenance	534,030	628,908	94,878	17.77%
Billing & Collecting	669,081	719,553	50,472	7.54%
Admin & General Expense	1,356,542	1,719,947	363,405	26.79%
Donations - LEAP	6,303	8,485	2,182	34.62%
Property Taxes	39,416	43,800	4,384	11.12%
Total Eligible Working Capital Expenses	**32,529,293**	**33,807,065**	**1,277,771**	**3.93%**
Working Capital Allowance (%)	7.50%	7.50%		
Working Capital Allowance	**2,439,697**	**2,535,530**	**95,833**	**3.93%**
Rate Base	**27,713,649**	**28,967,612**	**1,253,962**	**4.52%**

The variance between the 2022 Test Year and the 2021 Bridge Year Rate Base is $1,253,962, or 4.52%. The main drivers that explain the variance are:

1. Major contributors to the increase in gross fixed assets in this period are related to forecasted increase in spending of $850k during 2022 in the System Renewal investment portfolio (associated with planned increases for Defective Poles replacement program, Rear Lot conversion program and CNR Pole Line relocation project) along with forecasted increase of spending of $221k during 2022 in the System Access investment portfolio (associated with completion of forecasted activities associated with the Casablanca Blvd road widening project initiated by the Region).

2. The cost of power expenditures will be higher in 2022 by 2.67%. This is mainly due to an increase in predicted purchase and an increase in low voltage charges, $296,662 and $337,851 respectively. There will also be an expected increase in transmission charges.

3. The increase in administration and general expense values is further explained in Exhibit 4.

Fixed Asset Continuity Schedules

Opening and closing balances of gross assets and accumulated depreciation correspond to the fixed asset continuity statements. The net book value balances are the balances included in the rate base calculation.

Grimsby Power has completed Appendix 2-BA and it is provided as Tables 2-10 to 2-16 below.

Fixed Asset Continuity Schedule Variance Analysis

Table 2-10

Fixed Asset Continuity Schedule

December 31, 2016

Appendix 2-BA

Fixed Asset Continuity Schedule [1]

Accounting Standard MIFRS
Year 2016

			Cost				Accumulated Depreciation				
CCA Class [2]	OEB Account [3]	Description [3]	Opening Balance	Additions [4]	Disposals 6	Closing Balance	Opening Balance	Additions	Disposals 6	Closing Balance	Net Book Value
	1609	Capital Contributions Paid				$ -				$ -	$ -
12	1611	Computer Software (Formally known as Account 1925)	$ 774,616	$ 36,259	$ (2,705)	$ 808,170	$ (524,256)	$ (109,480)	$ 2,251	$ (631,485)	$ 176,685
CEC	1612	Land Rights (Formally known as Account 1906)	$ -			$ -				$ -	$ -
N/A	1805	Land	$ 149,992			$ 149,992				$ -	$ 149,992
47	1808	Buildings and Fixtures (50)	$ 1,256,185			$ 1,256,185	$ (296,721)	$ (25,124)		$ (321,845)	$ 934,340
47	1808	Buildings and Fixtures (25)				$ -				$ -	$ -
13	1810	Leasehold Improvements	$ -			$ -				$ -	$ -
47	1815	Transformer Station Equipment >50 kV (10)		$ 52,225		$ 52,225		$ (2,611)		$ (2,611)	$ 49,613
47	1815	Transformer Station Equipment >50 kV (20)	$ 732,310			$ 732,310	$ (231,587)	$ (62,590)		$ (294,177)	$ 438,133
47	1815	Transformer Station Equipment >50 kV (40)	$ 3,355,781	$ 30,946		$ 3,386,728	$ (662,399)	$ (84,070)		$ (746,469)	$ 2,640,258
47	1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922			$ 2,682,922	$ (809,912)	$ (56,758)		$ (866,670)	$ 1,816,252
47	1815	Transformer Station Equipment >50 kV (50)	$ 77,279			$ 77,279	$ (23,277)	$ (1,421)		$ (24,698)	$ 52,580
47	1815	Transformer Station Equipment >50 kV (55)	$ 643,777			$ 643,777	$ (193,585)	$ (10,470)		$ (204,054)	$ 439,722
47	1820	Distribution Station Equipment <50 kV	$ -			$ -				$ -	$ -
47	1825	Storage Battery Equipment	$ -			$ -				$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 4,218,570	$ 165,275		$ 4,383,845	$ (519,175)	$ (116,777)		$ (635,952)	$ 3,747,893
47	1835	Overhead Conductors & Devices	$ 3,136,960	$ 90,335		$ 3,227,295	$ (205,664)	$ (55,428)		$ (261,091)	$ 2,966,204
47	1840	Underground Conduit	$ 2,400,775	$ 89,556		$ 2,490,331	$ (267,387)	$ (61,496)		$ (328,883)	$ 2,161,448
47	1845	Underground Conductors & Devices	$ 2,037,508	$ 104,842		$ 2,142,350	$ (255,791)	$ (74,699)		$ (330,490)	$ 1,811,860
47	1850	Line Transformers	$ 4,473,551	$ 193,544		$ 4,667,095	$ (543,799)	$ (138,975)		$ (682,774)	$ 3,984,321
47	1855	Services - Overhead	$ 221,571	$ 14,791		$ 236,362	$ (14,034)	$ (3,962)		$ (17,995)	$ 218,367
47	1855	Services Underground	$ 1,465,886	$ 56,493		$ 1,522,379	$ (123,103)	$ (42,966)		$ (166,069)	$ 1,356,309
47	1860	Meters 15yrs	$ 1,795,911	$ 22,568		$ 1,818,479	$ (497,993)	$ (121,874)		$ (619,867)	$ 1,198,611
47	1860	Meters >50	$ 279,715	$ 39,664		$ 319,379	$ (48,391)	$ (13,564)		$ (61,955)	$ 257,424
47	1860	Meters CT's & PT's	$ 172,982	$ 2,189		$ 175,171	$ (13,961)	$ (5,214)		$ (19,174)	$ 155,997
N/A	1905	Land	$ 111,556			$ 111,556				$ -	$ 111,556
47	1908	Buildings and Fixtures (50)	$ 311,426			$ 311,426	$ (62,285)	$ (12,457)		$ (74,742)	$ 236,684
47	1908	Buildings and Fixtures (40)	$ 55,127			$ 55,127	$ (7,350)	$ (2,048)		$ (9,398)	$ 45,729
47	1908	Buildings and Fixtures (25)	$ 230,777	$ 117,556		$ 348,333	$ (38,612)	$ (11,586)		$ (50,197)	$ 298,136
13	1910	Leasehold Improvements		$ -		$ -				$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 128,285	$ 26,772		$ 155,057	$ (39,386)	$ (13,165)		$ (52,551)	$ 102,506
10	1920	Computer Equipment - Hardware	$ 153,123	$ 6,887	$ (27,283)	$ 132,728	$ (105,214)	$ (19,372)	$ 24,400	$ (100,186)	$ 32,542
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)				$ -				$ -	$ -
50	1920	Computer Equip.-Hardware(Post Mar. 19/07)				$ -				$ -	$ -
10	1930	Transportation Equipment (8)	$ 21,466			$ 21,466	$ (19,037)	$ (903)		$ (19,941)	$ 1,525
10	1930	Transportation Equipment (15)	$ 344,950	$ 359,940		$ 704,889	$ (83,490)	$ (45,121)		$ (128,610)	$ 576,279
8	1935	Stores Equipment		$ 11,963		$ 11,963		$ (598)		$ (598)	$ 11,364
8	1940	Tools, Shop & Garage Equipment	$ 199,687	$ 7,105		$ 206,792	$ (51,419)	$ (20,441)		$ (71,860)	$ 134,933
8	1945	Measurement & Testing Equipment	$ 37,485	$ 3,493		$ 40,977	$ (22,576)	$ (4,792)		$ (27,368)	$ 13,610
8	1950	Power Operated Equipment				$ -				$ -	$ -
8	1955	Communications Equipment	$ 70,080	$ 260	$ (3,754)	$ 66,586	$ (19,015)	$ (8,138)	$ 1,314	$ (25,840)	$ 40,746
8	1955	Communication Equipment (Smart Meters)	$ -			$ -				$ -	$ -
8	1960	Miscellaneous Equipment	$ -			$ -				$ -	$ -
47	1970	Load Management Controls Customer Premises	$ 16,439			$ 16,439	$ (2,182)	$ (1,644)		$ (3,826)	$ 12,613
47	1975	Load Management Controls Utility Premises	$ -			$ -				$ -	$ -
47	1980	System Supervisor Equipment	$ -			$ -				$ -	$ -
47	1985	Miscellaneous Fixed Assets	$ -			$ -				$ -	$ -
47	1990	Other Tangible Property	$ -			$ -				$ -	$ -
47	1995	Contributions & Grants	$ -			$ -				$ -	$ -
47	2440	Deferred Revenue[5]	$ (3,788,064)	$ (304,022)		$ (4,092,086)	$ 202,154	$ 107,795		$ 309,948	$ (3,782,137)
	2005	Property Under Finance Lease[7]				$ -				$ -	$ -
		Sub-Total	**$ 27,768,627**	**$ 1,128,640**	**$ (33,742)**	**$ 28,863,524**	**$ (5,479,445)**	**$ (1,019,949)**	**$ 27,964**	**$ (6,471,429)**	**$ 22,392,095**
		Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 27,768,627**	**$ 1,128,640**	**$ (33,742)**	**$ 28,863,524**	**$ (5,479,445)**	**$ (1,019,949)**	**$ 27,964**	**$ (6,471,429)**	**$ 22,392,095**
		Depreciation Expense adj. from gain or loss on the retirement of assets (pool of like assets), if applicable[6]									
		Total						**$ (1,019,949)**			

			Less: Fully Allocated Depreciation	
10		Transportation	Transportation	$ (46,024)
8		Stores Equipment	Stores Equipment	
47		Deferred Revenue	Deferred Revenue	$ 107,795
			Net Depreciation	$ (1,081,719)

Gross capital assets increased by $1,128,640 net of capital contributions and mainly resulted from GPI`s continued investment in its distribution system in the amount of

$558,405 (Distribution plant investment of $862,427 minus deferred revenue of $304,022). In 2016 there was also a significant investment in General Plant of $570,235. This included the purchase of a 46ft Bucket Truck. Deferred revenue represents the customer's financial contribution to building distribution assets assumed by Grimsby Power.

Based on the deemed useful lives of GPI`s assets, the total depreciation value for 2016 was calculated to be $1,019,949.

Table 2-11

Fixed Asset Continuity Schedule

December 31, 2017

Appendix 2-BA

Fixed Asset Continuity Schedule [1]

Accounting Standard MIFRS
Year 2017

CCA Class [2]	OEB Account [3]	Description [3]	Cost: Opening Balance	Cost: Additions [4]	Cost: Disposals 6	Cost: Closing Balance	Accumulated Depreciation: Opening Balance	Accumulated Depreciation: Additions	Accumulated Depreciation: Disposals 6	Accumulated Depreciation: Closing Balance	Net Book Value
	1609	Capital Contributions Paid				$ -				$ -	$ -
12	1611	Computer Software (Formally known as Account 1925)	$ 808,170	$ 25,271		$ 833,442	$ (631,485)	$ (89,836)		$ (721,321)	$ 112,121
CEC	1612	Land Rights (Formally known as Account 1906)	$ -			$ -	$ -			$ -	$ -
N/A	1805	Land	$ 149,992			$ 149,992	$ -			$ -	$ 149,992
47	1808	Buildings	$ 1,256,185			$ 1,256,185	$ (321,845)	$ (25,124)		$ (346,968)	$ 909,217
47	1808	Buildings	$ -	$ 6,468		$ 6,468	$ -	$ (129)		$ (129)	$ 6,339
13	1810	Leasehold Improvements	$ -			$ -	$ -			$ -	$ -
47	1815	Transformer Station Equipment >50 kV (10)	$ 52,225	$ 50,963		$ 103,188	$ (2,611)	$ (7,771)		$ (10,382)	$ 92,806
47	1815	Transformer Station Equipment >50 kV (20)	$ 732,310	$ 57,978		$ 790,288	$ (294,177)	$ (64,040)		$ (358,217)	$ 432,071
47	1815	Transformer Station Equipment >50 kV (40)	$ 3,386,728			$ 3,386,728	$ (746,469)	$ (84,457)		$ (830,926)	$ 2,555,802
47	1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922			$ 2,682,922	$ (866,670)	$ (56,758)		$ (923,428)	$ 1,759,494
47	1815	Transformer Station Equipment >50 kV (50)	$ 77,279			$ 77,279	$ (24,698)	$ (1,421)		$ (26,120)	$ 51,159
47	1815	Transformer Station Equipment >50 kV (55)	$ 643,777			$ 643,777	$ (204,054)	$ (10,470)		$ (214,524)	$ 429,253
47	1820	Distribution Station Equipment <50 kV	$ -			$ -	$ -			$ -	$ -
47	1825	Storage Battery Equipment	$ -			$ -	$ -			$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 4,383,845	$ 189,576	$ (36,010)	$ 4,537,411	$ (635,952)	$ (120,748)	$ 33,931	$ (722,768)	$ 3,814,643
47	1835	Overhead Conductors & Devices	$ 3,227,295	$ 249,899	$ (2,933)	$ 3,474,261	$ (261,091)	$ (58,263)	$ 2,933	$ (316,421)	$ 3,157,840
47	1840	Underground Conduit	$ 2,490,331	$ 348,205	$ -	$ 2,838,536	$ (328,883)	$ (65,874)	$ -	$ (394,757)	$ 2,443,779
47	1845	Underground Conductors & Devices	$ 2,142,350	$ 317,446	$ -	$ 2,459,796	$ (330,490)	$ (81,737)	$ -	$ (412,227)	$ 2,047,569
47	1850	Line Transformers	$ 4,667,095	$ 397,744	$ (4,050)	$ 5,060,789	$ (682,774)	$ (146,052)	$ 4,050	$ (824,776)	$ 4,236,013
47	1855	Services - Overhead	$ 236,362	$ 24,365	$ (914)	$ 259,814	$ (17,995)	$ (4,289)	$ 914	$ (21,370)	$ 238,443
47	1855	Services Underground	$ 1,522,379	$ 104,183	$ (79)	$ 1,626,483	$ (166,069)	$ (45,275)	$ 79	$ (211,265)	$ 1,415,217
47	1860	Meters 15yrs	$ 1,818,479	$ 72,752		$ 1,891,231	$ (619,867)	$ (125,052)		$ (744,919)	$ 1,146,312
47	1860	Meters >50	$ 319,379	$ 48,814		$ 368,193	$ (61,955)	$ (15,334)		$ (77,289)	$ 290,904
47	1860	Meters CT's & PT's	$ 175,171	$ 4,484		$ 179,655	$ (19,174)	$ (5,309)		$ (24,483)	$ 155,172
N/A	1905	Land	$ 111,556			$ 111,556	$ -			$ -	$ 111,556
47	1908	Buildings and Fixtures (50)	$ 311,426			$ 311,426	$ (74,742)	$ (12,457)		$ (87,199)	$ 224,227
47	1908	Buildings and Fixtures (40)	$ 55,127			$ 55,127	$ (9,398)	$ (2,049)		$ (11,447)	$ 43,679
47	1908	Buildings and Fixtures (25)	$ 348,333	$ 25,479		$ 373,812	$ (50,197)	$ (14,240)		$ (64,437)	$ 309,375
13	1910	Leasehold Improvements								$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 155,057	$ 1,780		$ 156,837	$ (52,551)	$ (14,593)		$ (67,144)	$ 89,693
10	1920	Computer Equipment - Hardware	$ 132,728	$ 13,758	$ (954)	$ 145,532	$ (100,186)	$ (16,125)	$ 859	$ (115,453)	$ 30,079
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)								$ -	$ -
50	1920	Computer Equip.-Hardware(Post Mar. 19/07)								$ -	$ -
10	1930	Transportation Equipment (8)	$ 21,466	$ 49,063		$ 70,529	$ (19,941)	$ (3,515)		$ (23,456)	$ 47,073
10	1930	Transportation Equipment (15)	$ 704,889			$ 704,889	$ (128,610)	$ (36,576)		$ (165,187)	$ 539,703
8	1935	Stores Equipment	$ 11,963			$ 11,963	$ (598)	$ (1,196)		$ (1,794)	$ 10,168
8	1940	Tools, Shop & Garage Equipment	$ 206,792		$ (147)	$ 206,646	$ (71,860)	$ (20,109)	$ 22	$ (91,946)	$ 114,700
8	1945	Measurement & Testing Equipment	$ 40,977	$ 3,431		$ 44,408	$ (27,368)	$ (5,281)		$ (32,649)	$ 11,759
8	1950	Power Operated Equipment									
8	1955	Communications Equipment	$ 66,586	$ 5,953		$ 72,539	$ (25,840)	$ (8,410)		$ (34,250)	$ 38,289
8	1955	Communication Equipment (Smart Meters)									
8	1960	Miscellaneous Equipment									
47	1970	Load Management Controls Customer Premises	$ 16,439			$ 16,439	$ (3,826)	$ (1,644)		$ (5,470)	$ 10,969
47	1975	Load Management Controls Utility Premises									
47	1980	System Supervisor Equipment		$ 194,995		$ 194,995		$ (4,875)		$ (4,875)	$ 190,120
47	1985	Miscellaneous Fixed Assets									
47	1990	Other Tangible Property									
47	1995	Contributions & Grants									
47	2440	Deferred Revenue[5]	$ (4,092,086)	$ (723,784)		$ (4,815,870)	$ 309,948	$ 121,588		$ 431,537	$ (4,384,333)
	2005	Property Under Finance Lease[7]				$ -				$ -	$ -
		Sub-Total	**$ 28,863,524**	**$ 1,468,825**	**$ (45,086)**	**$ 30,287,264**	**$ (6,471,429)**	**$ (1,027,419)**	**$ 42,787**	**$ (7,456,062)**	**$ 22,831,202**
		Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 28,863,524**	**$ 1,468,825**	**$ (45,086)**	**$ 30,287,264**	**$ (6,471,429)**	**$ (1,027,419)**	**$ 42,787**	**$ (7,456,062)**	**$ 22,831,202**
		Depreciation Expense adj. from gain or loss on the retirement of assets (pool of like assets), if applicable[6]									
		Total						**$ (1,027,419)**			

			Less: Fully Allocated Depreciation	
10		Transportation	Transportation	$ (40,092)
8		Stores Equipment	Stores Equipment	
47		Deferred Revenue	Deferred Revenue	$ 121,588
			Net Depreciation	$ (1,108,916)

Gross capital assets increased by $1,468,825 net of capital contributions and mainly resulted from GPI`s continued investment in its distribution system in the amount of $1,142,626 (Distribution plant investment of $1,866,410 minus deferred revenue of $723,784). Deferred revenue represents the customer’s financial contribution to

building distribution assets assumed by Grimsby Power. Based on the deemed useful lives of GPI`s assets, the total depreciation value for 2017 was calculated to be $1,027,419.

Table 2-12

Fixed Asset Continuity Schedule

December 31, 2018

Appendix 2-BA

Fixed Asset Continuity Schedule [1]

Accounting Standard MIFRS
Year 2018

			Cost				Accumulated Depreciation				
CCA Class [2]	OEB Account [3]	Description [3]	Opening Balance	Additions [4]	Disposals 6	Closing Balance	Opening Balance	Additions	Disposals 6	Closing Balance	Net Book Value
	1609	Capital Contributions Paid				$ -				$ -	$ -
12	1611	Computer Software (Formally known as Account 1925)	$ 833,442	$ 24,245		$ 857,687	$ (721,321)	$ (59,193)		$ (780,514)	$ 77,173
CEC	1612	Land Rights (Formally known as Account 1906)					$ -			$ -	$ -
N/A	1805	Land	$ 149,992			$ 149,992	$ -			$ -	$ 149,992
47	1808	Buildings	$ 1,256,185			$ 1,256,185	$ (346,968)	$ (25,124)		$ (372,092)	$ 884,093
47	1808	Buildings	$ 6,468	$ 8,256		$ 14,724	$ (129)	$ (424)		$ (553)	$ 14,171
13	1810	Leasehold Improvements	$ -				$ -			$ -	$ -
47	1815	Transformer Station Equipment >50 kV (10)	$ 103,188			$ 103,188	$ (10,382)	$ (10,319)		$ (20,701)	$ 82,487
47	1815	Transformer Station Equipment >50 kV (20)	$ 790,288	$ 8,384		$ 798,672	$ (358,217)	$ (65,699)		$ (423,916)	$ 374,756
47	1815	Transformer Station Equipment >50 kV (40)	$ 3,386,728	$ 43,800		$ 3,430,528	$ (830,926)	$ (85,004)		$ (915,930)	$ 2,514,597
47	1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922			$ 2,682,922	$ (923,428)	$ (56,758)		$ (980,186)	$ 1,702,736
47	1815	Transformer Station Equipment >50 kV (50)	$ 77,279			$ 77,279	$ (26,120)	$ (1,421)		$ (27,541)	$ 49,738
47	1815	Transformer Station Equipment >50 kV (55)	$ 643,777			$ 643,777	$ (214,524)	$ (10,470)		$ (224,993)	$ 418,783
47	1820	Distribution Station Equipment <50 kV								$ -	$ -
47	1825	Storage Battery Equipment								$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 4,537,411	$ 147,603		$ 4,685,014	$ (722,768)	$ (124,417)		$ (847,185)	$ 3,837,829
47	1835	Overhead Conductors & Devices	$ 3,474,261	$ 89,216		$ 3,563,477	$ (316,421)	$ (61,089)		$ (377,510)	$ 3,185,967
47	1840	Underground Conduit	$ 2,838,536	$ 271,079		$ 3,109,615	$ (394,757)	$ (72,067)		$ (466,824)	$ 2,642,791
47	1845	Underground Conductors & Devices	$ 2,459,796	$ 189,997		$ 2,649,793	$ (412,227)	$ (90,194)		$ (502,422)	$ 2,147,372
47	1850	Line Transformers	$ 5,060,789	$ 312,527	$ (5,973)	$ 5,367,344	$ (824,776)	$ (154,860)		$ (979,636)	$ 4,387,707
47	1855	Services - Overhead	$ 259,814	$ 16,096		$ 275,909	$ (21,370)	$ (4,626)		$ (25,996)	$ 249,913
47	1855	Services Underground	$ 1,626,483	$ 169,973		$ 1,796,456	$ (211,265)	$ (49,204)		$ (260,470)	$ 1,535,986
47	1860	Meters 15yrs	$ 1,891,231	$ 108,699		$ 1,999,930	$ (744,919)	$ (131,100)		$ (876,019)	$ 1,123,910
47	1860	Meters >50	$ 368,193	$ 33,041		$ 401,235	$ (77,289)	$ (16,971)		$ (94,260)	$ 306,975
47	1860	Meters CT's & PT's	$ 179,655	$ 7,279		$ 186,934	$ (24,483)	$ (5,477)		$ (29,960)	$ 156,974
N/A	1905	Land	$ 111,556			$ 111,556	$ -			$ -	$ 111,556
47	1908	Buildings and Fixtures (50)	$ 311,426			$ 311,426	$ (87,199)	$ (6,229)		$ (93,428)	$ 217,998
47	1908	Buildings and Fixtures (40)	$ 55,127			$ 55,127	$ (11,447)	$ (1,378)		$ (12,825)	$ 42,301
47	1908	Buildings and Fixtures (25)	$ 373,812	$ 21,137		$ 394,949	$ (64,437)	$ (15,349)		$ (79,786)	$ 315,163
13	1910	Leasehold Improvements								$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 156,837	$ 6,432	$ (20,071)	$ 143,198	$ (67,144)	$ (14,406)	$ 20,071	$ (61,479)	$ 81,719
10	1920	Computer Equipment - Hardware	$ 145,532	$ 3,695	$ (4,566)	$ 144,660	$ (115,453)	$ (11,525)	$ 4,566	$ (122,411)	$ 22,249
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)				$ -				$ -	$ -
50	1920	Computer Equip.-Hardware(Post Mar. 19/07)				$ -				$ -	$ -
10	1930	Transportation Equipment (8)	$ 70,529	$ 480		$ 71,009	$ (23,456)	$ (6,612)		$ (30,068)	$ 40,942
10	1930	Transportation Equipment (15)	$ 704,889	$ 373,388		$ 1,078,277	$ (165,187)	$ (59,439)		$ (224,626)	$ 853,652
8	1935	Stores Equipment	$ 11,963			$ 11,963	$ (1,794)	$ (1,196)	$ -	$ (2,991)	$ 8,972
8	1940	Tools, Shop & Garage Equipment	$ 206,646	$ 1,126	$ (5,243)	$ 202,528	$ (91,946)	$ (19,275)	$ 5,243	$ (105,978)	$ 96,550
8	1945	Measurement & Testing Equipment	$ 44,408	$ 2,995	$ (2,449)	$ 44,954	$ (32,649)	$ (5,721)	$ 2,449	$ (35,921)	$ 9,033
8	1950	Power Operated Equipment				$ -				$ -	$ -
8	1955	Communications Equipment	$ 72,539	$ 1,310		$ 73,849	$ (34,250)	$ (8,975)		$ (43,225)	$ 30,624
8	1955	Communication Equipment (Smart Meters)				$ -				$ -	$ -
8	1960	Miscellaneous Equipment				$ -				$ -	$ -
47	1970	Load Management Controls Customer Premises	$ 16,439			$ 16,439	$ (5,470)	$ (1,644)		$ (7,113)	$ 9,325
47	1975	Load Management Controls Utility Premises				$ -				$ -	$ -
47	1980	System Supervisor Equipment	$ 194,995	$ 63,985		$ 258,980	$ (4,875)	$ (11,349)		$ (16,224)	$ 242,755
47	1985	Miscellaneous Fixed Assets				$ -				$ -	$ -
47	1990	Other Tangible Property				$ -				$ -	$ -
47	1995	Contributions & Grants				$ -				$ -	$ -
47	2440	Deferred Revenue[5]	$ (4,815,870)	$ (363,406)		$ (5,179,276)	$ 431,537	$ 136,816		$ 568,353	$ (4,610,923)
	2005	Property Under Finance Lease[7]				$ -				$ -	$ -
		Sub-Total	**$ 30,287,264**	**$ 1,541,337**	**$ (38,303)**	**$ 31,790,298**	**$ (7,456,062)**	**$ (1,050,699)**	**$ 32,330**	**$ (8,474,431)**	**$ 23,315,867**
		Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 30,287,264**	**$ 1,541,337**	**$ (38,303)**	**$ 31,790,298**	**$ (7,456,062)**	**$ (1,050,699)**	**$ 32,330**	**$ (8,474,431)**	**$ 23,315,867**
		Depreciation Expense adj. from gain or loss on the retirement of assets (pool of like assets), if applicable[6]									
		Total						**$ (1,050,699)**			

			Less: Fully Allocated Depreciation	
10		Transportation	Transportation	$ (66,051)
8		Stores Equipment	Stores Equipment	
47		Deferred Revenue	Deferred Revenue	$ 136,816
			Net Depreciation	$ (1,121,465)

Gross capital assets increased by $1,541,337 net of capital contributions and mainly resulted from GPI`s continued investment in its distribution system in the amount of $1,034,289 (Distribution plant investment of $1,397,696 minus deferred revenue of $363,406). Deferred revenue represents the customer's financial contribution to building distribution assets assumed by Grimsby Power. Based on the deemed useful lives of GPI`s assets, the total depreciation value for 2018 was calculated to be $1,050,669.

Table 2-13
Fixed Asset Continuity Schedule
December 31, 2019

Appendix 2-BA
Fixed Asset Continuity Schedule [1]

Accounting Standard	MIFRS
Year	2019

			Cost				Accumulated Depreciation				
CCA Class [2]	OEB Account [3]	Description [3]	Opening Balance	Additions [4]	Disposals 6	Closing Balance	Opening Balance	Additions	Disposals 6	Closing Balance	Net Book Value
	1609	Capital Contributions Paid				$ -				$ -	$ -
12	1611	Computer Software (Formally known as Account 1925)	$ 857,687		$ (22,780)	$ 834,907	$ (780,514)	$ (33,364)	$ 22,780	$ (791,098)	$ 43,809
CEC	1612	Land Rights (Formally known as Account 1906)				$ -	$ -			$ -	$ -
N/A	1805	Land	$ 149,992			$ 149,992	$ -			$ -	$ 149,992
47	1808	Buildings	$ 1,256,185			$ 1,256,185	$ (372,092)	$ (25,124)		$ (397,216)	$ 858,969
47	1808	Buildings	$ 14,724	$ 280		$ 15,004	$ (553)	$ (589)		$ (1,142)	$ 13,862
13	1810	Leasehold Improvements				$ -	$ -			$ -	$ -
47	1815	Transformer Station Equipment >50 kV (10)	$ 103,188			$ 103,188	$ (20,701)	$ (10,319)		$ (31,020)	$ 72,169
47	1815	Transformer Station Equipment >50 kV (20)	$ 798,672	$ 106,683		$ 905,355	$ (423,916)	$ (68,576)		$ (492,491)	$ 412,864
47	1815	Transformer Station Equipment >50 kV (40)	$ 3,430,528	$ 27,046		$ 3,457,574	$ (915,930)	$ (85,890)		$ (1,001,820)	$ 2,455,754
47	1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922			$ 2,682,922	$ (980,186)	$ (56,758)		$ (1,036,943)	$ 1,645,979
47	1815	Transformer Station Equipment >50 kV (50)	$ 77,279			$ 77,279	$ (27,541)	$ (1,421)		$ (28,962)	$ 48,317
47	1815	Transformer Station Equipment >50 kV (55)	$ 643,777			$ 643,777	$ (224,993)	$ (10,470)		$ (235,463)	$ 408,314
47	1820	Distribution Station Equipment <50 kV				$ -				$ -	$ -
47	1825	Storage Battery Equipment				$ -				$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 4,685,014	$ 296,580		$ 4,981,594	$ (847,185)	$ (129,353)		$ (976,538)	$ 4,005,056
47	1835	Overhead Conductors & Devices	$ 3,563,477	$ 266,921		$ 3,830,398	$ (377,510)	$ (64,057)		$ (441,567)	$ 3,388,831
47	1840	Underground Conduit	$ 3,109,615	$ 186,764		$ 3,296,379	$ (466,824)	$ (76,645)		$ (543,469)	$ 2,752,910
47	1845	Underground Conductors & Devices	$ 2,649,793	$ 532,288		$ 3,182,082	$ (502,422)	$ (102,233)		$ (604,654)	$ 2,577,427
47	1850	Line Transformers	$ 5,367,344	$ 408,560	$ (26,744)	$ 5,749,160	$ (979,636)	$ (163,829)	$ 3,056	$ (1,140,409)	$ 4,608,751
47	1855	Services - Overhead	$ 275,909	$ 4,341		$ 280,251	$ (25,996)	$ (4,797)		$ (30,793)	$ 249,457
47	1855	Services Underground	$ 1,796,456	$ 67,807		$ 1,864,263	$ (260,470)	$ (52,601)		$ (313,071)	$ 1,551,192
47	1860	Meters 15yrs	$ 1,999,930	$ 78,765		$ 2,078,694	$ (876,019)	$ (137,349)		$ (1,013,368)	$ 1,065,326
47	1860	Meters >50	$ 401,235	$ 13,348		$ 414,582	$ (94,260)	$ (17,899)		$ (112,159)	$ 302,424
47	1860	Meters CT's & PT's	$ 186,934	$ 40,300		$ 227,234	$ (29,960)	$ (6,157)		$ (36,117)	$ 191,118
N/A	1905	Land	$ 111,556			$ 111,556				$ -	$ 111,556
47	1908	Buildings and Fixtures (50)	$ 311,426			$ 311,426	$ (93,428)	$ (6,229)		$ (99,656)	$ 211,770
47	1908	Buildings and Fixtures (40)	$ 55,127			$ 55,127	$ (12,825)	$ (1,378)		$ (14,203)	$ 40,923
47	1908	Buildings and Fixtures (25)	$ 394,949	$ 10,399		$ 405,348	$ (79,786)	$ (15,980)		$ (95,766)	$ 309,582
13	1910	Leasehold Improvements				$ -				$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 143,198	$ 854		$ 144,052	$ (61,479)	$ (15,539)		$ (77,018)	$ 67,034
10	1920	Computer Equipment - Hardware	$ 144,660	$ 49,827	$ (19,192)	$ 175,295	$ (122,411)	$ (14,078)	$ 19,192	$ (117,297)	$ 57,998
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)				$ -				$ -	$ -
50	1920	Computer Equip.-Hardware(Post Mar. 19/07)				$ -				$ -	$ -
10	1930	Transportation Equipment (8)	$ 71,009	$ 41,280	$ (4,436)	$ 107,853	$ (30,068)	$ (9,222)	$ 4,436	$ (34,853)	$ 73,000
10	1930	Transportation Equipment (15)	$ 1,078,277	$ 157,145		$ 1,235,422	$ (224,626)	$ (77,123)		$ (301,749)	$ 933,673
8	1935	Stores Equipment	$ 11,963			$ 11,963	$ (2,991)	$ (1,196)		$ (4,187)	$ 7,776
8	1940	Tools, Shop & Garage Equipment	$ 202,528	$ 49,580		$ 252,109	$ (105,978)	$ (21,851)		$ (127,829)	$ 124,279
8	1945	Measurement & Testing Equipment	$ 44,954	$ 418		$ 45,372	$ (35,921)	$ (4,130)		$ (40,050)	$ 5,322
8	1950	Power Operated Equipment				$ -				$ -	$ -
8	1955	Communications Equipment	$ 73,849	$ 3,200		$ 77,049	$ (43,225)	$ (9,212)		$ (52,437)	$ 24,612
8	1955	Communication Equipment (Smart Meters)				$ -	$ -			$ -	$ -
8	1960	Miscellaneous Equipment		$ 3,501		$ 3,501		$ (175)		$ (175)	$ 3,325
47	1970	Load Management Controls Customer Premises	$ 16,439			$ 16,439	$ (7,113)	$ (1,644)		$ (8,757)	$ 7,681
47	1975	Load Management Controls Utility Premises				$ -				$ -	$ -
47	1980	System Supervisor Equipment	$ 258,980	$ 65,044		$ 324,024	$ (16,224)	$ (14,575)		$ (30,799)	$ 293,224
47	1985	Miscellaneous Fixed Assets				$ -				$ -	$ -
47	1990	Other Tangible Property				$ -				$ -	$ -
47	1995	Contributions & Grants				$ -				$ -	$ -
47	2440	Deferred Revenue[5]	$ (5,179,276)	$ (214,248)		$ (5,393,524)	$ 568,353	$ 145,598		$ 713,951	$ (4,679,573)
	2005	Property Under Finance Lease[7]				$ -				$ -	$ -
		Sub-Total	**$ 31,790,298**	**$ 2,196,683**	**$ (73,152)**	**$ 33,913,829**	**$ (8,474,431)**	**$ (1,094,161)**	**$ 49,464**	**$ (9,519,127)**	**$ 24,394,702**
		Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 31,790,298**	**$ 2,196,683**	**$ (73,152)**	**$ 33,913,829**	**$ (8,474,431)**	**$ (1,094,161)**	**$ 49,464**	**$ (9,519,127)**	**$ 24,394,702**
		Depreciation Expense adj. from gain or loss on the retirement of assets (pool of like assets), if applicable[6]									
		Total						**$ (1,094,161)**			

			Less: Fully Allocated Depreciation	
10		Transportation	Transportation	$ (86,345)
8		Stores Equipment	Stores Equipment	
47		Deferred Revenue	Deferred Revenue	$ 145,598
			Net Depreciation	$ (1,153,414)

Gross capital assets increased by $2,196,683 net of capital contributions and mainly resulted from GPI`s continued investment in its distribution system in the amount of $1,815,155 (Distribution plant investment of $2,029,403 minus deferred revenue of $214,248). Deferred revenue represents the customer’s financial contribution to

building distribution assets assumed by Grimsby Power. Based on the deemed useful lives of GPI`s assets, the total depreciation value for 2019 was calculated to be $1,094,161.

Table 2-14

Fixed Asset Continuity Schedule

December 31, 2020

Appendix 2-BA

Fixed Asset Continuity Schedule [1]

Accounting Standard MIFRS
Year 2020

			Cost				Accumulated Depreciation				
CCA Class [2]	OEB Account [3]	Description [3]	Opening Balance	Additions [4]	Disposals 6	Closing Balance	Opening Balance	Additions	Disposals 6	Closing Balance	Net Book Value
	1609	Capital Contributions Paid				$ -				$ -	$ -
12	1611	Computer Software (Formally known as Account 1925)	$ 834,907	$ 48,021		$ 882,928	$ (791,098)	$ (25,282)		$ (816,379)	$ 66,549
CEC	1612	Land Rights (Formally known as Account 1906)				$ -				$ -	$ -
N/A	1805	Land	$ 149,992			$ 149,992				$ -	$ 149,992
47	1808	Buildings	$ 1,256,185			$ 1,256,185	$ (397,216)	$ (25,124)		$ (422,339)	$ 833,846
47	1808	Buildings	$ 15,004	$ 276		$ 15,279	$ (1,142)	$ (606)		$ (1,748)	$ 13,531
13	1810	Leasehold Improvements	$ -			$ -	$ -			$ -	$ -
47	1815	Transformer Station Equipment >50 kV (10)	$ 103,188			$ 103,188	$ (31,020)	$ (10,319)		$ (41,338)	$ 61,850
47	1815	Transformer Station Equipment >50 kV (20)	$ 905,355	$ 16,164		$ 921,519	$ (492,491)	$ (71,647)		$ (564,138)	$ 357,381
47	1815	Transformer Station Equipment >50 kV (40)	$ 3,457,574			$ 3,457,574	$ (1,001,820)	$ (86,228)		$ (1,088,048)	$ 2,369,526
47	1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922			$ 2,682,922	$ (1,036,943)	$ (56,758)		$ (1,093,701)	$ 1,589,221
47	1815	Transformer Station Equipment >50 kV (50)	$ 77,279			$ 77,279	$ (28,962)	$ (1,421)		$ (30,383)	$ 46,896
47	1815	Transformer Station Equipment >50 kV (55)	$ 643,777			$ 643,777	$ (235,463)	$ (10,470)		$ (245,933)	$ 397,844
47	1820	Distribution Station Equipment <50 kV	$ -			$ -	$ -			$ -	$ -
47	1825	Storage Battery Equipment	$ -			$ -	$ -			$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 4,981,594	$ 390,193		$ 5,371,787	$ (976,538)	$ (136,983)		$ (1,113,522)	$ 4,258,265
47	1835	Overhead Conductors & Devices	$ 3,830,398	$ 408,321		$ 4,238,719	$ (441,567)	$ (69,684)		$ (511,250)	$ 3,727,469
47	1840	Underground Conduit	$ 3,296,379	$ 189,641		$ 3,486,021	$ (543,469)	$ (80,409)		$ (623,879)	$ 2,862,142
47	1845	Underground Conductors & Devices	$ 3,182,082	$ 250,305		$ 3,432,387	$ (604,654)	$ (115,276)		$ (719,930)	$ 2,712,457
47	1850	Line Transformers	$ 5,749,160	$ 226,708		$ 5,975,868	$ (1,140,409)	$ (171,770)		$ (1,312,179)	$ 4,663,689
47	1855	Services - Overhead	$ 280,251	$ 10,868		$ 291,118	$ (30,793)	$ (4,923)		$ (35,717)	$ 255,402
47	1855	Services Underground	$ 1,864,263	$ 134,218		$ 1,998,481	$ (313,071)	$ (55,487)		$ (368,558)	$ 1,629,922
47	1860	Meters 15yrs	$ 2,078,694	$ 44,377		$ 2,123,071	$ (1,013,368)	$ (140,469)		$ (1,153,837)	$ 969,234
47	1860	Meters >50	$ 414,582	$ 10,825		$ 425,408	$ (112,159)	$ (18,382)		$ (130,541)	$ 294,867
47	1860	Meters CT's & PT's	$ 227,234	$ 5,361		$ 232,595	$ (36,117)	$ (6,809)		$ (42,926)	$ 189,669
N/A	1905	Land	$ 111,556			$ 111,556				$ -	$ 111,556
47	1908	Buildings and Fixtures (50)	$ 311,426			$ 311,426	$ (99,656)	$ (6,229)		$ (105,885)	$ 205,541
47	1908	Buildings and Fixtures (40)	$ 55,127	$ 2,020		$ 57,147	$ (14,203)	$ (1,403)		$ (15,607)	$ 41,540
47	1908	Buildings and Fixtures (25)	$ 405,348	$ 15,595		$ 420,943	$ (95,766)	$ (16,500)		$ (112,266)	$ 308,677
13	1910	Leasehold Improvements				$ -				$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 144,052	$ 126		$ 144,178	$ (77,018)	$ (14,286)		$ (91,304)	$ 52,874
10	1920	Computer Equipment - Hardware	$ 175,295	$ 35,056	$ (8,103)	$ 202,248	$ (117,297)	$ (19,769)	$ 6,487	$ (130,578)	$ 71,670
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)				$ -				$ -	$ -
50	1920	Computer Equip.-Hardware(Post Mar. 19/07)				$ -				$ -	$ -
10	1930	Transportation Equipment (8)	$ 107,853			$ 107,853	$ (34,853)	$ (11,680)		$ (46,533)	$ 61,320
10	1930	Transportation Equipment (15)	$ 1,235,422			$ 1,235,422	$ (301,749)	$ (82,361)		$ (384,110)	$ 851,312
8	1935	Stores Equipment	$ 11,963	$ 123,960		$ 135,923	$ (4,187)	$ (5,328)		$ (9,515)	$ 126,407
8	1940	Tools, Shop & Garage Equipment	$ 252,109	$ 15,009		$ 267,118	$ (127,829)	$ (23,925)		$ (151,754)	$ 115,364
8	1945	Measurement & Testing Equipment	$ 45,372			$ 45,372	$ (40,050)	$ (2,153)		$ (42,203)	$ 3,169
8	1950	Power Operated Equipment				$ -				$ -	$ -
8	1955	Communications Equipment	$ 77,049	$ 2,356		$ 79,405	$ (52,437)	$ (9,146)		$ (61,583)	$ 17,822
8	1955	Communication Equipment (Smart Meters)				$ -				$ -	$ -
8	1960	Miscellaneous Equipment	$ 3,501	$ 1,973		$ 5,474	$ (175)	$ (471)		$ (646)	$ 4,828
47	1970	Load Management Controls Customer Premises	$ 16,439			$ 16,439	$ (8,757)	$ (1,644)		$ (10,401)	$ 6,038
47	1975	Load Management Controls Utility Premises				$ -				$ -	$ -
47	1980	System Supervisor Equipment	$ 324,024	$ 33,172		$ 357,196	$ (30,799)	$ (17,030)		$ (47,830)	$ 309,366
47	1985	Miscellaneous Fixed Assets				$ -				$ -	$ -
47	1990	Other Tangible Property				$ -				$ -	$ -
47	1995	Contributions & Grants				$ -				$ -	$ -
47	2440	Deferred Revenue[5]	$ (5,393,524)	$ (461,764)		$ (5,855,288)	$ 713,951	$ 154,859		$ 868,810	$ (4,986,478)
	2005	Property Under Finance Lease[7]				$ -				$ -	$ -
		Sub-Total	**$ 33,913,829**	**$ 1,502,780**	**$ (8,103)**	**$ 35,408,506**	**$ (9,519,127)**	**$ (1,145,111)**	**$ 6,487**	**$ (10,657,751)**	**$ 24,750,755**
		Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 33,913,829**	**$ 1,502,780**	**$ (8,103)**	**$ 35,408,506**	**$ (9,519,127)**	**$ (1,145,111)**	**$ 6,487**	**$ (10,657,751)**	**$ 24,750,755**
		Depreciation Expense adj. from gain or loss on the retirement of assets (pool of like assets), if applicable[6]									
		Total						**$ (1,145,111)**			

			Less: Fully Allocated Depreciation	
10		Transportation	Transportation	$ (94,041)
8		Stores Equipment	Stores Equipment	
47		Deferred Revenue	Deferred Revenue	$ 154,859
			Net Depreciation	$ (1,205,929)

Gross capital assets increased by $1,502,780 net of capital contributions and mainly resulted from GPI`s continued investment in its distribution system in the amount of $1,225,217 (Distribution plant investment of $1,686,981 minus deferred revenue of $461,764). Deferred revenue represents the customer's financial contribution to building distribution assets assumed by Grimsby Power. Based on the deemed useful lives of GPI`s assets, the total depreciation value for 2020 was calculated to be $1,145,111.

Table 2-15

Fixed Asset Continuity Schedule

December 31, 2021

Appendix 2-BA
Fixed Asset Continuity Schedule [1]

Accounting Standard: MIFRS
Year: 2021

			Cost				Accumulated Depreciation				
CCA Class [2]	OEB Account [3]	Description [3]	Opening Balance	Additions [4]	Disposals 6	Closing Balance	Opening Balance	Additions	Disposals 6	Closing Balance	Net Book Value
	1609	Capital Contributions Paid				$ -				$ -	$ -
12	1611	Computer Software (Formally known as Account 1925)	$ 882,928	$ 20,000		$ 902,928	$ (816,379)	$ (25,133)		$ (841,513)	$ 61,415
CEC	1612	Land Rights (Formally known as Account 1906)				$ -				$ -	$ -
N/A	1805	Land	$ 149,992			$ 149,992				$ -	$ 149,992
47	1808	Buildings	$ 1,256,185			$ 1,256,185	$ (422,339)	$ (25,124)		$ (447,463)	$ 808,722
47	1808	Buildings	$ 15,279			$ 15,279	$ (1,748)	$ (611)		$ (2,359)	$ 12,920
13	1810	Leasehold Improvements	$ -			$ -				$ -	$ -
47	1815	Transformer Station Equipment >50 kV (10)	$ 103,188			$ 103,188	$ (41,338)	$ (10,319)		$ (51,657)	$ 51,531
47	1815	Transformer Station Equipment >50 kV (20)	$ 921,519			$ 921,519	$ (564,138)	$ (72,051)		$ (636,189)	$ 285,330
47	1815	Transformer Station Equipment >50 kV (40)	$ 3,457,574	$ 50,000		$ 3,507,574	$ (1,088,048)	$ (86,853)		$ (1,174,901)	$ 2,332,673
47	1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922			$ 2,682,922	$ (1,093,701)	$ (56,758)		$ (1,150,459)	$ 1,532,463
47	1815	Transformer Station Equipment >50 kV (50)	$ 77,279			$ 77,279	$ (30,383)	$ (1,421)		$ (31,804)	$ 45,475
47	1815	Transformer Station Equipment >50 kV (55)	$ 643,777			$ 643,777	$ (245,933)	$ (10,470)		$ (256,402)	$ 387,375
47	1820	Distribution Station Equipment <50 kV				$ -				$ -	$ -
47	1825	Storage Battery Equipment				$ -				$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 5,371,787	$ 1,115,840		$ 6,487,627	$ (1,113,522)	$ (153,717)		$ (1,267,239)	$ 5,220,388
47	1835	Overhead Conductors & Devices	$ 4,238,719	$ 361,613		$ 4,600,332	$ (511,250)	$ (76,100)		$ (587,350)	$ 4,012,982
47	1840	Underground Conduit	$ 3,486,021	$ 73,143		$ 3,559,164	$ (623,879)	$ (83,037)		$ (706,916)	$ 2,852,248
47	1845	Underground Conductors & Devices	$ 3,432,387	$ 261,644		$ 3,694,031	$ (719,930)	$ (123,808)		$ (843,738)	$ 2,850,293
47	1850	Line Transformers	$ 5,975,868	$ 263,765		$ 6,239,633	$ (1,312,179)	$ (177,901)		$ (1,490,080)	$ 4,749,553
47	1855	Services - Overhead	$ 291,118	$ 57,487		$ 348,605	$ (35,717)	$ (5,493)		$ (41,210)	$ 307,395
47	1855	Services Underground	$ 1,998,481	$ 63,171		$ 2,061,652	$ (368,558)	$ (58,307)		$ (426,866)	$ 1,634,787
47	1860	Meters 15yrs	$ 2,123,071	$ 82,183		$ 2,205,254	$ (1,153,837)	$ (144,699)		$ (1,298,536)	$ 906,718
47	1860	Meters >50	$ 425,408	$ 17,167		$ 442,575	$ (130,541)	$ (18,942)		$ (149,483)	$ 293,092
47	1860	Meters CTs & PTs	$ 232,595	$ 20,675		$ 253,270	$ (42,926)	$ (7,181)		$ (50,107)	$ 203,164
N/A	1905	Land	$ 111,556			$ 111,556				$ -	$ 111,556
47	1908	Buildings and Fixtures (50)	$ 311,426			$ 311,426	$ (105,885)	$ (6,229)		$ (112,113)	$ 199,313
47	1908	Buildings and Fixtures (40)	$ 57,147			$ 57,147	$ (15,607)	$ (1,429)		$ (17,036)	$ 40,111
47	1908	Buildings and Fixtures (25)	$ 420,943	$ 20,000		$ 440,943	$ (112,266)	$ (17,212)		$ (129,478)	$ 311,466
13	1910	Leasehold Improvements	$ -			$ -	$ -			$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 144,178	$ 5,000		$ 149,178	$ (91,304)	$ (14,141)		$ (105,445)	$ 43,733
10	1920	Computer Equipment - Hardware	$ 202,248	$ 14,000		$ 216,248	$ (130,578)	$ (21,871)		$ (152,449)	$ 63,799
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)				$ -				$ -	$ -
50	1920	Computer Equip.-Hardware(Post Mar. 19/07)				$ -				$ -	$ -
10	1930	Transportation Equipment (8)	$ 107,853			$ 107,853	$ (46,533)	$ (11,557)		$ (58,090)	$ 49,763
10	1930	Transportation Equipment (15)	$ 1,235,422	$ 87,000		$ 1,322,422	$ (384,110)	$ (85,069)		$ (469,180)	$ 853,243
8	1935	Stores Equipment	$ 135,923			$ 135,923	$ (9,515)	$ (9,460)		$ (18,975)	$ 116,947
8	1940	Tools, Shop & Garage Equipment	$ 267,118	$ 39,000		$ 306,118	$ (151,754)	$ (23,122)		$ (174,876)	$ 131,242
8	1945	Measurement & Testing Equipment	$ 45,372			$ 45,372	$ (42,203)	$ (1,718)		$ (43,922)	$ 1,451
8	1950	Power Operated Equipment				$ -				$ -	$ -
8	1955	Communications Equipment	$ 79,405	$ 10,000		$ 89,405	$ (61,583)	$ (8,292)		$ (69,875)	$ 19,530
8	1955	Communication Equipment (Smart Meters)				$ -				$ -	$ -
8	1960	Miscellaneous Equipment	$ 5,474			$ 5,474	$ (646)	$ (547)		$ (1,193)	$ 4,280
47	1970	Load Management Controls Customer Premises	$ 16,439			$ 16,439	$ (10,401)	$ (1,644)		$ (12,045)	$ 4,394
47	1975	Load Management Controls Utility Premises				$ -				$ -	$ -
47	1980	System Supervisor Equipment	$ 357,196	$ 21,040		$ 378,236	$ (47,830)	$ (17,557)		$ (65,386)	$ 312,850
47	1985	Miscellaneous Fixed Assets				$ -				$ -	$ -
47	1990	Other Tangible Property				$ -				$ -	$ -
47	1995	Contributions & Grants				$ -				$ -	$ -
47	2440	Deferred Revenue [5]	$ (5,855,288)	$ (344,613)		$ (6,199,902)	$ 868,810	$ 166,052		$ 1,034,862	$ (5,165,040)
	2005	Property Under Finance Lease [7]				$ -				$ -	$ -
		Sub-Total	$ 35,408,506	$ 2,238,116	$ -	$ 37,646,622	$ (10,657,751)	$ (1,191,722)	$ -	$ (11,849,473)	$ 25,797,149
		Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	$ 35,408,506	$ 2,238,116	$ -	$ 37,646,622	$ (10,657,751)	$ (1,191,722)	$ -	$ (11,849,473)	$ 25,797,149
		Depreciation Expense adj. from gain or loss on the retirement of assets (pool of like assets), if applicable [6]									
		Total						$ (1,191,722)			

			Less: Fully Allocated Depreciation	
10		Transportation	Transportation	$ (96,627)
8		Stores Equipment	Stores Equipment	
47		Deferred Revenue	Deferred Revenue	$ 166,052
			Net Depreciation	$ (1,261,147)

Gross capital assets increased by $2,238,116 net of capital contributions and mainly resulted from GPI`s continued investment in its distribution system in the amount of $2,022,076 (Distribution plant investment of $2,366,689 minus deferred revenue of $344,613). Deferred revenue represents the customer's financial contribution to

building distribution assets assumed by Grimsby Power. Based on the deemed useful lives of GPI`s assets, the total depreciation value for 2021 was calculated to be $1,191,722.

Table 2-16

Fixed Asset Continuity Schedule

December 31, 2022

Appendix 2-BA

Fixed Asset Continuity Schedule [1]

Accounting Standard MIFRS
Year 2022

			Cost				Accumulated Depreciation				
CCA Class [2]	**OEB Account [3]**	**Description [3]**	**Opening Balance**	**Additions [4]**	**Disposals 6**	**Closing Balance**	**Opening Balance**	**Additions**	**Disposals 6**	**Closing Balance**	**Net Book Value**
	1609	Capital Contributions Paid				$ -				$ -	$ -
12	1611	Computer Software (Formally known as Account 1925)	$ 902,928	$ 5,000		$ 907,928	$ (841,513)	$ (21,176)		$ (862,689)	$ 45,239
CEC	1612	Land Rights (Formally known as Account 1906)	$ -			$ -	$ -			$ -	$ -
N/A	1805	Land	$ 149,992			$ 149,992	$ -			$ -	$ 149,992
47	1808	Buildings	$ 1,256,185			$ 1,256,185	$ (447,463)	$ (25,124)		$ (472,587)	$ 783,598
47	1808	Buildings	$ 15,279			$ 15,279	$ (2,359)	$ (611)		$ (2,970)	$ 12,309
13	1810	Leasehold Improvements	$ -			$ -	$ -			$ -	$ -
47	1815	Transformer Station Equipment >50 kV (10)	$ 103,188			$ 103,188	$ (51,657)	$ (10,319)		$ (61,976)	$ 41,212
47	1815	Transformer Station Equipment >50 kV (20)	$ 921,519	$ 100,000		$ 1,021,519	$ (636,189)	$ (74,551)		$ (710,740)	$ 310,779
47	1815	Transformer Station Equipment >50 kV (40)	$ 3,507,574			$ 3,507,574	$ (1,174,901)	$ (87,478)		$ (1,262,379)	$ 2,245,195
47	1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922			$ 2,682,922	$ (1,150,459)	$ (56,758)		$ (1,207,217)	$ 1,475,705
47	1815	Transformer Station Equipment >50 kV (50)	$ 77,279			$ 77,279	$ (31,804)	$ (1,421)		$ (33,225)	$ 44,054
47	1815	Transformer Station Equipment >50 kV (55)	$ 643,777			$ 643,777	$ (256,402)	$ (10,470)		$ (266,872)	$ 376,905
47	1820	Distribution Station Equipment <50 kV	$ -			$ -	$ -			$ -	$ -
47	1825	Storage Battery Equipment	$ -			$ -	$ -			$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 6,487,627	$ 1,639,133		$ 8,126,759	$ (1,267,239)	$ (184,328)		$ (1,451,567)	$ 6,675,192
47	1835	Overhead Conductors & Devices	$ 4,600,332	$ 242,031		$ 4,842,362	$ (587,350)	$ (81,130)		$ (668,480)	$ 4,173,882
47	1840	Underground Conduit	$ 3,559,164	$ 164,352		$ 3,723,516	$ (706,916)	$ (85,412)		$ (792,328)	$ 2,931,187
47	1845	Underground Conductors & Devices	$ 3,694,031	$ 179,592		$ 3,873,623	$ (843,738)	$ (131,162)		$ (974,901)	$ 2,898,723
47	1850	Line Transformers	$ 6,239,633	$ 179,897		$ 6,419,530	$ (1,490,080)	$ (183,428)		$ (1,673,508)	$ 4,746,022
47	1855	Services - Overhead	$ 348,605	$ 95,980		$ 444,585	$ (41,210)	$ (6,772)		$ (47,981)	$ 396,603
47	1855	Services Underground	$ 2,061,652	$ 107,233		$ 2,168,885	$ (426,866)	$ (60,741)		$ (487,607)	$ 1,681,278
47	1860	Meters 15yrs	$ 2,205,254	$ 82,841		$ 2,288,095	$ (1,298,536)	$ (149,918)		$ (1,448,455)	$ 839,640
47	1860	Meters >50	$ 442,575	$ 18,391		$ 460,966	$ (149,483)	$ (19,653)		$ (169,136)	$ 291,830
47	1860	Meters CT's & PT's	$ 253,270	$ 26,379		$ 279,649	$ (50,107)	$ (7,853)		$ (57,960)	$ 221,689
N/A	1905	Land	$ 111,556			$ 111,556	$ -			$ -	$ 111,556
47	1908	Buildings and Fixtures (50)	$ 311,426			$ 311,426	$ (112,113)	$ (6,229)		$ (118,342)	$ 193,084
47	1908	Buildings and Fixtures (40)	$ 57,147			$ 57,147	$ (17,036)	$ (1,429)		$ (18,464)	$ 38,682
47	1908	Buildings and Fixtures (25)	$ 440,943	$ 80,000		$ 520,943	$ (129,478)	$ (19,212)		$ (148,689)	$ 372,254
13	1910	Leasehold Improvements	$ -			$ -	$ -			$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 149,178			$ 149,178	$ (105,445)	$ (12,054)		$ (117,499)	$ 31,679
10	1920	Computer Equipment - Hardware	$ 216,248	$ 15,000		$ 231,248	$ (152,449)	$ (22,899)		$ (175,349)	$ 55,900
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ -			$ -	$ -			$ -	$ -
50	1920	Computer Equip.-Hardware(Post Mar. 19/07)	$ -			$ -	$ -			$ -	$ -
10	1930	Transportation Equipment (8)	$ 107,853			$ 107,853	$ (58,090)	$ (11,455)		$ (69,546)	$ 38,307
10	1930	Transportation Equipment (15)	$ 1,322,422			$ 1,322,422	$ (469,180)	$ (87,851)		$ (557,030)	$ 765,392
8	1935	Stores Equipment	$ 135,923			$ 135,923	$ (18,975)	$ (9,460)		$ (28,436)	$ 107,487
8	1940	Tools, Shop & Garage Equipment	$ 306,118			$ 306,118	$ (174,876)	$ (22,601)		$ (197,477)	$ 108,641
8	1945	Measurement & Testing Equipment	$ 45,372			$ 45,372	$ (43,922)	$ (1,026)		$ (44,947)	$ 425
8	1950	Power Operated Equipment	$ -			$ -	$ -			$ -	$ -
8	1955	Communications Equipment	$ 89,405			$ 89,405	$ (69,875)	$ (7,113)		$ (76,989)	$ 12,416
8	1955	Communication Equipment (Smart Meters)	$ -			$ -	$ -			$ -	$ -
8	1960	Miscellaneous Equipment	$ 5,474			$ 5,474	$ (1,193)	$ (547)		$ (1,741)	$ 3,733
47	1970	Load Management Controls Customer Premises	$ 16,439			$ 16,439	$ (12,045)	$ (1,644)		$ (13,689)	$ 2,750
47	1975	Load Management Controls Utility Premises	$ -			$ -	$ -			$ -	$ -
47	1980	System Supervisor Equipment	$ 378,236	$ 1,063		$ 379,299	$ (65,386)	$ (18,109)		$ (83,495)	$ 295,804
47	1985	Miscellaneous Fixed Assets	$ -			$ -				$ -	$ -
47	1990	Other Tangible Property				$ -				$ -	$ -
47	1995	Contributions & Grants				$ -				$ -	$ -
47	2440	Deferred Revenue[5]	$ (6,199,902)	$ (423,426)		$ (6,623,328)	$ 1,034,862	$ 176,335		$ 1,211,197	$ (5,412,131)
	2005	Property Under Finance Lease[7]				$ -				$ -	$ -
		Sub-Total	**$ 37,646,622**	**$ 2,513,465**	**$ -**	**$ 40,160,087**	**$ (11,849,473)**	**$ (1,243,600)**	**$ -**	**$ (13,093,073)**	**$ 27,067,014**
		Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 37,646,622**	**$ 2,513,465**	**$ -**	**$ 40,160,087**	**$ (11,849,473)**	**$ (1,243,600)**	**$ -**	**$ (13,093,073)**	**$ 27,067,014**
		Depreciation Expense adj. from gain or loss on the retirement of assets (pool of like assets), if applicable[6]									
		Total						**$ (1,243,600)**			

Less: Fully Allocated Depreciation

10		Transportation	Transportation	$ (99,306)
8		Stores Equipment	Stores Equipment	
47		Deferred Revenue	Deferred Revenue	$ 176,335
			Net Depreciation	$ (1,320,629)

Gross capital assets increased by $2,513,465 net of capital contributions and mainly resulted from GPI`s continued investment in its distribution system in the amount of $2,412,402 (Distribution plant investment of $2,835,828 minus deferred revenue of $423,426). Deferred revenue represents the customer's financial contribution to building distribution assets assumed by Grimsby Power. Based on the deemed useful lives of GPI`s assets, the total depreciation value for 2022 was calculated to be $1,243,600.

1.2 GROSS ASSETS (PP&E)

Net Book Value has been used as the basis for setting opening rate base values. To establish the continuity of historical costs, the statement of opening value for regulated Net Book Value includes gross capital cost and accumulated depreciation and further breaks out amounts as necessary to support the regulatory accounting requirements.

Grimsby Power has adopted MIFRS capitalization accounting for rate settings and regulatory reporting purposes since January 1, 2011.

Customer Contributions Received for PP&E

For rate setting purposes, customer contributions are not treated as deferred revenue, as required under MIFRS, but instead these amounts are included as an offset to rate base, and amortized to income over the life of the asset to which they are related. For rate setting, the amortization of customer contributions has been added back to Grimsby Power's depreciation expense and there is corresponding offset in Other Revenue. This reflects the accounting treatment specified in Article 430 of the Accounting Procedures Handbook for Electricity Distributors.

Grimsby Power confirms that the amortization period of customer contributions is consistent with the useful lives of the asset category to which they relate.

Asset Reclassifications from PP&E to Intangible Assets

For 2021 and 2022 Grimsby Power has included intangible assets (e.g. computer software) in rate base and the associated amortization expenses for determining revenue requirement.

Summary of Incremental Capital Module Adjustment

Grimsby Power did not apply for any Incremental Capital Module adjustments in the IRM period following the 2016 Cost of Service Application.

1.3 ACCUMULATED DEPRECIATION

Grimsby Power does not have a written depreciation policy. However, Grimsby Power's depreciation practice once assets are capitalized is outlined below.

Grimsby Power recognizes depreciation on a straight-line basis over the estimated useful life of an item of property, plant and equipment. Land is not depreciated.

Grimsby Power uses the half year rule for calculating depreciation and the typical useful lives of assets developed by Kinectrics in the March 24, 2010 Useful Life of Assets study as included in its 2012 COS Application (EB-2011-0273) and agreed upon in the Board approved Settlement.

Details of Grimsby Power's depreciation by account number is provided in OEB Appendix 2-C Depreciation Expense.

Further information on Grimsby Power's depreciation expenses and continuity schedules is provided in Exhibit 4, Tab 8 Depreciation and Amortization.

Reconciliation of Continuity Statements to Calculated Depreciation Expenses

As shown in the last column of OEB Appendix 2-C, Grimsby Power has determined that there are no material differences (above the materiality threshold of $50,000) between the accumulated depreciation in the fixed asset continuity schedules (OEB Appendix 2-BA) and the depreciation expense calculated in OEB Appendix 2-C.

1.4 ALLOWANCE FOR WORKING CAPITAL

Overview

As outlined in the Filing Requirements, in its letter dated June 3, 2015 the Board provided an update to electricity distributors and transmitters regarding the options established for the calculation of allowance for working capital. Utilities have the option of using the default 7.5% of the sum of Cost of Power and OM&A or file a lead lag study.

Grimsby Power has elected to utilize the 7.5% default value for the Working Capital Allowance percentage. Grimsby Power's Working Capital Allowance is forecast to be $2,535,530. This figure is derived by taking 7.5% of the following expenses:

1. Cost of Power
2. Operations
3. Maintenance
4. Billing & Collecting
5. Administration and General Expense
6. LEAP Funding
7. Property Taxes

A summary Working Capital from 2016 OEB approved to the 2022 Test Year is presented in Table 2-17 below:

Table 2-17
Summary of Working Capital
2016 OEB Approved to 2022 Test Year

Description	2016 OEB Approved	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Actual	2021 Bridge Year	2022 Test Year
Cost of Power	24,178,909	22,644,068	23,381,553	24,578,974	27,218,144	33,957,950	28,983,124	29,756,512
Operations	699,287	786,475	800,624	876,797	831,139	938,714	940,797	929,860
Maintenance	587,574	661,048	497,770	624,703	640,714	644,984	534,030	628,908
Billing & Collecting	533,068	590,853	587,960	739,770	488,201	585,847	669,081	719,553
Admin & General Expense	1,291,536	1,465,636	1,171,456	1,151,879	1,210,603	1,370,419	1,356,542	1,719,947
Donations - LEAP	7,528	5,375	6,850	6,303	6,303	6,303	6,303	8,485
Property Taxes	27,594	26,113	29,610	32,455	35,547	39,416	39,416	43,800
Working Capital	**27,325,496**	**26,179,568**	**26,475,821**	**28,010,882**	**30,430,652**	**37,543,634**	**32,529,293**	**33,807,065**

Cost of Power Calculations

Grimsby Power has calculated the Cost of Power for the 2022 Test Year based upon the 2022 load forecast, adjusted for the 18.9% Ontario Energy Rebate which is applicated to the Cost of Power of RPP customers in accordance with the Board's filing requirements. A summary of the total cost of power expenses for the 2022 Test Year is provided in Table 2-18 with the associated kWh's, kW or customer numbers applicable for each expense.

Table 2-18

Summary of Total Cost of Power Expenses

2022 Test Year

		2022 Test Year	RPP		2022 Test Year	non-RPP		Total
Electricity Commodity	Units	Volume	Rate	$	Volume	Rate	$	$
Class per Load Forecast				-				
Residential	kWh	100,933,789		10,460,777.94	1,656,369		31,885	
GS<50kW	kWh	21,572,392		2,235,763	2,077,122		39,985	
GS>50 - 4,999 kW	kWh	8,606,314		891,958	73,432,418		1,413,574	
Streetlights	kWh	-		-	786,065		15,132	
Unmetered Scattered Load	kWh	314,890		32,635	10,496		202	
Embedded Distributor	kWh	-		-	58,660,344		1,129,212	
-		-		-	-		-	
-		-		-	-		-	
-		-		-	-		-	
SUB-TOTAL		131,427,386		13,621,134	136,622,814		2,629,989	$ 16,251,123

Global Adjustment non-RPP	Units	Volume	Rate	$	Volume	Rate	$	Total
Class per Load Forecast								
Residential	kWh			$ -			141,089.5	
GS<50kW	kWh			0			176,929.2	
GS>50 - 4,999 kW	kWh			0			6,148,887.5	
Streetlights	kWh			0			66,957.0	
Unmetered Scattered Load	kWh			0			894.1	
Embedded Distributor	kWh			0			4,996,688.1	
				0			-	
				0				
				0				
SUB-TOTAL		0		0			11,531,445	$ 11,531,445

Transmission - Network	Units	Volume	Rate	$	Volume	Rate	$	Total
Class per Load Forecast								
Residential	kWh	100,933,789	0.0085	854,780	1,656,369	0.0085	14,027	
GS<50kW	kWh	21,572,392	0.0079	170,004	2,077,122	0.0079	16,369	
GS>50 - 4,999 kW	kW	17,381	3.1354	54,498	206,601	3.1354	647,782	
Streetlights	kW		2.3348	-	2,087	2.3348	4,873	
Unmetered Scattered Load	kWh	314,890	0.0079	2,482	10,496	0.0079	83	
Embedded Distributor	kW		4.1472	-	166,110	4.1472	688,892	
				-			-	
				-			-	
				-			-	
				-			-	
SUB-TOTAL				1,081,763			1,372,026	2,453,789

Transmission - Connection	Units	Volume	Rate	$	Volume	Rate	$	Total
Class per Load Forecast								
Residential	kWh	100,933,789	0.0038	384,266	1,656,369	0.0038	6,306	
GS<50kW	kWh	21,572,392	0.0034	73,916	2,077,122	0.0034	7,117	
GS>50 - 4,999 kW	kW	17,381	1.4821	25,761	206,601	1.4821	306,205	
Streetlights	kW	-	1.0870	-	2,087	1.0870	2,269	
Unmetered Scattered Load	kWh	314,890	0.0034	1,079	10,496	0.0034	36	
Embedded Distributor	kW	-	0.6007	-	166,110	0.6007	99,777	
				-			-	
				-			-	
				-			-	
SUB-TOTAL				485,021			421,709	906,730

Wholesale Market Service	Units	Volume	Rate	$	Volume	Rate	$	Total
Class per Load Forecast								
Residential	kWh	100,933,789	0.0030	302,801	1,656,369	0.0030	4,969	
GS<50kW	kWh	21,572,392	0.0030	64,717	2,077,122	0.0030	6,231	
GS>50 - 4,999 kW	kWh	8,606,314	0.0030	25,819	73,432,418	0.0030	220,297	
Streetlights	kWh	-	0.0030	-	786,065	0.0030	2,358	
Unmetered Scattered Load	kWh	314,890	0.0030	945	10,496	0.0030	31	
Embedded Distributor	kWh	-	0.0030	-	58,660,344	0.0030	175,981	
				-			-	
				-			-	
				-			-	
SUB-TOTAL				394,282			409,868	804,151

Table 2-18 (cont.)
Summary of Total Cost of Power Expenses
2022 Test Year

Class A CBR	Units							
Class per Load Forecast		Volume	Rate	$	Volume	Rate[4]	$	Total
Residential				-			-	
GS<50kW				-			-	
GS>50 - 4,999 kW	kWh			-	19,499,514	0.0003	5,850	
Streetlights				-			-	
Unmetered Scattered Load				-			-	
Embedded Distributor				-			-	
				-			-	
				-			-	
				-			-	
SUB-TOTAL				-			5,850	5,850
Class B CBR	Units							
Class per Load Forecast		Volume	Rate	$	Volume	Rate	$	Total
Residential	kWh	100,933,789	0.0004	40,374	1,656,369	0.0004	663	
GS<50kW	kWh	21,572,392	0.0004	8,629	2,077,122	0.0004	831	
GS>50 - 4,999 kW	kWh	8,606,314	0.0004	3,443	53,932,904	0.0004	21,573	
Streetlights	kWh	-	0.0004	-	786,065	0.0004	314	
Unmetered Scattered Load	kWh	314,890	0.0004	126	10,496	0.0004	4	
Embedded Distributor	kWh	-	0.0004	-	58,660,344	0.0004	23,464	
				-			-	
				-			-	
				-			-	
SUB-TOTAL				52,571			46,849	99,420
RRRP	Units							
Class per Load Forecast		Volume	Rate	$	Volume	Rate	$	Total
Residential	kWh	100,933,789	0.0005	50,467	1,656,369	0.0005	828	
GS<50kW	kWh	21,572,392	0.0005	10,786	2,077,122	0.0005	1,039	
GS>50 - 4,999 kW	kWh	8,606,314	0.0005	4,303	73,432,418	0.0005	36,716	
Streetlights	kWh	-	0.0005	-	786,065	0.0005	393	
Unmetered Scattered Load	kWh	314,890	0.0005	157	10,496	0.0005	5	
Embedded Distributor	kWh	-	0.0005	-	58,660,344	0.0005	29,330	
				-			-	
				-			-	
				-			-	
SUB-TOTAL				65,714			68,311	134,025
Low Voltage - No TLF adjustme	Units							
Class per Load Forecast		Volume	Rate	$	Volume	Rate	$	Total
Residential		96,532,856	$ 0.0026	250,985	1,584,148	0.0026	4,119	
GS<50kW		20,631,789	$ 0.0024	49,516	1,986,555	0.0024	4,768	
GS>50 - 4,999 kW		17,381	$ 0.9779	16,997	206,601	0.9777	201,994	
Streetlights			$ 0.7173	-	2,087	0.7171	1,497	
Unmetered Scattered Load		301,160	$ 0.0024	723	10,039	0.0024	24	
Embedded Distributor				-			-	
				-			-	
				-			-	
				-			-	
SUB-TOTAL				318,222			212,401	530,623
Smart Meter Entity Charge								
Class per Load Forecast		Customers	Rate	$	Customers	Rate	$	Total
Residential		11,213	0.57	76,699			-	
GS<50kW		845	0.57	5,782			-	
				-			-	
SUB-TOTAL				82,480			-	82,480
SUB- TOTAL				16,101,187			16,698,450	32,799,637
OER CREDIT[3]	18.90%			(3,043,124)			0	(3,043,124)
TOTAL				**13,058,062**			**16,698,450**	**29,756,512**

Commodity Prices

In accordance with the Filing Requirements, the commodity price estimate used to calculate COP was determined in a way that bases the split between Regulated Price Plan ("RPP") and non-RPP customers on actual historical data and uses the most current RPP price.

The RPP and non-RPP price was obtained from the Regulated Price Plan Price Report for the period of May 1, 2021 through April 30, 2022 published by the Board April 30, 2021. For the purposes of calculating the 2022 Test Year, Grimsby Power has used an estimate of $0.10364 per kWh for RPP customers. For non-RPP customers, Grimsby Power has used $0.10443 per kWh which includes $0.01925 per kWh for the Wholesale Electricity Price and $0.08518 per kWh for Global Adjustment charges.

Grimsby Power understands that the commodity charge will be updated to reflect any changes to commodity prices that may become available prior to the approval of its application.

Network and Connection Charges

Grimsby Power incurs Network and Connection charges from both the IESO and Hydro One. For the purposes of determining the cost of each for the 2022 Test Year, Grimsby Power determined the kW billed by both the IESO and Hydro One for 2020 actual Network and Connection costs. The 2020 consumption and demand data was then utilized to estimate the monthly Network and Connection costs for the 2022 Test Year by applying the forecasted kW by the July 1, 2021 Uniform Transmission Rates as approved by the Board (EB-2021-0176) and Hydro One's approved 2021 Sub-Transmission rates. Grimsby Power understands that the transmission costs will be updated to reflect any new rates that may become available prior to the approval of its application.

Regulatory Charges – Wholesale Market Services & Rural or Remote Electricity Rate Protection Charge

On December 10, 2020 the Board issued a Decision and Rate Order (EB-2020-0276) establishing regulatory charges effective January 1, 2021. The Rate Order set the

Wholesale Market Service ("WMS") Charge at $0.003, the capacity-based recovery component at $0.0004 and the RRRP charge at $0.0005.

The above rates were used in the calculation of Wholesale Market Services, Wholesale Market Service – Capacity Based Recovery and the RRRP charge included in the 2022 Cost of Power.

Low Voltage Charges

Grimsby Power incurs low voltage charges from Hydro One and the 2022 Test Year costs were estimated using the actual 2020 charges from Hydro One.

Smart Meter Entity Charges

The Smart Meter Entity costs are calculated based on the rate of $0.57 per month for each Residential and General Service < 50 kW customer approved as approved by the OEB March 23, 2018. The estimated number of customers for the 2022 test year been utilized for the 2022 Test Year calculation.

Appendix 2-C
Depreciation and Amortization Expense

This appendix is to be completed in conjunction with the accounting instructions in Appendix 2-B

Scenario that applies	Applicable Years and Accounting Standard	Year Reflected in Schedule Below	Accounting Standard Reflected in Schedule
Already rebased with depreciation policy changes in a prior rate application and rebasing MIFRS for the first time. ☐	This appendix must be completed for 2014 to the test year. The appendix for 2014 is to be completed under Revised CGAAP (after changes in depreciation policies). The appendix for 2014 to the test year is to be completed under MIFRS (2014 if changes to MIFRS are material).		
Already rebased under MIFRS in a prior rate application ☑	This appendix must be completed under MIFRS for each year for the earlier of: 1) all historical years back to its last rebasing; or 2) at least three years of historical actuals, in addition to Bridge Year and Test Year forecasts.	2016	MIFRS

		Book Values							Service Lives				Depreciation Expense					
Account	Description	Opening Net Book Value of Existing Assets as at Date of Policy Change (Jan. 1) [1]	Less Fully Depreciated [7]	Net Amount of Existing Assets Before Policy Change to be Depreciated	Opening Gross Book Value of Assets Acquired After Policy Change [2]	Less Fully Depreciated [8]	Net Amount of Assets Acquired After Policy Change to be Depreciated	Current Year Additions	Average Remaining Life of Assets Existing Before Policy Change [3]	Depreciation Rate Assets Acquired After Policy Change	Life of Assets Acquired After Policy Change [4]	Depreciation Rate on New Additions	Depreciation Expense on Assets Existing Before Policy Change	Depreciation Expense on Assets Acquired After Policy Change	Depreciation Expense on Current Year Additions [5]	Total Current Year Depreciation Expense	Depreciation Expense per Appendix 2-BA Fixed Assets, Column J	Variance [6]
		a	b	c = a-b	d	e	f = d- e	g	h	i = 1/h	j	k = 1/j	l = c/h	m = f/j	n = g*0.5/j	o = l+m+n	p	q = p-o
1611	Computer Software (Formally known as Account 1925)	$ 289,366	$ 262,678	$ 26,688	$ 774,616	$ 289,826	$ 484,791	$ 36,259	3.00	33.33%	5.00	20.00%	$ 8,896	$ 96,958	$ 3,626	$ 109,480	$ 109,480	$ 0
1612	Land Rights (Formally known as Account 1906)			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1805	Land			$ -	$ 149,992		$ 149,992	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1808	Buildings			$ -	$ 1,256,185		$ 1,256,185	$ -		0.00%	50.00	2.00%	$ -	$ 25,124	$ -	$ 25,124	$ 25,124	$ -
1810	Leasehold Improvements			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1815	Transformer Station Equipment >50 kV (10)	$ -		$ -	$ -		$ -	$ 52,225	10.00	10.00%	10.00	10.00%	$ -	$ -	$ 2,611	$ 2,611	$ 2,611	$ -
1815	Transformer Station Equipment >50 kV (20)	$ 732,310	$ 524,507	$ 207,803	$ 732,310		$ 732,310	$ -	8.00	12.50%	20.00	5.00%	$ 25,975	$ 36,615	$ -	$ 62,591	$ 62,590	$ (0)
1815	Transformer Station Equipment >50 kV (40)	$ 3,355,781	$ 2,708,611	$ 647,171	$ 3,355,781	$ 932,983	$ 2,422,799	$ 30,946	28.00	3.57%	40.00	2.50%	$ 23,113	$ 60,570	$ 387	$ 84,070	$ 84,070	$ (0)
1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922	$ 1,873,011	$ 809,911	$ 2,682,922	$ 1,233,242	$ 1,449,680	$ -	33.00	3.03%	45.00	2.22%	$ 24,543	$ 32,215	$ -	$ 56,758	$ 56,758	$ 0
1815	Transformer Station Equipment >50 kV (50)	$ 77,279	$ 54,001	$ 23,277	$ 77,279	$ 36,853	$ 40,426	$ -	38.00	2.63%	50.00	2.00%	$ 613	$ 809	$ -	$ 1,421	$ 1,421	$ 0
1815	Transformer Station Equipment >50 kV (55)	$ 643,777	$ 242,716	$ 401,061	$ 643,777	$ 580,935	$ 62,842	$ -	43.00	2.33%	55.00	1.82%	$ 9,327	$ 1,143	$ -	$ 10,470	$ 10,470	$ 0
1820	Distribution Station Equipment <50 kV			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1825	Storage Battery Equipment			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1830	Poles, Towers & Fixtures	$ 3,337,033	$ 286,299	$ 3,050,734	$ 4,218,570	$ 3,050,170	$ 1,168,401	$ 165,275	34.00	2.94%	45.00	2.22%	$ 89,727	$ 25,964	$ 1,836	$ 117,528	$ 116,777	$ (751)
1835	Overhead Conductors & Devices	$ 1,897,776	$ 313,192	$ 1,584,584	$ 3,136,960	$ 1,600,974	$ 1,535,986	$ 90,335	54.50	1.83%	60.00	1.67%	$ 29,075	$ 25,600	$ 753	$ 55,428	$ 55,428	$ (0)
1840	Underground Conduit	$ 1,853,805	$ 253,180	$ 1,600,625	$ 2,400,775	$ 1,675,114	$ 725,661	$ 89,556	34.73	2.88%	50.00	2.00%	$ 46,088	$ 14,513	$ 896	$ 61,496	$ 61,496	$ 0
1845	Underground Conductors & Devices	$ 1,058,668	$ 220,916	$ 837,751	$ 2,037,508	$ 842,342	$ 1,195,167	$ 104,842	25.30	3.95%	30.00	3.33%	$ 33,113	$ 39,839	$ 1,747	$ 74,699	$ 74,699	$ 0
1850	Line Transformers	$ 2,978,874	$ 346,651	$ 2,632,223	$ 4,473,551	$ 2,593,800	$ 1,879,752	$ 193,544	29.23	3.42%	40.00	2.50%	$ 90,052	$ 46,994	$ 2,419	$ 139,465	$ 138,975	$ (490)
1855	Services Overhead	$ 134,454	$ 27,746	$ 106,708	$ 221,571	$ 108,258	$ 113,312	$ 14,791	54.73	1.83%	60.00	1.67%	$ 1,950	$ 1,889	$ 123	$ 3,962	$ 3,962	$ 0
1855	Services Underground	$ 505,122	$ 259,545	$ 245,577	$ 1,465,886	$ 267,581	$ 1,198,305	$ 56,493	31.00	3.23%	35.00	2.86%	$ 7,922	$ 34,237	$ 807	$ 42,966	$ 42,966	$ (0)
1860	Meters 15yrs	$ 1,519,758	$ 1,254,177	$ 265,581	$ 1,795,911	$ 267,753	$ 1,528,158	$ 22,568	13.80	7.25%	15.00	6.67%	$ 19,245	$ 101,877	$ 752	$ 121,874	$ 121,874	$ (0)
1860	Meters >50	$ 162,827	$ 1,843	$ 160,984	$ 279,715	$ 171,597	$ 108,119	$ 39,664	19.06	5.25%	25.00	4.00%	$ 8,446	$ 4,325	$ 793	$ 13,564	$ 13,564	$ (0)
1860	Meters CT's & PT's	$ 69,489	$ 6,710	$ 62,780	$ 172,982	$ 63,407	$ 109,575	$ 2,189	30.60	3.27%	35.00	2.86%	$ 2,052	$ 3,131	$ 31	$ 5,214	$ 5,214	$ 0
1905	Land	$ 111,556		$ 111,556	$ 111,556		$ 111,556	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1908	Buildings and Fixtures (50)	$ 311,426	$ 161,942	$ 149,484	$ 311,426		$ 311,426	$ -	24.00	4.17%	50.00	2.00%	$ 6,229	$ 6,229	$ -	$ 12,457	$ 12,457	$ 0
1908	Buildings and Fixtures (40)	$ 29,372	$ 1,639	$ 27,732	$ 55,127	$ 29,372	$ 25,755	$ -	19.75	5.06%	40.00	2.50%	$ 1,404	$ 644	$ -	$ 2,048	$ 2,048	$ 0
1908	Buildings and Fixtures (25)	$ 174,026	$ 11,546	$ 162,480	$ 230,777	$ 174,026	$ 56,751	$ 117,556	23.33	4.29%	25.00	4.00%	$ 6,964	$ 2,270	$ 2,351	$ 11,586	$ 11,586	$ 0
1910	Leasehold Improvements			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1915	Office Furniture & Equipment (10 years)	$ 25,914	$ 11,318	$ 14,596	$ 128,285	$ 27,001	$ 101,283	$ 26,772	5.67	17.64%	10.00	10.00%	$ 2,574	$ 10,128	$ 1,339	$ 14,041	$ 13,165	$ (876)
1920	Computer Equipment - Hardware	$ 64,440	$ 62,871	$ 1,569	$ 153,123	$ 62,323	$ 90,801	$ 6,887	3.00	33.33%	5.00	20.00%	$ 523	$ 18,160	$ 689	$ 19,372	$ 19,372	$ 0
1920	Computer Equip.-Hardware(Post Mar. 22/04)			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1920	Computer Equip.-Hardware(Post Mar. 19/07)			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1930	Transportation Equipment (8)	$ 17,876	$ 15,830	$ 2,046	$ 21,466	$ 14,417	$ 7,049		4.50	22.22%	8.00	12.50%	$ 455	$ 881	$ -	$ 1,336	$ 903	$ (432)
1930	Transportation Equipment (15)	$ 22,698		$ 22,698	$ 344,950		$ 344,950	$ 359,940	2.25	44.44%	15.00	6.67%	$ 10,088	$ 22,997	$ 11,998	$ 45,083	$ 45,121	$ 38
1935	Stores Equipment			$ -	$ -		$ -	$ 11,963		0.00%	10.00	10.00%	$ -	$ -	$ 598	$ 598	$ 598	$ 0
1940	Tools, Shop & Garage Equipment	$ 66,736	$ 24,371	$ 42,365	$ 199,687	$ 61,972	$ 137,715	$ 7,105	6.71	14.90%	10.00	10.00%	$ 6,314	$ 13,772	$ 355	$ 20,441	$ 20,441	$ 0
1945	Measurement & Testing Equipment	$ 15,273	$ 15,273	$ -	$ 37,485	$ 15,273	$ 22,211	$ 3,493	1.50	66.67%	5.00	20.00%	$ -	$ 4,442	$ 349	$ 4,792	$ 4,792	$ 0
1950	Power Operated Equipment			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1955	Communications Equipment			$ -	$ 70,080		$ 70,080	$ 260		0.00%	8.50	11.76%	$ -	$ 8,245	$ 15	$ 8,260	$ 8,138	$ (122)
1955	Communication Equipment (Smart Meters)			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1960	Miscellaneous Equipment			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1970	Load Management Controls Customer Premises			$ -	$ 16,439		$ 16,439	$ -		0.00%	10.00	10.00%	$ -	$ 1,644	$ -	$ 1,644	$ 1,644	$ 0
1975	Load Management Controls Utility Premises			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1980	System Supervisor Equipment			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1985	Miscellaneous Fixed Assets			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1990	Other Tangible Property			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1995	Contributions & Grants -Transformer Station			$ -	$ (1,218,270)		$ (1,218,270)		40.00	2.50%	40.00	2.50%	$ -	-$ 30,457	$ -	-$ 30,457	$ (30,457)	$ (0)
1995	Contributions & Grants - Poles	$ (13,087)	$ 145	$ (13,232)	$ (105,928)	$ (13,232)	$ (92,696)	$ (62,281)	45.00	2.22%	45.00	2.22%	-$ 294	-$ 2,060	-$ 692	-$ 3,046	$ (3,046)	$ (0)
1995	Contributions & Grants - OH Conductors	$ (46,607)	$ 388	$ (46,996)	$ (110,584)	$ (46,996)	$ (63,588)	$ (14,841)	60.00	1.67%	60.00	1.67%	-$ 783	-$ 1,060	-$ 124	-$ 1,967	$ (1,967)	$ (0)
1995	Contributions & Grants - UG Conduit	$ (149,904)	$ 1,499	$ (151,403)	$ (295,432)	$ (151,403)	$ (144,029)	$ (22,883)	50.00	2.00%	50.00	2.00%	-$ 3,028	-$ 2,881	-$ 229	-$ 6,137	$ (6,137)	$ 0
1995	Contributions & Grants - UG Conductors	$ (105,186)	$ 1,753	$ (106,939)	$ (323,668)	$ (106,939)	$ (216,729)	$ (65,433)	30.00	3.33%	30.00	3.33%	-$ 3,565	-$ 7,224	-$ 1,091	-$ 11,880	$ (11,880)	$ 0
1995	Contributions & Grants - Line Transformers	$ (173,796)	$ 2,172	$ (175,968)	$ (689,255)	$ (175,968)	$ (513,286)	$ (77,968)	40.00	2.50%	40.00	2.50%	-$ 4,399	-$ 12,832	-$ 975	-$ 18,206	$ (18,206)	$ 0
1995	Contributions & Grants - Services OH	$ (415)	$ 3	$ (418)	$ (9,047)	$ (418)	$ (8,629)	$ (581)	60.00	1.67%	60.00	1.67%	-$ 7	-$ 144	-$ 5	-$ 156	$ (156)	$ 0
1995	Contributions & Grants - Services UG	$ (201,560)	$ 2,879	$ (204,439)	$ (874,140)	$ (204,439)	$ (669,700)	$ (43,784)	35.00	2.86%	35.00	2.86%	-$ 5,841	-$ 19,134	-$ 625	-$ 25,601	$ (25,601)	$ 0
1995	Contributions & Grants - Meters 15 years	$ (11,159)	$ 223	$ (11,382)	$ (105,973)	$ (11,382)	$ (94,591)	$ (8,593)	15.00	6.67%	15.00	6.67%	-$ 759	-$ 6,306	-$ 286	-$ 7,351	$ (7,351)	$ (0)
1995	Contributions & Grants - Meters 25 years	$ (5,489)	$ 110	$ (5,599)	$ (25,332)	$ (5,599)	$ (19,733)	$ (5,408)	25.00	4.00%	25.00	4.00%	-$ 224	-$ 789	-$ 108	-$ 1,121	$ (1,121)	$ 0
1995	Contributions & Grants - Meters 35 years	$ (2,127)	$ 30	$ (2,158)	$ (16,837)	$ (2,158)	$ (14,680)	$ (2,250)	35.00	2.86%	35.00	2.86%	-$ 62	-$ 419	-$ 32	-$ 513	$ (513)	$ (0)
1995	Contributions & Grants - Load Mgmt Control			$ -	$ (13,599)	$ -	$ (13,599)		10.00	10.00%	10.00	10.00%	$ -	-$ 1,360	$ -	-$ 1,360	$ (1,360)	$ (0)
2005	Property Under Finance Lease			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -		$ -
	Total	**$ 21,429,228**	**$ 8,949,776**	**$ 12,479,451**	**$ 27,768,627**	**$ 13,380,683**	**$ 14,387,944**	**$ 1,128,640**					**$ 435,725**	**$ 556,547**	**$ 30,310**	**$ 1,022,582**	**$ 1,019,949**	**$ (2,633)**

General: Applicants are to complete this appendix to show the reasonability of the depreciation expense that is included in rate base via. Accumulated depreciation and the revenue requirement.
Applicants must provide a breakdown of depreciation and amortization expense in the above format for all relevant accounts. Balances presented in the table should exclude asset retirement obligations (AROs) and the related depreciation and accretion expense. These should be disclosed separately consistent with the Notes of historical Audited Financial Statements.

Notes:

1 This is the net book value of assets that existed as at the date of the utility's change in depreciation policies (i.e. as at Jan. 1, 2012 or Jan. 1, 2013). These assets are to be depreciated at the average remaining service life. This amount will not change in years subsequent to the date of the utility's change in depreciation policies. This column is expected to be used until the assets that existed as at the date of the utility's change in depreciation policies are fully depreciated.

2 This is the opening gross book value of assets that have been acquired after the date of the utility's change in depreciation policies (i.e. additions starting in 2012/2013 for those who changed policies Jan. 1, 2012/2013). These assets are to be depreciated at the revised service life. The amount is expected to be equal to the opening gross book value of the prior year plus the prior year's additions.

3 A recalculation should be performed to determine the average remaining life of opening balance of assets (i.e. excluding current year's additions) under the change in policies under CGAAP. For example, Asset A had a useful life of 20 years under CGAAP without the change in policies. On January 1 of the year of policy changes, Asset A was 3 years depreciated. As a result, Asset A would have a remaining service life of 17 years (20 years less 3 years) as at January 1 of the year of policy changes. Due to making the change in policies under CGAAP, management re-assessed the asset useful lives and concluded that the revised useful life of Asset A is now 30 years. Therefore, the average remaining useful life of the opening balance of Asset A is determined to be 27 years (30 years less 3 years) under the revised CGAAP as at January 1 of the year of policy changes.

4 The useful life used should be consistent with the OEB's regulatory accounting policies as set out in the Accounting Procedures Handbook for Electricity Distributors, effective Jan. 1, 2012 and also with the Report of the Board, Transition to International Financial Reporting Standards, EB-2008-0408, and the Kinectrics Report.

5 OEB policy of the "half-year" rule - the applicant must ensure that additions in the year attract a half-year depreciation expense in the first year. Deviations from this standard practice must be supported in the application.

6 The applicant must provide an explanation of material variances in evidence.

7 This should include assets in column A (excel column C) that become fully depreciated since the date of the policy change. The amount input in b (excel column D) should equal the net book value of the asset as at the date of depreciation policy change

8 This should include assets in column D (excel column F) that have become fully depreciated. The amount input in e (excel column G) should equal the gross book value of the asset

2017		Book Values							Service Lives				Depreciation Expense					
Account	Description	Opening Net Book Value of Existing Assets as at Date of Policy Change (Jan. 1) [1]	Less Fully Depreciated [7]	Net Amount of Existing Assets Before Policy Change to be Depreciated	Opening Gross Book Value of Assets Acquired After Policy Change [2]	Less Fully Depreciated [8]	Net Amount of Assets Acquired After Policy Change to be Depreciated	Current Year Additions	Average Remaining Life of Assets Existing Before Policy Change [3]	Depreciation Rate Assets Acquired After Policy Change	Life of Assets Acquired After Policy Change [4]	Depreciation Rate on New Additions	Depreciation Expense on Assets Existing Before Policy Change	Depreciation Expense on Assets Acquired After Policy Change	Depreciation Expense on Current Year Additions [5]	Total Current Year Depreciation Expense	Depreciation Expense per Appendix 2-BA Fixed Assets, Column J	Variance [6]
		a	b	c = a-b	d	e	f = d- e	g	h	i = 1/h	j	k = 1/j	l = c/h	m = f/j	n = g*0.5/j	o = l+m+n	p	q = p-o
1611	Computer Software (Formally known as Account 1925)	$ 289,366	$ 289,366	$ -	$ 808,170	$ 371,626	$ 436,544	$ 25,271	3.00	33.33%	5.00	20.00%	$ -	$ 87,309	$ 2,527	$ 89,836	$ 89,836	$ 0
1612	Land Rights (Formally known as Account 1906)			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1805	Land			$ -	$ 149,992		$ 149,992	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1808	Buildings and Fixtures (50)			$ -	$ 1,256,185		$ 1,256,185	$ -		0.00%	50.00	2.00%	$ -	$ 25,124	$ -	$ 25,124	$ 25,124	$ -
1808	Buildings and Fixtures (25)			$ -	$ -		$ -	$ 6,468		0.00%	25.00	4.00%	$ -	$ -	$ 129	$ 129	$ 129	$ -
1810	Leasehold Improvements			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1815	Transformer Station Equipment >50 kV (10)	$ -		$ -	$ 52,225		$ 52,225	$ 50,963	10.00	10.00%	10.00	10.00%	$ -	$ 5,222	$ 2,548	$ 7,771	$ 7,771	$ -
1815	Transformer Station Equipment >50 kV (20)	$ 732,310	$ 524,507	$ 207,803	$ 732,310		$ 732,310	$ 57,978	8.00	12.50%	20.00	5.00%	$ 25,975	$ 36,615	$ 1,449	$ 64,040	$ 64,040	$ (0)
1815	Transformer Station Equipment >50 kV (40)	$ 3,355,781	$ 2,708,611	$ 647,171	$ 3,386,728	$ 932,983	$ 2,453,745	$ -	28.00	3.57%	40.00	2.50%	$ 23,113	$ 61,344	$ -	$ 84,457	$ 84,457	$ (0)
1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922	$ 1,873,011	$ 809,911	$ 2,682,922	$ 1,233,242	$ 1,449,680	$ -	33.00	3.03%	45.00	2.22%	$ 24,543	$ 32,215	$ -	$ 56,758	$ 56,758	$ 0
1815	Transformer Station Equipment >50 kV (50)	$ 77,279	$ 54,001	$ 23,277	$ 77,279	$ 36,853	$ 40,426	$ -	38.00	2.63%	50.00	2.00%	$ 613	$ 809	$ -	$ 1,421	$ 1,421	$ 0
1815	Transformer Station Equipment >50 kV (55)	$ 643,777	$ 242,716	$ 401,061	$ 643,777	$ 580,935	$ 62,842	$ -	43.00	2.33%	55.00	1.82%	$ 9,327	$ 1,143	$ -	$ 10,470	$ 10,470	$ 0
1820	Distribution Station Equipment <50 kV			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1825	Storage Battery Equipment			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1830	Poles, Towers & Fixtures	$ 3,337,033	$ 286,299	$ 3,050,734	$ 4,383,845	$ 3,050,170	$ 1,333,675	$ 189,576	34.00	2.94%	45.00	2.22%	$ 89,727	$ 29,637	$ 2,106	$ 121,471	$ 120,748	$ (724)
1835	Overhead Conductors & Devices	$ 1,897,776	$ 313,192	$ 1,584,584	$ 3,227,295	$ 1,600,974	$ 1,626,321	$ 249,899	54.50	1.83%	60.00	1.67%	$ 29,075	$ 27,105	$ 2,082	$ 58,263	$ 58,263	$ 0
1840	Underground Conduit	$ 1,853,805	$ 253,180	$ 1,600,625	$ 2,490,331	$ 1,675,114	$ 815,217	$ 348,205	34.73	2.88%	50.00	2.00%	$ 46,088	$ 16,304	$ 3,482	$ 65,874	$ 65,874	$ 0
1845	Underground Conductors & Devices	$ 1,058,668	$ 220,916	$ 837,751	$ 2,142,350	$ 842,342	$ 1,300,008	$ 317,446	25.30	3.95%	30.00	3.33%	$ 33,113	$ 43,334	$ 5,291	$ 81,737	$ 81,737	$ (0)
1850	Line Transformers	$ 2,978,874	$ 346,651	$ 2,632,223	$ 4,667,095	$ 2,593,800	$ 2,073,296	$ 397,744	29.23	3.42%	40.00	2.50%	$ 90,052	$ 51,832	$ 4,972	$ 146,856	$ 146,052	$ (805)
1855	Services Overhead	$ 134,454	$ 27,746	$ 106,708	$ 236,362	$ 108,258	$ 128,104	$ 24,365	54.73	1.83%	60.00	1.67%	$ 1,950	$ 2,135	$ 203	$ 4,288	$ 4,289	$ 1
1855	Services Underground	$ 505,122	$ 259,545	$ 245,577	$ 1,522,379	$ 267,120	$ 1,255,259	$ 104,183	31.00	3.23%	35.00	2.86%	$ 7,922	$ 35,865	$ 1,488	$ 45,275	$ 45,275	$ (0)
1860	Meters 15yrs	$ 1,519,758	$ 1,254,177	$ 265,581	$ 1,818,479	$ 267,753	$ 1,550,725	$ 72,752	13.80	7.25%	15.00	6.67%	$ 19,245	$ 103,382	$ 2,425	$ 125,052	$ 125,052	$ 0
1860	Meters >50	$ 162,827	$ 1,843	$ 160,984	$ 319,379	$ 171,597	$ 147,782	$ 48,814	19.06	5.25%	25.00	4.00%	$ 8,446	$ 5,911	$ 976	$ 15,334	$ 15,334	$ (0)
1860	Meters CT's & PT's	$ 69,489	$ 6,710	$ 62,780	$ 175,171	$ 63,407	$ 111,764	$ 4,484	30.60	3.27%	35.00	2.86%	$ 2,052	$ 3,193	$ 64	$ 5,309	$ 5,309	$ (0)
1905	Land	$ 111,556		$ 111,556	$ 111,556		$ 111,556	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1908	Buildings and Fixtures (50)	$ 311,426	$ 161,942	$ 149,484	$ 311,426		$ 311,426	$ -	24.00	4.17%	50.00	2.00%	$ 6,229	$ 6,229	$ -	$ 12,457	$ 12,457	$ 0
1908	Buildings and Fixtures (40)	$ 29,372	$ 1,639	$ 27,732	$ 55,127	$ 29,372	$ 25,755	$ -	19.75	5.06%	40.00	2.50%	$ 1,404	$ 644	$ -	$ 2,048	$ 2,049	$ 1
1908	Buildings and Fixtures (25)	$ 174,026	$ 16,358	$ 157,668	$ 348,333	$ 174,026	$ 174,307	$ 25,479	23.33	4.29%	25.00	4.00%	$ 6,758	$ 6,972	$ 510	$ 14,240	$ 14,240	$ 0
1910	Leasehold Improvements			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1915	Office Furniture & Equipment (10 years)	$ 25,914	$ 11,318	$ 14,596	$ 155,057	$ 27,001	$ 128,056	$ 1,780	5.67	17.64%	10.00	10.00%	$ 2,574	$ 12,806	$ 89	$ 15,469	$ 14,593	$ (876)
1920	Computer Equipment - Hardware	$ 64,440	$ 62,871	$ 1,569	$ 132,728	$ 62,323	$ 70,405	$ 13,758	3.00	33.33%	5.00	20.00%	$ 523	$ 14,081	$ 1,376	$ 15,980	$ 16,125	$ 146
1920	Computer Equip.-Hardware(Post Mar. 22/04)			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1920	Computer Equip.-Hardware(Post Mar. 19/07)			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1930	Transportation Equipment (8)	$ 17,876	$ 17,876	$ -	$ 21,466	$ 14,417	$ 7,049	$ 49,063	4.50	22.22%	8.00	12.50%	$ -	$ 881	$ 3,066	$ 3,948	$ 3,515	$ (432)
1930	Transportation Equipment (15)	$ 22,698	$ 22,698	$ -	$ 704,889		$ 704,889	$ -	2.25	44.44%	15.00	6.67%	$ -	$ 46,993	$ -	$ 46,993	$ 36,576	$ (10,416)
1935	Stores Equipment			$ -	$ 11,963		$ 11,963	$ -		0.00%	10.00	10.00%	$ -	$ 1,196	$ -	$ 1,196	$ 1,196	$ 0
1940	Tools, Shop & Garage Equipment	$ 66,736	$ 28,884	$ 37,852	$ 206,792	$ 62,118	$ 144,674	$ -	6.71	14.90%	10.00	10.00%	$ 5,641	$ 14,467	$ -	$ 20,109	$ 20,109	$ (0)
1945	Measurement & Testing Equipment	$ 15,273	$ 15,273	$ -	$ 40,977	$ 16,287	$ 24,690	$ 3,431	1.50	66.67%	5.00	20.00%	$ -	$ 4,938	$ 343	$ 5,281	$ 5,281	$ 0
1950	Power Operated Equipment			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1955	Communications Equipment			$ -	$ 66,586		$ 66,586	$ 5,953		0.00%	8.50	11.76%	$ -	$ 7,834	$ 350	$ 8,184	$ 8,410	$ 227
1955	Communication Equipment (Smart Meters)			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1960	Miscellaneous Equipment			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1970	Load Management Controls Customer Premises			$ -	$ 16,439		$ 16,439	$ -		0.00%	10.00	10.00%	$ -	$ 1,644	$ -	$ 1,644	$ 1,644	$ 0
1975	Load Management Controls Utility Premises			$ -	$ -		$ -	$ -		0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1980	System Supervisor Equipment			$ -	$ -		$ -	$ 194,995		0.00%	20.00	5.00%	$ -	$ -	$ 4,875	$ 4,875	$ 4,875	$ 0
1985	Miscellaneous Fixed Assets			$ -	$ -		$ -			0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1990	Other Tangible Property			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1995	Contributions & Grants -Transformer Station			$ -	$ (1,218,270)		$ (1,218,270)		40.00	2.50%	40.00	2.50%	$ -	-$ 30,457	$ -	-$ 30,457	$ (30,457)	$ (0)
1995	Contributions & Grants - Poles	$ (13,087)	$ 145	$ (13,232)	$ (168,209)	$ (13,232)	$ (154,977)	$ (40,712)	45.00	2.22%	45.00	2.22%	-$ 294	-$ 3,444	-$ 452	-$ 4,190	$ (4,190)	$ (0)
1995	Contributions & Grants - OH Conductors	$ (46,607)	$ 388	$ (46,996)	$ (125,425)	$ (46,996)	$ (78,429)	$ (52,308)	60.00	1.67%	60.00	1.67%	-$ 783	-$ 1,307	-$ 436	-$ 2,526	$ (2,526)	$ -
1995	Contributions & Grants - UG Conduit	$ (149,904)	$ 1,499	$ (151,403)	$ (318,315)	$ (151,403)	$ (166,912)	$ (205,711)	50.00	2.00%	50.00	2.00%	-$ 3,028	-$ 3,338	-$ 2,057	-$ 8,423	$ (8,423)	$ -
1995	Contributions & Grants - UG Conductors	$ (105,186)	$ 1,753	$ (106,939)	$ (389,102)	$ (106,939)	$ (282,163)	$ (135,203)	30.00	3.33%	30.00	3.33%	-$ 3,565	-$ 9,405	-$ 2,253	-$ 15,223	$ (15,223)	$ 0
1995	Contributions & Grants - Line Transformers	$ (173,796)	$ 2,172	$ (175,968)	$ (767,222)	$ (175,968)	$ (591,254)	$ (184,045)	40.00	2.50%	40.00	2.50%	-$ 4,399	-$ 14,781	-$ 2,301	-$ 21,481	$ (21,481)	$ 0
1995	Contributions & Grants - Services OH	$ (415)	$ 3	$ (418)	$ (9,628)	$ (418)	$ (9,210)	$ (1,474)	60.00	1.67%	60.00	1.67%	-$ 7	-$ 154	-$ 12	-$ 173	$ (173)	$ (0)
1995	Contributions & Grants - Services UG	$ (201,560)	$ 2,879	$ (204,439)	$ (917,924)	$ (204,439)	$ (713,484)	$ (62,983)	35.00	2.86%	35.00	2.86%	-$ 5,841	-$ 20,385	-$ 900	-$ 27,126	$ (27,126)	$ 0
1995	Contributions & Grants - Meters 15 years	$ (11,159)	$ 223	$ (11,382)	$ (114,565)	$ (11,382)	$ (103,184)	$ (30,766)	15.00	6.67%	15.00	6.67%	-$ 759	-$ 6,879	-$ 1,026	-$ 8,663	$ (8,663)	$ 0
1995	Contributions & Grants - Meters 25 years	$ (5,489)	$ 110	$ (5,599)	$ (30,740)	$ (5,599)	$ (25,141)	$ (6,761)	25.00	4.00%	25.00	4.00%	-$ 224	-$ 1,006	-$ 135	-$ 1,365	$ (1,365)	$ -
1995	Contributions & Grants - Meters 35 years	$ (2,127)	$ 30	$ (2,158)	$ (19,087)	$ (2,158)	$ (16,929)	$ (3,821)	35.00	2.86%	35.00	2.86%	-$ 62	-$ 484	-$ 55	-$ 600	$ (600)	$ 0
1995	Contributions & Grants - Load Mgmt Control			$ -	$ (13,599)		$ (13,599)		10.00	10.00%	10.00	10.00%	$ -	-$ 1,360	$ -	-$ 1,360	$ (1,360)	$ (0)
2005	Property Under Finance Lease			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -		$ -
	Total	$ 21,429,228	$ 9,010,533	$ 12,418,695	$ 28,863,524	$ 13,463,183	$ 15,400,342	$ 1,468,825					$ 415,408	$ 594,164	$ 30,727	$ 1,040,298	$ 1,027,419	$ (12,879)

2018		Book Values							Service Lives				Depreciation Expense					
Account	Description	Opening Net Book Value of Existing Assets as at Date of Policy Change (Jan. 1) [1]	Less Fully Depreciated [7]	Net Amount of Existing Assets Before Policy Change to be Depreciated	Opening Gross Book Value of Assets Acquired After Policy Change [2]	Less Fully Depreciated [8]	Net Amount of Assets Acquired After Policy Change to be Depreciated	Current Year Additions	Average Remaining Life of Assets Existing Before Policy Change [3]	Depreciation Rate Assets Acquired After Policy Change	Life of Assets Acquired After Policy Change [4]	Depreciation Rate on New Additions	Depreciation Expense on Assets Existing Before Policy Change	Depreciation Expense on Assets Acquired After Policy Change	Depreciation Expense on Current Year Additions [5]	Total Current Year Depreciation Expense	Depreciation Expense per Appendix 2-BA Fixed Assets, Column J	Variance [6]
		a	b	c = a-b	d	e	f = d- e	g	h	i = 1/h	j	k = 1/j	l = c/h	m = f/j	n = g*0.5/j	o = l+m+n	p	q = p-o
1611	Computer Software (Formally known as Account 1925)	$ 289,366	$ 289,366	$ -	$ 833,442	$ 549,601	$ 283,840	$ 24,245	3.00	33.33%	5.00	20.00%	$ -	$ 56,768	$ 2,425	$ 59,193	$ 59,193	$ (0)
1612	Land Rights (Formally known as Account 1906)			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1805	Land			$ -	$ 149,992		$ 149,992	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1808	Buildings and Fixtures (50)			$ -	$ 1,256,185		$ 1,256,185	$ -	-	0.00%	50.00	2.00%	$ -	$ 25,124	$ -	$ 25,124	$ 25,124	$ -
1808	Buildings and Fixtures (25)			$ -	$ 6,468		$ 6,468	$ 8,256	-	0.00%	25.00	4.00%	$ -	$ 259	$ 165	$ 424	$ 424	$ (0)
1810	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1815	Transformer Station Equipment >50 kV (10)	$ -		$ -	$ 103,188		$ 103,188	$ -	10.00	10.00%	10.00	10.00%	$ -	$ 10,319	$ -	$ 10,319	$ 10,319	$ -
1815	Transformer Station Equipment >50 kV (20)	$ 732,310	$ 524,507	$ 207,803	$ 790,288		$ 790,288	$ 8,384	8.00	12.50%	20.00	5.00%	$ 25,975	$ 39,514	$ 210	$ 65,699	$ 65,699	$ (0)
1815	Transformer Station Equipment >50 kV (40)	$ 3,355,781	$ 2,708,611	$ 647,171	$ 3,386,728	$ 932,983	$ 2,453,745	$ 43,800	28.00	3.57%	40.00	2.50%	$ 23,113	$ 61,344	$ 548	$ 85,004	$ 85,004	$ (0)
1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922	$ 1,873,011	$ 809,911	$ 2,682,922	$ 1,233,242	$ 1,449,680	$ -	33.00	3.03%	45.00	2.22%	$ 24,543	$ 32,215	$ -	$ 56,758	$ 56,758	$ 0
1815	Transformer Station Equipment >50 kV (50)	$ 77,279	$ 54,001	$ 23,277	$ 77,279	$ 36,853	$ 40,426	$ -	38.00	2.63%	50.00	2.00%	$ 613	$ 809	$ -	$ 1,421	$ 1,421	$ 0
1815	Transformer Station Equipment >50 kV (55)	$ 643,777	$ 242,716	$ 401,061	$ 643,777	$ 580,935	$ 62,842	$ -	43.00	2.33%	55.00	1.82%	$ 9,327	$ 1,143	$ -	$ 10,470	$ 10,470	$ 0
1820	Distribution Station Equipment <50 kV			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1825	Storage Battery Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1830	Poles, Towers & Fixtures	$ 3,337,033	$ 286,299	$ 3,050,734	$ 4,537,411	$ 3,050,170	$ 1,487,241	$ 147,603	34.00	2.94%	45.00	2.22%	$ 89,727	$ 33,050	$ 1,640	$ 124,417	$ 124,417	$ (0)
1835	Overhead Conductors & Devices	$ 1,897,776	$ 313,192	$ 1,584,584	$ 3,474,261	$ 1,600,974	$ 1,873,287	$ 89,216	54.50	1.83%	60.00	1.67%	$ 29,075	$ 31,221	$ 743	$ 61,040	$ 61,089	$ 49
1840	Underground Conduit	$ 1,853,805	$ 253,180	$ 1,600,625	$ 2,838,536	$ 1,675,114	$ 1,163,422	$ 271,079	34.73	2.88%	50.00	2.00%	$ 46,088	$ 23,268	$ 2,711	$ 72,067	$ 72,067	$ 0
1845	Underground Conductors & Devices	$ 1,058,668	$ 220,916	$ 837,751	$ 2,459,796	$ 842,342	$ 1,617,454	$ 189,997	25.30	3.95%	30.00	3.33%	$ 33,113	$ 53,915	$ 3,167	$ 90,194	$ 90,194	$ (0)
1850	Line Transformers	$ 2,978,874	$ 346,651	$ 2,632,223	$ 5,060,789	$ 2,593,800	$ 2,466,990	$ 312,527	29.23	3.42%	40.00	2.50%	$ 90,052	$ 61,675	$ 3,907	$ 155,633	$ 154,860	$ (773)
1855	Services Overhead	$ 134,454	$ 27,746	$ 106,708	$ 259,814	$ 108,258	$ 151,555	$ 16,096	54.73	1.83%	60.00	1.67%	$ 1,950	$ 2,526	$ 134	$ 4,610	$ 4,626	$ 17
1855	Services Underground	$ 505,122	$ 259,545	$ 245,577	$ 1,626,483	$ 267,120	$ 1,359,362	$ 169,973	31.00	3.23%	35.00	2.86%	$ 7,922	$ 38,839	$ 2,428	$ 49,189	$ 49,204	$ 15
1860	Meters 15yrs	$ 1,519,758	$ 1,254,177	$ 265,581	$ 1,891,231	$ 267,753	$ 1,623,478	$ 108,699	13.80	7.25%	15.00	6.67%	$ 19,245	$ 108,232	$ 3,623	$ 131,100	$ 131,100	$ 0
1860	Meters >50	$ 162,827	$ 1,843	$ 160,984	$ 368,193	$ 171,597	$ 196,596	$ 33,041	19.06	5.25%	25.00	4.00%	$ 8,446	$ 7,864	$ 661	$ 16,971	$ 16,971	$ 0
1860	Meters CT's & PT's	$ 69,489	$ 6,710	$ 62,780	$ 179,655	$ 63,407	$ 116,248	$ 7,279	30.60	3.27%	35.00	2.86%	$ 2,052	$ 3,321	$ 104	$ 5,477	$ 5,477	$ 0
1905	Land	$ 111,556		$ 111,556	$ 111,556		$ 111,556	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1908	Buildings and Fixtures (50)	$ 311,426	$ 311,426	$ -	$ 311,426		$ 311,426	$ -	24.00	4.17%	50.00	2.00%	$ -	$ 6,229	$ -	$ 6,229	$ 6,229	$ 0
1908	Buildings and Fixtures (40)	$ 29,372	$ 14,869	$ 14,502	$ 55,127	$ 29,372	$ 25,755	$ -	19.75	5.06%	40.00	2.50%	$ 734	$ 644	$ -	$ 1,378	$ 1,378	$ (0)
1908	Buildings and Fixtures (25)	$ 174,026	$ 16,358	$ 157,668	$ 373,812	$ 174,026	$ 199,786	$ 21,137	23.33	4.29%	25.00	4.00%	$ 6,758	$ 7,991	$ 423	$ 15,172	$ 15,349	$ 177
1910	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1915	Office Furniture & Equipment (10 years)	$ 25,914	$ 11,318	$ 14,596	$ 156,837	$ 27,001	$ 129,836	$ 6,432	5.67	17.64%	10.00	10.00%	$ 2,574	$ 12,984	$ 322	$ 15,879	$ 14,406	$ (1,474)
1920	Computer Equipment - Hardware	$ 64,440	$ 62,871	$ 1,569	$ 145,532	$ 89,754	$ 55,778	$ 3,695	3.00	33.33%	5.00	20.00%	$ 523	$ 11,156	$ 370	$ 12,048	$ 11,525	$ (523)
1920	Computer Equip.-Hardware(Post Mar. 22/04)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1920	Computer Equip.-Hardware(Post Mar. 19/07)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1930	Transportation Equipment (8)	$ 17,876	$ 17,876	$ -	$ 70,529	$ 14,417	$ 56,112	$ 480	4.50	22.22%	8.00	12.50%	$ -	$ 7,014	$ 30	$ 7,044	$ 6,612	$ (432)
1930	Transportation Equipment (15)	$ 22,698	$ 22,698	$ -	$ 704,889		$ 704,889	$ 373,388	2.25	44.44%	15.00	6.67%	$ -	$ 46,993	$ 12,446	$ 59,439	$ 59,439	$ 0
1935	Stores Equipment			$ -	$ 11,963		$ 11,963	$ -	-	0.00%	10.00	10.00%	$ -	$ 1,196	$ -	$ 1,196	$ 1,196	$ 0
1940	Tools, Shop & Garage Equipment	$ 66,736	$ 30,967	$ 35,769	$ 206,646	$ 62,118	$ 144,528	$ 1,126	6.71	14.90%	10.00	10.00%	$ 5,331	$ 14,453	$ 56	$ 19,840	$ 19,275	$ (564)
1945	Measurement & Testing Equipment	$ 15,273	$ 15,273	$ -	$ 44,408	$ 17,302	$ 27,107	$ 2,995	1.50	66.67%	5.00	20.00%	$ -	$ 5,421	$ 300	$ 5,721	$ 5,721	$ (0)
1950	Power Operated Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1955	Communications Equipment			$ -	$ 72,539		$ 72,539	$ 1,310	-	0.00%	8.50	11.76%	$ -	$ 8,534	$ 77	$ 8,611	$ 8,975	$ 364
1955	Communication Equipment (Smart Meters)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1960	Miscellaneous Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1970	Load Management Controls Customer Premises			$ -	$ 16,439		$ 16,439	$ -	-	0.00%	10.00	10.00%	$ -	$ 1,644	$ -	$ 1,644	$ 1,644	$ 0
1975	Load Management Controls Utility Premises			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1980	System Supervisor Equipment			$ -	$ 194,995		$ 194,995	$ 63,985	-	0.00%	20.00	5.00%	$ -	$ 9,750	$ 1,600	$ 11,349	$ 11,349	$ (0)
1985	Miscellaneous Fixed Assets			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1990	Other Tangible Property			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1995	Contributions & Grants -Transformer Station			$ -	$ (1,218,270)		$ (1,218,270)		40.00	2.50%	40.00	2.50%	$ -	-$ 30,457	$ -	-$ 30,457	$ (30,457)	$ 0
1995	Contributions & Grants - Poles	$ (13,087)	$ 145	$ (13,232)	$ (208,921)	$ (13,232)	$ (195,689)	$ (14,943)	45.00	2.22%	45.00	2.22%	-$ 294	-$ 4,349	-$ 166	-$ 4,809	$ (4,809)	$ (0)
1995	Contributions & Grants - OH Conductors	$ (46,607)	$ 388	$ (46,996)	$ (177,733)	$ (46,996)	$ (130,737)	$ (35,924)	60.00	1.67%	60.00	1.67%	-$ 783	-$ 2,179	-$ 299	-$ 3,262	$ (3,262)	$ 0
1995	Contributions & Grants - UG Conduit	$ (149,904)	$ 1,499	$ (151,403)	$ (524,026)	$ (151,403)	$ (372,623)	$ (42,456)	50.00	2.00%	50.00	2.00%	-$ 3,028	-$ 7,452	-$ 425	-$ 10,905	$ (10,905)	$ -
1995	Contributions & Grants - UG Conductors	$ (105,186)	$ 1,753	$ (106,939)	$ (524,305)	$ (106,939)	$ (417,366)	$ (49,168)	30.00	3.33%	30.00	3.33%	-$ 3,565	-$ 13,912	-$ 819	-$ 18,296	$ (18,296)	$ (0)
1995	Contributions & Grants - Line Transformers	$ (173,796)	$ 2,172	$ (175,968)	$ (951,267)	$ (175,968)	$ (775,299)	$ (57,184)	40.00	2.50%	40.00	2.50%	-$ 4,399	-$ 19,382	-$ 715	-$ 24,496	$ (24,496)	$ (0)
1995	Contributions & Grants - Services OH	$ (415)	$ 3	$ (418)	$ (11,103)	$ (418)	$ (10,684)	$ (252)	60.00	1.67%	60.00	1.67%	-$ 7	-$ 178	-$ 2	-$ 187	$ (187)	$ 0
1995	Contributions & Grants - Services UG	$ (201,560)	$ 2,879	$ (204,439)	$ (980,906)	$ (204,439)	$ (776,467)	$ (106,535)	35.00	2.86%	35.00	2.86%	-$ 5,841	-$ 22,185	-$ 1,522	-$ 29,548	$ (29,548)	$ 0
1995	Contributions & Grants - Meters 15 years	$ (11,159)	$ 223	$ (11,382)	$ (145,331)	$ (11,382)	$ (133,949)	$ (41,503)	15.00	6.67%	15.00	6.67%	-$ 759	-$ 8,930	-$ 1,383	-$ 11,072	$ (11,072)	$ 0
1995	Contributions & Grants - Meters 25 years	$ (5,489)	$ 110	$ (5,599)	$ (37,501)	$ (5,599)	$ (31,902)	$ (8,613)	25.00	4.00%	25.00	4.00%	-$ 224	-$ 1,276	-$ 172	-$ 1,672	$ (1,672)	$ 0
1995	Contributions & Grants - Meters 35 years	$ (2,127)	$ 30	$ (2,158)	$ (22,908)	$ (2,158)	$ (20,750)	$ (6,829)	35.00	2.86%	35.00	2.86%	-$ 62	-$ 593	-$ 98	-$ 752	$ (752)	$ (0)
1995	Contributions & Grants - Load Mgmt Control			$ -	$ (13,599)		$ (13,599)		10.00	10.00%	10.00	10.00%	$ -	-$ 1,360	$ -	-$ 1,360	$ (1,360)	$ (0)
2005	Property Under Finance Lease			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -		$ -
	Total	**$ 21,429,228**	**$ 9,175,331**	**$ 12,253,897**	**$ 30,287,264**	**$ 13,669,603**	**$ 16,617,660**	**$ 1,541,337**					**$ 408,199**	**$ 613,160**	**$ 32,486**	**$ 1,053,844**	**$ 1,050,699**	**$ (3,145)**

2019		Book Values							Service Lives				Depreciation Expense					
Account	Description	Opening Net Book Value of Existing Assets as at Date of Policy Change (Jan. 1) [1]	Less Fully Depreciated [7]	Net Amount of Existing Assets Before Policy Change to be Depreciated	Opening Gross Book Value of Assets Acquired After Policy Change [2]	Less Fully Depreciated [8]	Net Amount of Assets Acquired After Policy Change to be Depreciated	Current Year Additions	Average Remaining Life of Assets Existing Before Policy Change [3]	Depreciation Rate Assets Acquired After Policy Change	Life of Assets Acquired After Policy Change [4]	Depreciation Rate on New Additions	Depreciation Expense on Assets Existing Before Policy Change	Depreciation Expense on Assets Acquired After Policy Change	Depreciation Expense on Current Year Additions [5]	Total Current Year Depreciation Expense	Depreciation Expense per Appendix 2-BA Fixed Assets, Column J	Variance [6]
		a	b	c = a-b	d	e	f = d- e	g	h	i = 1/h	j	k = 1/j	l = c/h	m = f/j	n = g*0.5/j	o = l+m+n	p	q = p-o
1611	Computer Software (Formally known as Account 1925)	$ 289,366	$ 289,366	$ -	$ 857,687	$ 690,868	$ 166,818	$ -	3.00	33.33%	5.00	20.00%	$ -	$ 33,364	$ -	$ 33,364	$ 33,364	$ (0)
1612	Land Rights (Formally known as Account 1906)			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1805	Land			$ -	$ 149,992		$ 149,992	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1808	Buildings and Fixtures (50)			$ -	$ 1,256,185		$ 1,256,185	$ -	-	0.00%	50.00	2.00%	$ -	$ 25,124	$ -	$ 25,124	$ 25,124	$ -
1808	Buildings and Fixtures (25)			$ -	$ 14,724		$ 14,724	$ 280	-	0.00%	25.00	4.00%	$ -	$ 589	$ 6	$ 595	$ 589	$ (6)
1810	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1815	Transformer Station Equipment >50 kV (10)	$ -		$ -	$ 103,188		$ 103,188	$ -	10.00	10.00%	10.00	10.00%	$ -	$ 10,319	$ -	$ 10,319	$ 10,319	$ -
1815	Transformer Station Equipment >50 kV (20)	$ 732,310	$ 524,507	$ 207,803	$ 798,672		$ 798,672	$ 106,683	8.00	12.50%	20.00	5.00%	$ 25,975	$ 39,934	$ 2,667	$ 68,576	$ 68,576	$ (0)
1815	Transformer Station Equipment >50 kV (40)	$ 3,355,781	$ 2,708,611	$ 647,171	$ 3,430,528	$ 932,983	$ 2,497,545	$ 27,046	28.00	3.57%	40.00	2.50%	$ 23,113	$ 62,439	$ 338	$ 85,890	$ 85,890	$ 0
1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922	$ 1,873,011	$ 809,911	$ 2,682,922	$ 1,233,242	$ 1,449,680	$ -	33.00	3.03%	45.00	2.22%	$ 24,543	$ 32,215	$ -	$ 56,758	$ 56,758	$ (0)
1815	Transformer Station Equipment >50 kV (50)	$ 77,279	$ 54,001	$ 23,277	$ 77,279	$ 36,853	$ 40,426	$ -	38.00	2.63%	50.00	2.00%	$ 613	$ 809	$ -	$ 1,421	$ 1,421	$ 0
1815	Transformer Station Equipment >50 kV (55)	$ 643,777	$ 242,716	$ 401,061	$ 643,777	$ 580,935	$ 62,842	$ -	43.00	2.33%	55.00	1.82%	$ 9,327	$ 1,143	$ -	$ 10,470	$ 10,470	$ 0
1820	Distribution Station Equipment <50 kV			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1825	Storage Battery Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1830	Poles, Towers & Fixtures	$ 3,337,033	$ 286,299	$ 3,050,734	$ 4,685,014	$ 3,050,170	$ 1,634,845	$ 296,580	34.00	2.94%	45.00	2.22%	$ 89,727	$ 36,330	$ 3,295	$ 129,353	$ 129,353	$ 0
1835	Overhead Conductors & Devices	$ 1,897,776	$ 313,192	$ 1,584,584	$ 3,563,477	$ 1,600,974	$ 1,962,503	$ 266,921	54.50	1.83%	60.00	1.67%	$ 29,075	$ 32,708	$ 2,224	$ 64,008	$ 64,057	$ 49
1840	Underground Conduit	$ 1,853,805	$ 253,180	$ 1,600,625	$ 3,109,615	$ 1,675,114	$ 1,434,501	$ 186,764	34.73	2.88%	50.00	2.00%	$ 46,088	$ 28,690	$ 1,868	$ 76,645	$ 76,645	$ (0)
1845	Underground Conductors & Devices	$ 1,058,668	$ 220,916	$ 837,751	$ 2,649,793	$ 842,342	$ 1,807,452	$ 532,288	25.30	3.95%	30.00	3.33%	$ 33,113	$ 60,248	$ 8,871	$ 102,233	$ 102,233	$ (0)
1850	Line Transformers	$ 2,978,874	$ 346,651	$ 2,632,223	$ 5,367,344	$ 2,593,800	$ 2,773,544	$ 408,560	29.23	3.42%	40.00	2.50%	$ 90,052	$ 69,339	$ 5,107	$ 164,498	$ 163,829	$ (669)
1855	Services Overhead	$ 134,454	$ 27,746	$ 106,708	$ 275,909	$ 108,258	$ 167,651	$ 4,341	54.73	1.83%	60.00	1.67%	$ 1,950	$ 2,794	$ 36	$ 4,780	$ 4,797	$ 17
1855	Services Underground	$ 505,122	$ 259,545	$ 245,577	$ 1,796,456	$ 267,120	$ 1,529,336	$ 67,807	31.00	3.23%	35.00	2.86%	$ 7,922	$ 43,695	$ 969	$ 52,586	$ 52,601	$ 15
1860	Meters 15yrs	$ 1,519,758	$ 1,254,177	$ 265,581	$ 1,999,930	$ 267,753	$ 1,732,176	$ 78,765	13.80	7.25%	15.00	6.67%	$ 19,245	$ 115,478	$ 2,625	$ 137,349	$ 137,349	$ 0
1860	Meters >50	$ 162,827	$ 1,843	$ 160,984	$ 401,235	$ 171,597	$ 229,638	$ 13,348	19.06	5.25%	25.00	4.00%	$ 8,446	$ 9,186	$ 267	$ 17,899	$ 17,899	$ 0
1860	Meters CT's & PT's	$ 69,489	$ 6,710	$ 62,780	$ 186,934	$ 63,407	$ 123,527	$ 40,300	30.60	3.27%	35.00	2.86%	$ 2,052	$ 3,529	$ 576	$ 6,157	$ 6,157	$ (0)
1905	Land	$ 111,556		$ 111,556	$ 111,556		$ 111,556	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1908	Buildings and Fixtures (50)	$ 311,426	$ 311,426	$ -	$ 311,426		$ 311,426	$ -	24.00	4.17%	50.00	2.00%	$ -	$ 6,229	$ -	$ 6,229	$ 6,229	$ 0
1908	Buildings and Fixtures (40)	$ 29,372	$ 14,869	$ 14,502	$ 55,127	$ 29,372	$ 25,755	$ -	19.75	5.06%	40.00	2.50%	$ 734	$ 644	$ -	$ 1,378	$ 1,378	$ (0)
1908	Buildings and Fixtures (25)	$ 174,026	$ 16,358	$ 157,668	$ 394,949	$ 174,026	$ 220,924	$ 10,399	23.33	4.29%	25.00	4.00%	$ 6,758	$ 8,837	$ 208	$ 15,803	$ 15,980	$ 177
1910	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1915	Office Furniture & Equipment (10 years)	$ 25,914	$ 11,318	$ 14,596	$ 143,198	$ 27,001	$ 116,197	$ 854	5.67	17.64%	10.00	10.00%	$ 2,574	$ 11,620	$ 43	$ 14,237	$ 15,539	$ 1,303
1920	Computer Equipment - Hardware	$ 64,440	$ 62,871	$ 1,569	$ 144,660	$ 89,754	$ 54,907	$ 49,827	3.00	33.33%	5.00	20.00%	$ 523	$ 10,981	$ 4,983	$ 16,487	$ 14,078	$ (2,409)
1920	Computer Equip.-Hardware(Post Mar. 22/04)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1920	Computer Equip.-Hardware(Post Mar. 19/07)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1930	Transportation Equipment (8)	$ 17,876	$ 17,876	$ -	$ 71,009	$ 14,417	$ 56,592	$ 41,280	4.50	22.22%	8.00	12.50%	$ -	$ 7,074	$ 2,580	$ 9,654	$ 9,222	$ (432)
1930	Transportation Equipment (15)	$ 22,698	$ 22,698	$ -	$ 1,078,277		$ 1,078,277	$ 157,145	2.25	44.44%	15.00	6.67%	$ -	$ 71,885	$ 5,238	$ 77,123	$ 77,123	$ 0
1935	Stores Equipment			$ -	$ 11,963		$ 11,963	$ -	-	0.00%	10.00	10.00%	$ -	$ 1,196	$ -	$ 1,196	$ 1,196	$ 0
1940	Tools, Shop & Garage Equipment	$ 66,736	$ 30,967	$ 35,769	$ 202,528	$ 62,118	$ 140,410	$ 49,580	6.71	14.90%	10.00	10.00%	$ 5,331	$ 14,041	$ 2,479	$ 21,851	$ 21,851	$ 0
1945	Measurement & Testing Equipment	$ 15,273	$ 15,273	$ -	$ 44,954	$ 24,515	$ 20,439	$ 418	1.50	66.67%	5.00	20.00%	$ -	$ 4,088	$ 42	$ 4,130	$ 4,130	$ (0)
1950	Power Operated Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1955	Communications Equipment			$ -	$ 73,849		$ 73,849	$ 3,200	-	0.00%	8.50	11.76%	$ -	$ 8,688	$ 188	$ 8,876	$ 9,212	$ 336
1955	Communication Equipment (Smart Meters)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1960	Miscellaneous Equipment			$ -	$ -		$ -	$ 3,501	-	0.00%	10.00	10.00%	$ -	$ -	$ 175	$ 175	$ 175	$ 0
1970	Load Management Controls Customer Premises			$ -	$ 16,439		$ 16,439	$ -	-	0.00%	10.00	10.00%	$ -	$ 1,644	$ -	$ 1,644	$ 1,644	$ 0
1975	Load Management Controls Utility Premises			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1980	System Supervisor Equipment			$ -	$ 258,980		$ 258,980	$ 65,044	-	0.00%	20.00	5.00%	$ -	$ 12,949	$ 1,626	$ 14,575	$ 14,575	$ 0
1985	Miscellaneous Fixed Assets			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1990	Other Tangible Property			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1995	Contributions & Grants -Transformer Station			$ -	$ (1,218,270)		$ (1,218,270)		40.00	2.50%	40.00	2.50%	$ -	-$ 30,457	$ -	-$ 30,457	$ (30,457)	$ (0)
1995	Contributions & Grants - Poles	$ (13,087)	$ 145	$ (13,232)	$ (223,863)	$ (13,232)	$ (210,631)	$ (10,175)	45.00	2.22%	45.00	2.22%	-$ 294	-$ 4,681	-$ 113	-$ 5,088	$ (5,088)	$ (0)
1995	Contributions & Grants - OH Conductors	$ (46,607)	$ 388	$ (46,996)	$ (213,656)	$ (46,996)	$ (166,661)	$ (4,197)	60.00	1.67%	60.00	1.67%	-$ 783	-$ 2,778	-$ 35	-$ 3,596	$ (3,596)	$ 0
1995	Contributions & Grants - UG Conduit	$ (149,904)	$ 1,499	$ (151,403)	$ (566,482)	$ (151,403)	$ (415,079)	$ (5,758)	50.00	2.00%	50.00	2.00%	-$ 3,028	-$ 8,302	-$ 58	-$ 11,387	$ (11,387)	$ -
1995	Contributions & Grants - UG Conductors	$ (105,186)	$ 1,753	$ (106,939)	$ (573,473)	$ (106,939)	$ (466,534)	$ (28,577)	30.00	3.33%	30.00	3.33%	-$ 3,565	-$ 15,551	-$ 476	-$ 19,592	$ (19,592)	$ (0)
1995	Contributions & Grants - Line Transformers	$ (173,796)	$ 2,172	$ (175,968)	$ (1,008,452)	$ (175,968)	$ (832,483)	$ (59,449)	40.00	2.50%	40.00	2.50%	-$ 4,399	-$ 20,812	-$ 743	-$ 25,954	$ (25,954)	$ (0)
1995	Contributions & Grants - Services OH	$ (415)	$ 3	$ (418)	$ (11,354)	$ (418)	$ (10,936)	$ (841)	60.00	1.67%	60.00	1.67%	-$ 7	-$ 182	-$ 7	-$ 196	$ (196)	$ (0)
1995	Contributions & Grants - Services UG	$ (201,560)	$ 2,879	$ (204,439)	$ (1,087,441)	$ (204,439)	$ (883,002)	$ (51,580)	35.00	2.86%	35.00	2.86%	-$ 5,841	-$ 25,229	-$ 737	-$ 31,807	$ (31,807)	$ 0
1995	Contributions & Grants - Meters 15 years	$ (11,159)	$ 223	$ (11,382)	$ (186,835)	$ (11,382)	$ (175,453)	$ (10,876)	15.00	6.67%	15.00	6.67%	-$ 759	-$ 11,697	-$ 363	-$ 12,818	$ (12,818)	$ (0)
1995	Contributions & Grants - Meters 25 years	$ (5,489)	$ 110	$ (5,599)	$ (46,114)	$ (5,599)	$ (40,515)	$ (6,532)	25.00	4.00%	25.00	4.00%	-$ 224	-$ 1,621	-$ 131	-$ 1,975	$ (1,975)	$ (0)
1995	Contributions & Grants - Meters 35 years	$ (2,127)	$ 30	$ (2,158)	$ (29,737)	$ (2,158)	$ (27,579)	$ (36,263)	35.00	2.86%	35.00	2.86%	-$ 62	-$ 788	-$ 518	-$ 1,368	$ (1,368)	$ -
1995	Contributions & Grants - Load Mgmt Control			$ -	$ (13,599)		$ (13,599)		10.00	10.00%	10.00	10.00%	$ -	-$ 1,360	$ -	-$ 1,360	$ (1,360)	$ (0)
2005	Property Under Finance Lease			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -		$ -
	Total	**$ 21,429,228**	**$ 9,175,331**	**$ 12,253,897**	**$ 31,790,298**	**$ 13,818,083**	**$ 17,972,215**	**$ 2,196,683**					**$ 408,199**	**$ 644,351**	**$ 43,231**	**$ 1,095,781**	**$ 1,094,161**	**$ (1,620)**

2020		Book Values							Service Lives				Depreciation Expense					
Account	Description	Opening Net Book Value of Existing Assets as at Date of Policy Change (Jan. 1)[1]	Less Fully Depreciated[7]	Net Amount of Existing Assets Before Policy Change to be Depreciated	Opening Gross Book Value of Assets Acquired After Policy Change[2]	Less Fully Depreciated[8]	Net Amount of Assets Acquired After Policy Change to be Depreciated	Current Year Additions	Average Remaining Life of Assets Existing Before Policy Change[3]	Depreciation Rate Assets Acquired After Policy Change	Life of Assets Acquired After Policy Change[4]	Depreciation Rate on New Additions	Depreciation Expense on Assets Existing Before Policy Change	Depreciation Expense on Assets Acquired After Policy Change	Depreciation Expense on Current Year Additions[5]	Total Current Year Depreciation Expense	Depreciation Expense per Appendix 2-BA Fixed Assets, Column J	Variance[6]
		a	b	c = a-b	d	e	f = d- e	g	h	i = 1/h	j	k = 1/j	l = c/h	m = f/j	n = g*0.5/j	o = l+m+n	p	q = p-o
1611	Computer Software (Formally known as Account 1925)	$ 289,366	$ 289,366	$ -	$ 834,907	$ 732,509	$ 102,399	$ 48,021	3.00	33.33%	5.00	20.00%	$ -	$ 20,480	$ 4,802	$ 25,282	$ 25,282	$ (0)
1612	Land Rights (Formally known as Account 1906)			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1805	Land			$ -	$ 149,992		$ 149,992	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1808	Buildings and Fixtures (50)			$ -	$ 1,256,185		$ 1,256,185	$ -	-	0.00%	50.00	2.00%	$ -	$ 25,124	$ -	$ 25,124	$ 25,124	$ -
1808	Buildings and Fixtures (25)			$ -	$ 15,004		$ 15,004	$ 276	-	0.00%	25.00	4.00%	$ -	$ 600	$ 6	$ 606	$ 606	$ (0)
1810	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1815	Transformer Station Equipment >50 kV (10)	$ -		$ -	$ 103,188		$ 103,188	$ -	10.00	10.00%	10.00	10.00%	$ -	$ 10,319	$ -	$ 10,319	$ 10,319	$ -
1815	Transformer Station Equipment >50 kV (20)	$ 732,310	$ 524,507	$ 207,803	$ 905,355		$ 905,355	$ 16,164	8.00	12.50%	20.00	5.00%	$ 25,975	$ 45,268	$ 404	$ 71,647	$ 71,647	$ (0)
1815	Transformer Station Equipment >50 kV (40)	$ 3,355,781	$ 2,708,611	$ 647,171	$ 3,457,574	$ 932,983	$ 2,524,591	$ -	28.00	3.57%	40.00	2.50%	$ 23,113	$ 63,115	$ -	$ 86,228	$ 86,228	$ 0
1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922	$ 1,873,011	$ 809,911	$ 2,682,922	$ 1,233,242	$ 1,449,680	$ -	33.00	3.03%	45.00	2.22%	$ 24,543	$ 32,215	$ -	$ 56,758	$ 56,758	$ 0
1815	Transformer Station Equipment >50 kV (50)	$ 77,279	$ 54,001	$ 23,277	$ 77,279	$ 36,853	$ 40,426	$ -	38.00	2.63%	50.00	2.00%	$ 613	$ 809	$ -	$ 1,421	$ 1,421	$ 0
1815	Transformer Station Equipment >50 kV (55)	$ 643,777	$ 242,716	$ 401,061	$ 643,777	$ 580,935	$ 62,842	$ -	43.00	2.33%	55.00	1.82%	$ 9,327	$ 1,143	$ -	$ 10,470	$ 10,470	$ 0
1820	Distribution Station Equipment <50 kV			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1825	Storage Battery Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1830	Poles, Towers & Fixtures	$ 3,337,033	$ 286,299	$ 3,050,734	$ 4,981,594	$ 3,050,170	$ 1,931,424	$ 390,193	34.00	2.94%	45.00	2.22%	$ 89,727	$ 42,921	$ 4,335	$ 136,983	$ 136,983	$ 0
1835	Overhead Conductors & Devices	$ 1,897,776	$ 313,192	$ 1,584,584	$ 3,830,398	$ 1,600,974	$ 2,229,424	$ 408,321	54.50	1.83%	60.00	1.67%	$ 29,075	$ 37,157	$ 3,403	$ 69,635	$ 69,684	$ 49
1840	Underground Conduit	$ 1,853,805	$ 253,180	$ 1,600,625	$ 3,296,379	$ 1,675,114	$ 1,621,266	$ 189,641	34.73	2.88%	50.00	2.00%	$ 46,088	$ 32,425	$ 1,896	$ 80,409	$ 80,409	$ 0
1845	Underground Conductors & Devices	$ 1,058,668	$ 220,916	$ 837,751	$ 3,182,082	$ 842,342	$ 2,339,740	$ 250,305	25.30	3.95%	30.00	3.33%	$ 33,113	$ 77,991	$ 4,172	$ 115,276	$ 115,276	$ (0)
1850	Line Transformers	$ 2,978,874	$ 346,651	$ 2,632,223	$ 5,749,160	$ 2,593,800	$ 3,155,360	$ 226,708	29.23	3.42%	40.00	2.50%	$ 90,052	$ 78,884	$ 2,834	$ 171,770	$ 171,770	$ 0
1855	Services Overhead	$ 134,454	$ 27,746	$ 106,708	$ 280,251	$ 108,258	$ 171,992	$ 10,868	54.73	1.83%	60.00	1.67%	$ 1,950	$ 2,867	$ 91	$ 4,907	$ 4,923	$ 17
1855	Services Underground	$ 505,122	$ 259,545	$ 245,577	$ 1,864,263	$ 267,120	$ 1,597,143	$ 134,218	31.00	3.23%	35.00	2.86%	$ 7,922	$ 45,633	$ 1,917	$ 55,472	$ 55,487	$ 15
1860	Meters 15yrs	$ 1,519,758	$ 1,267,763	$ 251,995	$ 2,078,694	$ 267,753	$ 1,810,941	$ 44,377	13.80	7.25%	15.00	6.67%	$ 18,261	$ 120,729	$ 1,479	$ 140,469	$ 140,469	$ (0)
1860	Meters >50	$ 162,827	$ 1,843	$ 160,984	$ 414,582	$ 171,597	$ 242,986	$ 10,825	19.06	5.25%	25.00	4.00%	$ 8,446	$ 9,719	$ 217	$ 18,382	$ 18,382	$ 0
1860	Meters CT's & PT's	$ 69,489	$ 6,710	$ 62,780	$ 227,234	$ 63,407	$ 163,827	$ 5,361	30.60	3.27%	35.00	2.86%	$ 2,052	$ 4,681	$ 77	$ 6,809	$ 6,809	$ (0)
1905	Land	$ 111,556		$ 111,556	$ 111,556		$ 111,556	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1908	Buildings and Fixtures (50)	$ 311,426	$ 311,426	$ -	$ 311,426		$ 311,426	$ -	24.00	4.17%	50.00	2.00%	$ -	$ 6,229	$ -	$ 6,229	$ 6,229	$ 0
1908	Buildings and Fixtures (40)	$ 29,372	$ 14,869	$ 14,502	$ 55,127	$ 29,372	$ 25,755	$ 2,020	19.75	5.06%	40.00	2.50%	$ 734	$ 644	$ 25	$ 1,403	$ 1,403	$ 0
1908	Buildings and Fixtures (25)	$ 174,026	$ 16,358	$ 157,668	$ 405,348	$ 174,026	$ 231,323	$ 15,595	23.33	4.29%	25.00	4.00%	$ 6,758	$ 9,253	$ 312	$ 16,323	$ 16,500	$ 177
1910	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1915	Office Furniture & Equipment (10 years)	$ 25,914	$ 11,318	$ 14,596	$ 144,052	$ 27,001	$ 117,051	$ 126	5.67	17.64%	10.00	10.00%	$ 2,574	$ 11,705	$ 6	$ 14,286	$ 14,286	$ (0)
1920	Computer Equipment - Hardware	$ 64,440	$ 62,871	$ 1,569	$ 175,295	$ 96,595	$ 78,700	$ 35,056	3.00	33.33%	5.00	20.00%	$ 523	$ 15,740	$ 3,506	$ 19,769	$ 19,769	$ 0
1920	Computer Equip.-Hardware(Post Mar. 22/04)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1920	Computer Equip.-Hardware(Post Mar. 19/07)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1930	Transportation Equipment (8)	$ 17,876	$ 17,876	$ -	$ 107,853	$ 14,417	$ 93,436	$ -	4.50	22.22%	8.00	12.50%	$ -	$ 11,680	$ -	$ 11,680	$ 11,680	$ -
1930	Transportation Equipment (15)	$ 22,698	$ 22,698	$ -	$ 1,235,422		$ 1,235,422	$ -	2.25	44.44%	15.00	6.67%	$ -	$ 82,361	$ -	$ 82,361	$ 82,361	$ 0
1935	Stores Equipment			$ -	$ 11,963		$ 11,963	$ 123,960	10.00	10.00%	15.00	6.67%	$ -	$ 798	$ 4,132	$ 4,930	$ 5,328	$ 399
1940	Tools, Shop & Garage Equipment	$ 66,736	$ 38,720	$ 28,016	$ 252,109	$ 62,118	$ 189,990	$ 15,009	6.71	14.90%	10.00	10.00%	$ 4,175	$ 18,999	$ 750	$ 23,925	$ 23,925	$ 0
1945	Measurement & Testing Equipment	$ 15,273	$ 15,273	$ -	$ 45,372	$ 34,606	$ 10,766	$ -	1.50	66.67%	5.00	20.00%	$ -	$ 2,153	$ -	$ 2,153	$ 2,153	$ (0)
1950	Power Operated Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1955	Communications Equipment			$ -	$ 77,049		$ 77,049	$ 2,356	-	0.00%	8.50	11.76%	$ -	$ 9,065	$ 139	$ 9,203	$ 9,146	$ (58)
1955	Communication Equipment (Smart Meters)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1960	Miscellaneous Equipment			$ -	$ 3,501		$ 3,501	$ 1,973	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ 471	$ 471
1970	Load Management Controls Customer Premises			$ -	$ 16,439		$ 16,439	$ -	-	0.00%	10.00	10.00%	$ -	$ 1,644	$ -	$ 1,644	$ 1,644	$ 0
1975	Load Management Controls Utility Premises			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1980	System Supervisor Equipment			$ -	$ 324,024		$ 324,024	$ 33,172	-	0.00%	20.00	5.00%	$ -	$ 16,201	$ 829	$ 17,030	$ 17,030	$ 0
1985	Miscellaneous Fixed Assets			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1990	Other Tangible Property			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1995	Contributions & Grants -Transformer Station			$ -	$ (1,218,270)		$ (1,218,270)		40.00	2.50%	40.00	2.50%	$ -	-$ 30,457	$ -	-$ 30,457	$ (30,457)	$ (0)
1995	Contributions & Grants - Poles	$ (13,087)	$ 145	$ (13,232)	$ (234,038)	$ (13,232)	$ (220,806)	$ (22,880)	45.00	2.22%	45.00	2.22%	-$ 294	-$ 4,907	-$ 254	-$ 5,455	$ (5,455)	$ (0)
1995	Contributions & Grants - OH Conductors	$ (46,607)	$ 388	$ (46,996)	$ (217,853)	$ (46,996)	$ (170,858)	$ (17,469)	60.00	1.67%	60.00	1.67%	-$ 783	-$ 2,848	-$ 146	-$ 3,776	$ (3,776)	$ 0
1995	Contributions & Grants - UG Conduit	$ (149,904)	$ 1,499	$ (151,403)	$ (572,240)	$ (151,403)	$ (420,837)	$ (119,789)	50.00	2.00%	50.00	2.00%	-$ 3,028	-$ 8,417	-$ 1,198	-$ 12,643	$ (12,643)	$ -
1995	Contributions & Grants - UG Conductors	$ (105,186)	$ 1,753	$ (106,939)	$ (602,050)	$ (106,939)	$ (495,111)	$ (60,830)	30.00	3.33%	30.00	3.33%	-$ 3,565	-$ 16,504	-$ 1,014	-$ 21,082	$ (21,082)	$ (0)
1995	Contributions & Grants - Line Transformers	$ (173,796)	$ 2,172	$ (175,968)	$ (1,067,901)	$ (175,968)	$ (891,932)	$ (131,411)	40.00	2.50%	40.00	2.50%	-$ 4,399	-$ 22,298	-$ 1,643	-$ 28,340	$ (28,340)	$ 0
1995	Contributions & Grants - Services OH	$ (415)	$ 3	$ (418)	$ (12,196)	$ (418)	$ (11,778)	$ (1,251)	60.00	1.67%	60.00	1.67%	-$ 7	-$ 196	-$ 10	-$ 214	$ (214)	$ 0
1995	Contributions & Grants - Services UG	$ (201,560)	$ 2,879	$ (204,439)	$ (1,139,021)	$ (204,439)	$ (934,582)	$ (83,125)	35.00	2.86%	35.00	2.86%	-$ 5,841	-$ 26,702	-$ 1,188	-$ 33,731	$ (33,731)	$ 0
1995	Contributions & Grants - Meters 15 years	$ (11,159)	$ 223	$ (11,382)	$ (197,711)	$ (11,382)	$ (186,329)	$ (11,788)	15.00	6.67%	15.00	6.67%	-$ 759	-$ 12,422	-$ 393	-$ 13,574	$ (13,574)	$ (0)
1995	Contributions & Grants - Meters 25 years	$ (5,489)	$ 110	$ (5,599)	$ (52,645)	$ (5,599)	$ (47,046)	$ (8,299)	25.00	4.00%	25.00	4.00%	-$ 224	-$ 1,882	-$ 166	-$ 2,272	$ (2,272)	$ -
1995	Contributions & Grants - Meters 35 years	$ (2,127)	$ 30	$ (2,158)	$ (66,000)	$ (2,158)	$ (63,842)	$ (4,921)	35.00	2.86%	35.00	2.86%	-$ 62	-$ 1,824	-$ 70	-$ 1,956	$ (1,956)	$ -
1995	Contributions & Grants - Load Mgmt Control			$ -	$ (13,599)		$ (13,599)		10.00	10.00%	10.00	10.00%	$ -	-$ 1,360	$ -	-$ 1,360	$ (1,360)	$ (0)
2005	Property Under Finance Lease			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -		$ -
	Total	**$ 21,429,228**	**$ 9,196,670**	**$ 12,232,557**	**$ 33,913,829**	**$ 13,876,656**	**$ 20,037,173**	**$ 1,502,780**					**$ 406,059**	**$ 708,733**	**$ 29,250**	**$ 1,144,042**	**$ 1,145,111**	**$ 1,069**

2021		Book Values							Service Lives				Depreciation Expense					
Account	Description	Opening Net Book Value of Existing Assets as at Date of Policy Change (Jan. 1) [1]	Less Fully Depreciated [7]	Net Amount of Existing Assets Before Policy Change to be Depreciated	Opening Gross Book Value of Assets Acquired After Policy Change [2]	Less Fully Depreciated [8]	Net Amount of Assets Acquired After Policy Change to be Depreciated	Current Year Additions	Average Remaining Life of Assets Existing Before Policy Change [3]	Depreciation Rate Assets Acquired After Policy Change	Life of Assets Acquired After Policy Change [4]	Depreciation Rate on New Additions	Depreciation Expense on Assets Existing Before Policy Change	Depreciation Expense on Assets Acquired After Policy Change	Depreciation Expense on Current Year Additions [5]	Total Current Year Depreciation Expense	Depreciation Expense per Appendix 2-BA Fixed Assets, Column J	Variance [6]
		a	b	c = a-b	d	e	f = d- e	g	h	i = 1/h	j	k = 1/j	l = c/h	m = f/j	n = g*0.5/j	o = l+m+n	p	q = p-o
1611	Computer Software (Formally known as Account 1925)	$ 289,366	$ 289,366	$ -	$ 882,928	$ 767,261	$ 115,667	$ 20,000	3.00	33.33%	5.00	20.00%	$ -	$ 23,133	$ 2,000	$ 25,133	$ 25,133	$ (0)
1612	Land Rights (Formally known as Account 1906)			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1805	Land			$ -	$ 149,992		$ 149,992	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1808	Buildings and Fixtures (50)			$ -	$ 1,256,185		$ 1,256,185	$ -	-	0.00%	50.00	2.00%	$ -	$ 25,124	$ -	$ 25,124	$ 25,124	$ -
1808	Buildings and Fixtures (25)			$ -	$ 15,279		$ 15,279	$ -	-	0.00%	25.00	4.00%	$ -	$ 611	$ -	$ 611	$ 611	$ (0)
1810	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1815	Transformer Station Equipment >50 kV (10)	$ -		$ -	$ 103,188		$ 103,188	$ -	10.00	10.00%	10.00	10.00%	$ -	$ 10,319	$ -	$ 10,319	$ 10,319	$ -
1815	Transformer Station Equipment >50 kV (20)	$ 732,310	$ 524,507	$ 207,803	$ 921,519		$ 921,519	$ -	8.00	12.50%	20.00	5.00%	$ 25,975	$ 46,076	$ -	$ 72,051	$ 72,051	$ (0)
1815	Transformer Station Equipment >50 kV (40)	$ 3,355,781	$ 2,708,611	$ 647,171	$ 3,457,574	$ 932,983	$ 2,524,591	$ 50,000	28.00	3.57%	40.00	2.50%	$ 23,113	$ 63,115	$ 625	$ 86,853	$ 86,853	$ (0)
1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922	$ 1,873,011	$ 809,911	$ 2,682,922	$ 1,233,242	$ 1,449,680	$ -	33.00	3.03%	45.00	2.22%	$ 24,543	$ 32,215	$ -	$ 56,758	$ 56,758	$ 0
1815	Transformer Station Equipment >50 kV (50)	$ 77,279	$ 54,001	$ 23,277	$ 77,279	$ 36,853	$ 40,426	$ -	38.00	2.63%	50.00	2.00%	$ 613	$ 809	$ -	$ 1,421	$ 1,421	$ 0
1815	Transformer Station Equipment >50 kV (55)	$ 643,777	$ 242,716	$ 401,061	$ 643,777	$ 580,935	$ 62,842	$ -	43.00	2.33%	55.00	1.82%	$ 9,327	$ 1,143	$ -	$ 10,470	$ 10,470	$ 0
1820	Distribution Station Equipment <50 kV			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1825	Storage Battery Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1830	Poles, Towers & Fixtures	$ 3,337,033	$ 286,299	$ 3,050,734	$ 5,371,787	$ 3,050,170	$ 2,321,617	$ 1,115,840	34.00	2.94%	45.00	2.22%	$ 89,727	$ 51,591	$ 12,398	$ 153,717	$ 153,717	$ (0)
1835	Overhead Conductors & Devices	$ 1,897,776	$ 313,192	$ 1,584,584	$ 4,238,719	$ 1,600,974	$ 2,637,745	$ 361,613	54.50	1.83%	60.00	1.67%	$ 29,075	$ 43,962	$ 3,013	$ 76,051	$ 76,100	$ 49
1840	Underground Conduit	$ 1,853,805	$ 253,180	$ 1,600,625	$ 3,486,021	$ 1,675,114	$ 1,810,907	$ 73,143	34.73	2.88%	50.00	2.00%	$ 46,088	$ 36,218	$ 731	$ 83,037	$ 83,037	$ 0
1845	Underground Conductors & Devices	$ 1,058,668	$ 220,916	$ 837,751	$ 3,432,387	$ 842,342	$ 2,590,045	$ 261,644	25.30	3.95%	30.00	3.33%	$ 33,113	$ 86,335	$ 4,361	$ 123,808	$ 123,808	$ 0
1850	Line Transformers	$ 2,978,874	$ 346,651	$ 2,632,223	$ 5,975,868	$ 2,593,800	$ 3,382,068	$ 263,765	29.23	3.42%	40.00	2.50%	$ 90,052	$ 84,552	$ 3,297	$ 177,901	$ 177,901	$ (0)
1855	Services Overhead	$ 134,454	$ 27,746	$ 106,708	$ 291,118	$ 108,258	$ 182,860	$ 57,487	54.73	1.83%	60.00	1.67%	$ 1,950	$ 3,048	$ 479	$ 5,476	$ 5,493	$ 17
1855	Services Underground	$ 505,122	$ 259,545	$ 245,577	$ 1,998,481	$ 267,120	$ 1,731,361	$ 63,171	31.00	3.23%	35.00	2.86%	$ 7,922	$ 49,467	$ 902	$ 58,292	$ 58,307	$ 15
1860	Meters 15yrs	$ 1,519,758	$ 1,267,763	$ 251,995	$ 2,123,071	$ 267,753	$ 1,855,318	$ 82,183	13.80	7.25%	15.00	6.67%	$ 18,261	$ 123,688	$ 2,739	$ 144,688	$ 144,699	$ 11
1860	Meters >50	$ 162,827	$ 1,843	$ 160,984	$ 425,408	$ 171,597	$ 253,811	$ 17,167	19.06	5.25%	25.00	4.00%	$ 8,446	$ 10,152	$ 343	$ 18,942	$ 18,942	$ 0
1860	Meters CT's & PT's	$ 69,489	$ 6,710	$ 62,780	$ 232,595	$ 63,407	$ 169,188	$ 20,675	30.60	3.27%	35.00	2.86%	$ 2,052	$ 4,834	$ 295	$ 7,181	$ 7,181	$ (0)
1905	Land	$ 111,556		$ 111,556	$ 111,556		$ 111,556	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1908	Buildings and Fixtures (50)	$ 311,426	$ 311,426	$ -	$ 311,426		$ 311,426	$ -	24.00	4.17%	50.00	2.00%	$ -	$ 6,229	$ -	$ 6,229	$ 6,229	$ 0
1908	Buildings and Fixtures (40)	$ 29,372	$ 14,869	$ 14,502	$ 57,147	$ 29,372	$ 27,775	$ -	19.75	5.06%	40.00	2.50%	$ 734	$ 694	$ -	$ 1,429	$ 1,429	$ 0
1908	Buildings and Fixtures (25)	$ 174,026	$ 16,358	$ 157,668	$ 420,943	$ 174,026	$ 246,918	$ 20,000	23.33	4.29%	25.00	4.00%	$ 6,758	$ 9,877	$ 400	$ 17,035	$ 17,212	$ 177
1910	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1915	Office Furniture & Equipment (10 years)	$ 25,914	$ 13,589	$ 12,325	$ 144,178	$ 27,001	$ 117,177	$ 5,000	5.67	17.64%	10.00	10.00%	$ 2,174	$ 11,718	$ 250	$ 14,141	$ 14,141	$ (0)
1920	Computer Equipment - Hardware	$ 64,440	$ 62,871	$ 1,569	$ 202,248	$ 102,508	$ 99,741	$ 14,000	3.00	33.33%	5.00	20.00%	$ 523	$ 19,948	$ 1,400	$ 21,871	$ 21,871	$ 0
1920	Computer Equip.-Hardware(Post Mar. 22/04)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1920	Computer Equip.-Hardware(Post Mar. 19/07)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1930	Transportation Equipment (8)	$ 17,876	$ 17,876	$ -	$ 107,853	$ 15,393	$ 92,460	$ -	4.50	22.22%	8.00	12.50%	$ -	$ 11,557	$ -	$ 11,557	$ 11,557	$ (0)
1930	Transportation Equipment (15)	$ 22,698	$ 22,698	$ -	$ 1,235,422	$ 2,883	$ 1,232,539	$ 87,000	2.25	44.44%	15.00	6.67%	$ -	$ 82,169	$ 2,900	$ 85,069	$ 85,069	$ -
1935	Stores Equipment			$ -	$ 135,923		$ 135,923	$ -	10.00	10.00%	15.00	6.67%	$ -	$ 9,062	$ -	$ 9,062	$ 9,460	$ 399
1940	Tools, Shop & Garage Equipment	$ 66,736	$ 62,226	$ 4,510	$ 267,118	$ 62,118	$ 205,000	$ 39,000	6.71	14.90%	10.00	10.00%	$ 672	$ 20,500	$ 1,950	$ 23,122	$ 23,122	$ 0
1945	Measurement & Testing Equipment	$ 15,273	$ 15,273	$ -	$ 45,372	$ 36,782	$ 8,591	$ -	1.50	66.67%	5.00	20.00%	$ -	$ 1,718	$ -	$ 1,718	$ 1,718	$ (0)
1950	Power Operated Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1955	Communications Equipment			$ -	$ 79,405	$ 13,919	$ 65,486	$ 10,000	-	0.00%	8.50	11.76%	$ -	$ 7,704	$ 588	$ 8,292	$ 8,292	$ (0)
1955	Communication Equipment (Smart Meters)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1960	Miscellaneous Equipment			$ -	$ 5,474		$ 5,474	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ 547	$ 547
1970	Load Management Controls Customer Premises			$ -	$ 16,439		$ 16,439	$ -	-	0.00%	10.00	10.00%	$ -	$ 1,644	$ -	$ 1,644	$ 1,644	$ 0
1975	Load Management Controls Utility Premises			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1980	System Supervisor Equipment			$ -	$ 357,196	$ 16,586	$ 340,610	$ 21,040	-	0.00%	20.00	5.00%	$ -	$ 17,030	$ 526	$ 17,557	$ 17,557	$ 0
1985	Miscellaneous Fixed Assets			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1990	Other Tangible Property			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1995	Contributions & Grants -Transformer Station			$ -	$ (1,218,270)		$ (1,218,270)		40.00	2.50%	40.00	2.50%	$ -	-$ 30,457	$ -	-$ 30,457	$ (30,457)	$ (0)
1995	Contributions & Grants - Poles	$ (13,087)	$ 145	$ (13,232)	$ (256,918)	$ (13,232)	$ (243,686)	$ (24,464)	45.00	2.22%	45.00	2.22%	-$ 294	-$ 5,415	-$ 272	-$ 5,981	$ (5,981)	$ (0)
1995	Contributions & Grants - OH Conductors	$ (46,607)	$ 388	$ (46,996)	$ (235,322)	$ (46,996)	$ (188,327)	$ (29,811)	60.00	1.67%	60.00	1.67%	-$ 783	-$ 3,139	-$ 248	-$ 4,170	$ (4,170)	$ 0
1995	Contributions & Grants - UG Conduit	$ (149,904)	$ 1,499	$ (151,403)	$ (692,029)	$ (151,403)	$ (540,627)	$ (31,580)	50.00	2.00%	50.00	2.00%	-$ 3,028	-$ 10,813	-$ 316	-$ 14,156	$ (14,156)	$ -
1995	Contributions & Grants - UG Conductors	$ (105,186)	$ 1,753	$ (106,939)	$ (662,880)	$ (106,939)	$ (555,941)	$ (54,232)	30.00	3.33%	30.00	3.33%	-$ 3,565	-$ 18,531	-$ 904	-$ 23,000	$ (23,000)	$ (0)
1995	Contributions & Grants - Line Transformers	$ (173,796)	$ 2,172	$ (175,968)	$ (1,199,312)	$ (175,968)	$ (1,023,344)	$ (98,867)	40.00	2.50%	40.00	2.50%	-$ 4,399	-$ 25,584	-$ 1,236	-$ 31,219	$ (31,219)	$ (0)
1995	Contributions & Grants - Services OH	$ (415)	$ 3	$ (418)	$ (13,447)	$ (418)	$ (13,029)	$ (839)	60.00	1.67%	60.00	1.67%	-$ 7	-$ 217	-$ 7	-$ 231	$ (231)	$ (0)
1995	Contributions & Grants - Services UG	$ (201,560)	$ 2,879	$ (204,439)	$ (1,222,147)	$ (204,439)	$ (1,017,707)	$ (51,851)	35.00	2.86%	35.00	2.86%	-$ 5,841	-$ 29,077	-$ 741	-$ 35,659	$ (35,659)	$ 0
1995	Contributions & Grants - Meters 15 years	$ (11,159)	$ 223	$ (11,382)	$ (209,499)	$ (11,382)	$ (198,117)	$ (30,986)	15.00	6.67%	15.00	6.67%	-$ 759	-$ 13,208	-$ 1,033	-$ 14,999	$ (14,999)	$ 0
1995	Contributions & Grants - Meters 25 years	$ (5,489)	$ 110	$ (5,599)	$ (60,944)	$ (5,599)	$ (55,345)	$ (7,183)	25.00	4.00%	25.00	4.00%	-$ 224	-$ 2,214	-$ 144	-$ 2,581	$ (2,581)	$ -
1995	Contributions & Grants - Meters 35 years	$ (2,127)	$ 30	$ (2,158)	$ (70,921)	$ (2,158)	$ (68,763)	$ (14,801)	35.00	2.86%	35.00	2.86%	-$ 62	-$ 1,965	-$ 211	-$ 2,238	$ (2,238)	$ 0
1995	Contributions & Grants - Load Mgmt Control			$ -	$ (13,599)		$ (13,599)		10.00	10.00%	10.00	10.00%	$ -	-$ 1,360	$ -	-$ 1,360	$ (1,360)	$ (0)
2005	Property Under Finance Lease			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -		$ -
	Total	$ 21,429,228	$ 9,222,447	$ 12,206,781	$ 35,408,506	$ 13,953,862	$ 21,454,645	$ 2,238,116					$ 402,155	$ 754,263	$ 34,088	$ 1,190,507	$ 1,191,722	$ 1,215

2022		Book Values							Service Lives				Depreciation Expense					
Account	Description	Opening Net Book Value of Existing Assets as at Date of Policy Change (Jan. 1) [1]	Less Fully Depreciated [7]	Net Amount of Existing Assets Before Policy Change to be Depreciated	Opening Gross Book Value of Assets Acquired After Policy Change [2]	Less Fully Depreciated [8]	Net Amount of Assets Acquired After Policy Change to be Depreciated	Current Year Additions	Average Remaining Life of Assets Existing Before Policy Change [3]	Depreciation Rate Assets Acquired After Policy Change	Life of Assets Acquired After Policy Change [4]	Depreciation Rate on New Additions	Depreciation Expense on Assets Existing Before Policy Change	Depreciation Expense on Assets Acquired After Policy Change	Depreciation Expense on Current Year Additions [5]	Total Current Year Depreciation Expense	Depreciation Expense per Appendix 2-BA Fixed Assets, Column J	Variance [6]
		a	b	c = a-b	d	e	f = d- e	g	h	i = 1/h	j	k = 1/j	l = c/h	m = f/j	n = g*0.5/j	o = l+m+n	p	q = p-o
1611	Computer Software (Formally known as Account 1925)	$ 289,366	$ 289,366	$ -	$ 902,928	$ 798,027	$ 104,902	$ 5,000	3.00	33.33%	5.00	20.00%	$ -	$ 20,980	$ 500	$ 21,480	$ 21,176	$ (304)
1612	Land Rights (Formally known as Account 1906)			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1805	Land			$ -	$ 149,992		$ 149,992	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1808	Buildings and Fixtures (50)			$ -	$ 1,256,185		$ 1,256,185	$ -	-	0.00%	50.00	2.00%	$ -	$ 25,124	$ -	$ 25,124	$ 25,124	$ -
1808	Buildings and Fixtures (25)			$ -	$ 15,279		$ 15,279	$ -	-	0.00%	25.00	4.00%	$ -	$ 611	$ -	$ 611	$ 611	$ (0)
1810	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%	-	0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1815	Transformer Station Equipment >50 kV (10)	$ -		$ -	$ 103,188		$ 103,188	$ -	10.00	10.00%	10.00	10.00%	$ -	$ 10,319	$ -	$ 10,319	$ 10,319	$ -
1815	Transformer Station Equipment >50 kV (20)	$ 732,310	$ 524,507	$ 207,803	$ 921,519		$ 921,519	$ 100,000	8.00	12.50%	20.00	5.00%	$ 25,975	$ 46,076	$ 2,500	$ 74,551	$ 74,551	$ (0)
1815	Transformer Station Equipment >50 kV (40)	$ 3,355,781	$ 2,708,611	$ 647,171	$ 3,507,574	$ 932,983	$ 2,574,591	$ -	28.00	3.57%	40.00	2.50%	$ 23,113	$ 64,365	$ -	$ 87,478	$ 87,478	$ (0)
1815	Transformer Station Equipment >50 kV (45)	$ 2,682,922	$ 1,873,011	$ 809,911	$ 2,682,922	$ 1,233,242	$ 1,449,680	$ -	33.00	3.03%	45.00	2.22%	$ 24,543	$ 32,215	$ -	$ 56,758	$ 56,758	$ 0
1815	Transformer Station Equipment >50 kV (50)	$ 77,279	$ 54,001	$ 23,277	$ 77,279	$ 36,853	$ 40,426	$ -	38.00	2.63%	50.00	2.00%	$ 613	$ 809	$ -	$ 1,421	$ 1,421	$ 0
1815	Transformer Station Equipment >50 kV (55)	$ 643,777	$ 242,716	$ 401,061	$ 643,777	$ 580,935	$ 62,842	$ -	43.00	2.33%	55.00	1.82%	$ 9,327	$ 1,143	$ -	$ 10,470	$ 10,470	$ 0
1820	Distribution Station Equipment <50 kV			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1825	Storage Battery Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1830	Poles, Towers & Fixtures	$ 3,337,033	$ 286,299	$ 3,050,734	$ 6,487,627	$ 3,050,170	$ 3,437,457	$ 1,639,133	34.00	2.94%	45.00	2.22%	$ 89,727	$ 76,388	$ 18,213	$ 184,328	$ 184,328	$ 0
1835	Overhead Conductors & Devices	$ 1,897,776	$ 313,192	$ 1,584,584	$ 4,600,332	$ 1,600,974	$ 2,999,358	$ 242,031	54.50	1.83%	60.00	1.67%	$ 29,075	$ 49,989	$ 2,017	$ 81,081	$ 81,130	$ 49
1840	Underground Conduit	$ 1,853,805	$ 253,180	$ 1,600,625	$ 3,559,164	$ 1,675,114	$ 1,884,050	$ 164,352	34.73	2.88%	50.00	2.00%	$ 46,088	$ 37,681	$ 1,644	$ 85,412	$ 85,412	$ (0)
1845	Underground Conductors & Devices	$ 1,058,668	$ 220,916	$ 837,751	$ 3,694,031	$ 842,342	$ 2,851,690	$ 179,592	25.30	3.95%	30.00	3.33%	$ 33,113	$ 95,056	$ 2,993	$ 131,162	$ 131,162	$ 0
1850	Line Transformers	$ 2,978,874	$ 346,651	$ 2,632,223	$ 6,239,633	$ 2,593,800	$ 3,645,833	$ 179,897	29.23	3.42%	40.00	2.50%	$ 90,052	$ 91,146	$ 2,249	$ 183,447	$ 183,428	$ (18)
1855	Services Overhead	$ 134,454	$ 27,746	$ 106,708	$ 348,605	$ 108,258	$ 240,347	$ 95,980	54.73	1.83%	60.00	1.67%	$ 1,950	$ 4,006	$ 800	$ 6,755	$ 6,772	$ 17
1855	Services Underground	$ 505,122	$ 259,545	$ 245,577	$ 2,061,652	$ 267,120	$ 1,794,532	$ 107,233	31.00	3.23%	35.00	2.86%	$ 7,922	$ 51,272	$ 1,532	$ 60,726	$ 60,741	$ 15
1860	Meters 15yrs	$ 1,519,758	$ 1,267,763	$ 251,995	$ 2,205,254	$ 267,753	$ 1,937,501	$ 82,841	13.80	7.25%	15.00	6.67%	$ 18,261	$ 129,167	$ 2,761	$ 150,189	$ 149,918	$ (271)
1860	Meters >50	$ 162,827	$ 1,843	$ 160,984	$ 442,575	$ 171,597	$ 270,978	$ 18,391	19.06	5.25%	25.00	4.00%	$ 8,446	$ 10,839	$ 368	$ 19,653	$ 19,653	$ (0)
1860	Meters CT's & PT's	$ 69,489	$ 6,710	$ 62,780	$ 253,270	$ 63,407	$ 189,863	$ 26,379	30.60	3.27%	35.00	2.86%	$ 2,052	$ 5,425	$ 377	$ 7,853	$ 7,853	$ (0)
1905	Land	$ 111,556		$ 111,556	$ 111,556		$ 111,556	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1908	Buildings and Fixtures (50)	$ 311,426	$ 311,426	$ -	$ 311,426		$ 311,426	$ -	24.00	4.17%	50.00	2.00%	$ -	$ 6,229	$ -	$ 6,229	$ 6,229	$ 0
1908	Buildings and Fixtures (40)	$ 29,372	$ 14,869	$ 14,502	$ 57,147	$ 29,372	$ 27,775	$ -	19.75	5.06%	40.00	2.50%	$ 734	$ 694	$ -	$ 1,429	$ 1,429	$ 0
1908	Buildings and Fixtures (25)	$ 174,026	$ 16,358	$ 157,668	$ 440,943	$ 174,026	$ 266,918	$ 80,000	23.33	4.29%	25.00	4.00%	$ 6,758	$ 10,677	$ 1,600	$ 19,035	$ 19,212	$ 177
1910	Leasehold Improvements			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1915	Office Furniture & Equipment (10 years)	$ 25,914	$ 25,914	$ -	$ 149,178	$ 28,636	$ 120,542	$ -	5.67	17.64%	10.00	10.00%	$ -	$ 12,054	$ -	$ 12,054	$ 12,054	$ (0)
1920	Computer Equipment - Hardware	$ 64,440	$ 62,871	$ 1,569	$ 216,248	$ 111,866	$ 104,383	$ 15,000	3.00	33.33%	5.00	20.00%	$ 523	$ 20,877	$ 1,500	$ 22,899	$ 22,899	$ 0
1920	Computer Equip.-Hardware(Post Mar. 22/04)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1920	Computer Equip.-Hardware(Post Mar. 19/07)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1930	Transportation Equipment (8)	$ 17,876	$ 17,876	$ -	$ 107,853	$ 16,212	$ 91,641	$ -	4.50	22.22%	8.00	12.50%	$ -	$ 11,455	$ -	$ 11,455	$ 11,455	$ (0)
1930	Transportation Equipment (15)	$ 22,698	$ 22,698	$ -	$ 1,322,422	$ 4,661	$ 1,317,761	$ -	2.25	44.44%	15.00	6.67%	$ -	$ 87,851	$ -	$ 87,851	$ 87,851	$ -
1935	Stores Equipment			$ -	$ 135,923		$ 135,923	$ -	10.00	10.00%	15.00	6.67%	$ -	$ 9,062	$ -	$ 9,062	$ 9,460	$ 399
1940	Tools, Shop & Garage Equipment	$ 66,736	$ 62,226	$ 4,510	$ 306,118	$ 86,831	$ 219,286	$ -	6.71	14.90%	10.00	10.00%	$ 672	$ 21,929	$ -	$ 22,601	$ 22,601	$ 0
1945	Measurement & Testing Equipment	$ 15,273	$ 15,273	$ -	$ 45,372	$ 40,244	$ 5,129	$ -	1.50	66.67%	5.00	20.00%	$ -	$ 1,026	$ -	$ 1,026	$ 1,026	$ (0)
1950	Power Operated Equipment			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1955	Communications Equipment			$ -	$ 89,405	$ 28,941	$ 60,464	$ -	-	0.00%	8.50	11.76%	$ -	$ 7,113	$ -	$ 7,113	$ 7,113	$ (0)
1955	Communication Equipment (Smart Meters)			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1960	Miscellaneous Equipment			$ -	$ 5,474		$ 5,474	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ 547	$ 547
1970	Load Management Controls Customer Premises			$ -	$ 16,439		$ 16,439	$ -	-	0.00%	10.00	10.00%	$ -	$ 1,644	$ -	$ 1,644	$ 1,644	$ 0
1975	Load Management Controls Utility Premises			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1980	System Supervisor Equipment			$ -	$ 378,236	$ 16,586	$ 361,650	$ 1,063	-	0.00%	20.00	5.00%	$ -	$ 18,083	$ 27	$ 18,109	$ 18,109	$ (0)
1985	Miscellaneous Fixed Assets			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1990	Other Tangible Property			$ -	$ -		$ -	$ -	-	0.00%		0.00%	$ -	$ -	$ -	$ -	$ -	$ -
1995	Contributions & Grants -Transformer Station			$ -	$ (1,218,270)		$ (1,218,270)		40.00	2.50%	40.00	2.50%	$ -	-$ 30,457	$ -	-$ 30,457	$ (30,457)	$ (0)
1995	Contributions & Grants - Poles	$ (13,087)	$ 145	$ (13,232)	$ (281,382)	$ (13,232)	$ (268,150)	$ (20,402)	45.00	2.22%	45.00	2.22%	-$ 294	-$ 5,959	-$ 227	-$ 6,480	$ (6,480)	$ 0
1995	Contributions & Grants - OH Conductors	$ (46,607)	$ 388	$ (46,996)	$ (265,134)	$ (46,996)	$ (218,138)	$ (24,187)	60.00	1.67%	60.00	1.67%	-$ 783	-$ 3,636	-$ 202	-$ 4,620	$ (4,620)	$ 0
1995	Contributions & Grants - UG Conduit	$ (149,904)	$ 1,499	$ (151,403)	$ (723,609)	$ (197,354)	$ (526,255)	$ (91,902)	50.00	2.00%	50.00	2.00%	-$ 3,028	-$ 10,525	-$ 919	-$ 14,472	$ (14,472)	$ -
1995	Contributions & Grants - UG Conductors	$ (105,186)	$ 1,753	$ (106,939)	$ (717,112)	$ (106,939)	$ (610,173)	$ (64,713)	30.00	3.33%	30.00	3.33%	-$ 3,565	-$ 20,339	-$ 1,079	-$ 24,982	$ (24,982)	$ (0)
1995	Contributions & Grants - Line Transformers	$ (173,796)	$ 2,172	$ (175,968)	$ (1,298,179)	$ (175,968)	$ (1,122,210)	$ (77,572)	40.00	2.50%	40.00	2.50%	-$ 4,399	-$ 28,055	-$ 970	-$ 33,424	$ (33,424)	$ (0)
1995	Contributions & Grants - Services OH	$ (415)	$ 3	$ (418)	$ (14,285)	$ (418)	$ (13,867)	$ (680)	60.00	1.67%	60.00	1.67%	-$ 7	-$ 231	-$ 6	-$ 244	$ (244)	$ 0
1995	Contributions & Grants - Services UG	$ (201,560)	$ 2,879	$ (204,439)	$ (1,273,998)	$ (204,439)	$ (1,069,558)	$ (88,125)	35.00	2.86%	35.00	2.86%	-$ 5,841	-$ 30,559	-$ 1,259	-$ 37,659	$ (37,659)	$ 0
1995	Contributions & Grants - Meters 15 years	$ (11,159)	$ 223	$ (11,382)	$ (240,485)	$ (11,382)	$ (229,103)	$ (31,010)	15.00	6.67%	15.00	6.67%	-$ 759	-$ 15,274	-$ 1,034	-$ 17,066	$ (17,066)	$ 0
1995	Contributions & Grants - Meters 25 years	$ (5,489)	$ 110	$ (5,599)	$ (68,128)	$ (5,599)	$ (62,529)	$ (7,289)	25.00	4.00%	25.00	4.00%	-$ 224	-$ 2,501	-$ 146	-$ 2,871	$ (2,871)	$ -
1995	Contributions & Grants - Meters 35 years	$ (2,127)	$ 30	$ (2,158)	$ (85,722)	$ (2,158)	$ (83,564)	$ (17,546)	35.00	2.86%	35.00	2.86%	-$ 62	-$ 2,388	-$ 251	-$ 2,700	$ (2,700)	$ (0)
1995	Contributions & Grants - Load Mgmt Control			$ -	$ (13,599)		$ (13,599)		10.00	10.00%	10.00	10.00%	$ -	-$ 1,360	$ -	-$ 1,360	$ (1,360)	$ (0)
2005	Property Under Finance Lease			$ -			$ -			0.00%		0.00%	$ -	$ -	$ -	$ -		$ -
	Total	**$ 21,429,228**	**$ 9,234,772**	**$ 12,194,455**	**$ 37,646,622**	**$ 13,995,462**	**$ 23,651,160**	**$ 2,513,465**					**$ 399,981**	**$ 810,019**	**$ 32,989**	**$ 1,242,990**	**$ 1,243,600**	**$ 610**

CAPITAL EXPENDITURES

2.1 PLANNING

Planning Overview

This exhibit includes the following sections:

1) Planning Process;
2) Capital Expenditures;
3) Capitalization Policy;
4) Capitalization of Overhead;
5) Costs of Eligible Investments for Distributors;
6) New Policy Options for the Funding of Capital;
7) Addition of ACM and ICM Assets to Rate Base; and
8) Service Quality and Reliability Performance.

In accordance with the Filing Requirements, Grimsby Power Inc. (GPI) is filing its consolidated DSP as a stand-alone document as Exhibit 2, Tab 3, Attachment 1.

Planning

All categories of system investments, including system renewal, system access, system service, and general plant have been addressed and consolidated in Grimsby Power's capital expenditure plan. GPI has followed guidance in the OEB letter dated April 15, 2021 entitled *Consultation on Updates to Filing Requirements for Electricity Distribution Cost of Service Applications.* Accordingly, as related to the filing requirements for Section 2.2.1.1., GPI has provided historical spending and analysis by material capital projects in the specified categories for the 2020 Actual and 2021 Bridge Years. GPI has assigned all historical and future construction projects to the new categories as required by the Board. The DSP provides the planned spending level, as determined by the methodologies outlined in Grimsby Power`s DSP for 2022 through 2026. GPI has leveled the plan, as best as possible, to address pacing and affordability.

Regional Planning

For Regional planning purposes GPI belongs to the "Niagara Region" for which HONI is the lead transmitter. The Needs Assessment phase of the planning process with HONI was initiated in early 2021. The purpose of Needs Assessment phase is to identify any near term and/or emerging needs in the area over the next 10 years. The findings of Needs Assessment phase are not expected to have material impacts on Grimsby Power's DSP. After completion of the Needs Assessment phase the IESO initiated Scoping Assessment as part of the Regional Planning process in June 2021. At the time of writing this evidence IESO was initiating this process and Grimsby Power is one of the participating utilities. In addition to this it is relevant to note that there are no transmission capacity constraints within Grimsby Power`s service territory that may deter new connections.

Planning Horizon

The RRFE Report indicated that a planning horizon of five years is required to support integrated planning and better align distributor planning cycles with rate-setting cycles. Grimsby Power has taken an integrated approach for investment planning on Grimsby Power's distribution system. All investments pertaining to the following categories have been planned and optimized together:

- System renewal and expansion;
- Renewable generation connections;
- Customer connections and regulatory requirements;
- System growth and planning criteria;
- General plant in support of daily operations;
- Smart grid development and implementation; and

- Regionally planned infrastructure.

This allowed Grimsby Power to develop a DSP that allocates its resources in an optimal way to achieve cost-effective planning over the planning horizon. The DSP covers a planning horizon of five years starting in the 2022 Test Year and ending in 2026.

Employing this longer term approach requires Grimsby Power to consider future customer needs and any required changes to its distribution system in advance, thereby enhancing Grimsby Power's ability to plan ahead and respond to the evolving needs of customers in a timely manner, while managing and leveling the impacts of these expenditures on consumer rates to maintain the affordability of its service.

Based on an evaluation of Grimsby Power's distribution system to accept distributed generation connections, GPI is not proposing any capital investments for capacity upgrades to accommodate applications for the connection of renewable energy generation (REG) plant over the next five years (2022 to 2026) as no constraints have been identified in the system preventing the connection of such installations.

GPI assets fall into two broad categories. Distribution plant, which includes assets such as, overhead wires, underground cable, transformers, switches, meters and a substation.

General plant is the second category which includes assets, such as buildings, computer hardware and software, mobile equipment (fleet), office furniture and tools & equipment.

For internal budgeting purposes, GPI has categorized all spending to align with the DSP categories of system renewal, system access, system service and general plant.

2.2 REQUIRED INFORMATION

Grimsby Power has completed OEB Appendix 2-AB Capital Expenditure Summary presenting five historical years, the 2021 Bridge Year, the 2022 Test Year and an additional four planned years of capital expenditures (2023 to 2026). Appendix 2-AB Capital Expenditure Summary is provided as Exhibit 2, Tab 2, Attachment 1.

Grimsby Power has made its best efforts to categorize historical projects into the DSP categories (System Access, System Renewal, System Service, and General Plant).

Figure 2-1
Cumulative Gross Capital Expenditures Historical and Bridge by %
(2016-2021)

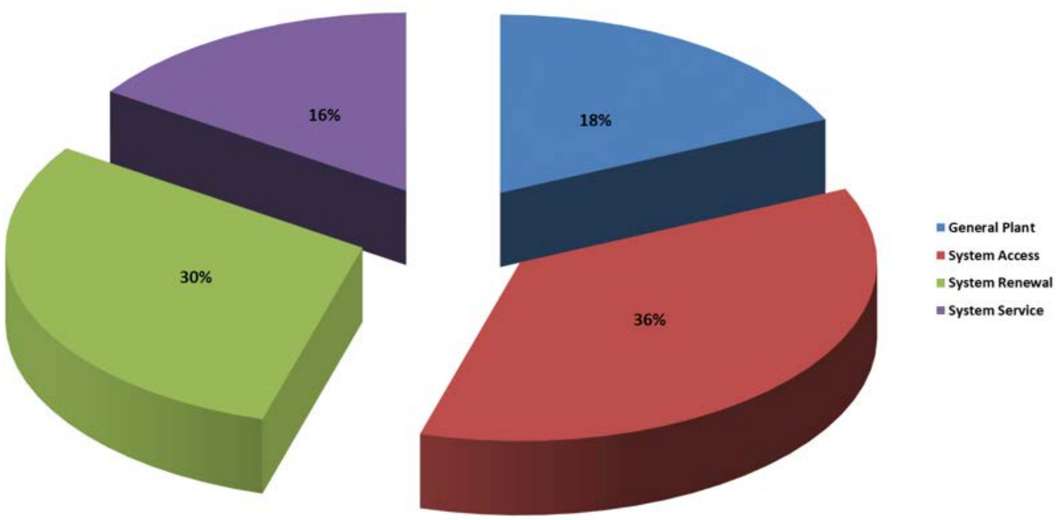
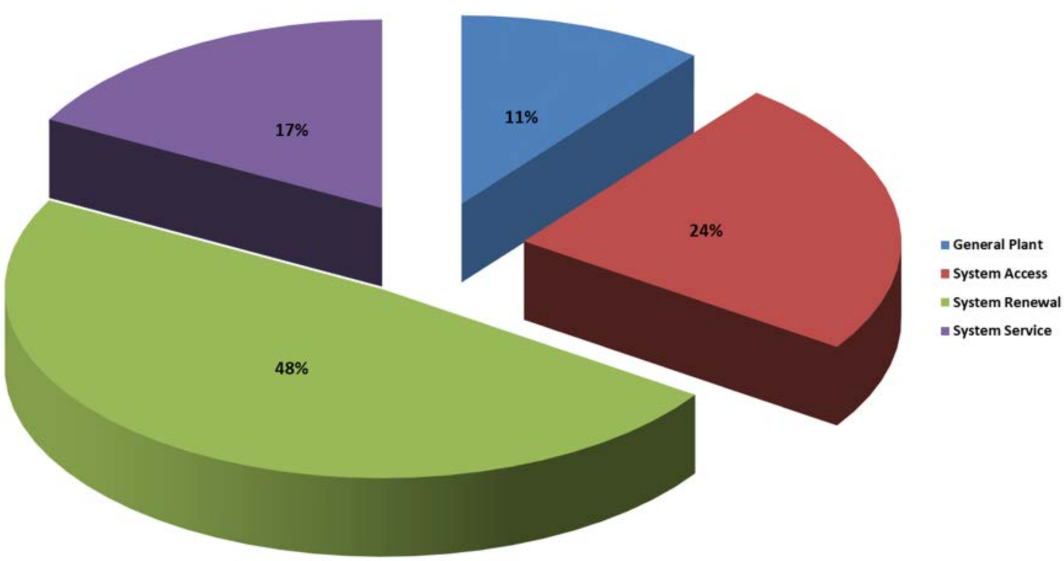


Figure 2-2
Cumulative Gross Capital Expenditures by %
(2022 – 2026)



As shown in the above table and figures, Grimsby Power's main infrastructure focus has been on System Access. System Access makes up 36% of the overall historical period. From 2022 – 2026 the focus of GPI will change to 48% System Renewal and 24% System Access. The change is due to a focus on aging infrastructure on the CNR pole line relocation and back yard projects.

Capital spending by category is designed to meet both defined customer preferences and distribution system requirements. As per OEB guidelines the spending categories are described below. The planning methodologies are also included in the description.

System Access

A significant portion of System Access is assumed plant or expansions to the distribution system as a result of residential subdivision development. The value of the assumed plant is based on an average of historical costs to service individual customers multiplied by the estimated new customer connections the next five years. Grimsby Power has made its best attempt at estimating the new connections over the planning horizon, however this is inevitably linked to the economy and the developers who are making the investments. Therefore, the number of new connections in any given year may be different than forecast. In conjunction with assumed plant there is a contributed capital offset which is essentially the capital that the customer paid. The value of this contributed capital is deducted from the value of the assumed assets. GPI will need to ensure that the infrastructure is in place to accommodate this growth.

System Renewal

System renewal investments are driven by asset condition to derive replacement programs. Plans for replacements are based on consideration of the number, type, age and condition of assets. In 2018 Grimsby Power conducted a detailed review of asset condition by engaging a 3rd party provider to create a detailed Asset Condition Assessment (ACA) (issued in January 2019). Since then Grimsby Power has been utilizing ACA data and optimizing it with its' existing maintenance practices. The proactive replacement of system components prior to failure will reduce costs associated with outage response and reactive replacement. It also allows Grimsby

Power to manage the level of spend in any given year to avoid highs and lows that may occur due to the age distribution of the assets.

System Service

System service spending is focused on system reliability improvement projects, which are based on outage considerations, system impact, smart grid upgrade scenarios and customer preferences. These projects are assessed against corporate business objectives including customers stated preferences. During this forecasted period significant investment in this category is related to the addition of new feeders out of NW MTS as a direct result of a Capacity Planning Study. Also within this category there is voltage conversion work which has taken place through all of the historical years and into the forecast period. Voltage conversion work has a positive impact on the reduction of line losses and reliability improvements.

General Plant

The General plant category includes all assets that are not distribution assets. Investments in general plant are planned on an annual basis based on need. Some investments such as building renovations and office furniture replacement are made over the longer term as not to create any highs or lows in capital spend. In the short term the general plant category is focused on ensuring that adequate tools such as Outage Management System (OMS) - SCADA improvements are in place to support the day-to-day operations, and to improve customer communications in contingency scenarios of unplanned outages.

Table 2-19

Capital Expenditure Summary

2016 OEB Approved to 2021

CATEGORY	Historical								
	2016			2017			2018		
	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var
	$'000		%	$'000		%	$'000		%
System Access	977	600	-38.6%	995	1,287	29.3%	967	762	-21.2%
System Renewal	205	209	2.1%	918	208	-77.3%	977	565	-42.2%
System Service	178	53	-70.0%	399	371	-7.1%	409	71	-82.7%
General Plant	711	570	-19.8%	202	326	61.2%	170	507	198.2%
TOTAL EXPENDITURE	2,071	1,433	-30.8%	2,515	2,193	-12.8%	2,523	1,905	-24.5%
Capital Contributions	-561	-304	-45.8%	-572	-724	26.5%	-554	-363	-34.4%
Net Capital Expenditures	1,510	1,129	-25.3%	1,943	1,469	-24.4%	1,969	1,541	-21.7%
System O&M	$1,448	$1,287	-11.1%	$1,709	$1,298	-24.0%	$1,777	$1,502	-15.5%

CATEGORY	Historical								
	2019			2020			2021		
	Plan	Actual	Var	Plan	Actual	Var	Plan	Projection	Var
	$'000		%	$'000		%	$'000		%
System Access	906	478	-47.3%	839	740	-11.9%		662	--
System Renewal	1,062	1,069	0.7%	1,067	661	-38.1%		1,022	--
System Service	421	482	14.6%	428	286	-33.1%		683	--
General Plant	173	382	120.0%	177	278	56.9%		216	--
TOTAL EXPENDITURE	2,562	2,411	-5.9%	2,511	1,965	-21.8%		2,583	--
Capital Contributions	-518	-214	-58.7%	-482	-462	-4.3%		-345	--
Net Capital Expenditures	2,044	2,197	7.5%	2,029	1,503	-25.9%		2,238	--
System O&M	$1,848	$1,472	-20.4%	$1,922	$1,584	-17.6%		$1,475	--

Variance of Year over Year Category Spending

An analysis of year over year variances for historical costs within the DSP categories is as follows:

Table 2-20
Variance Analysis of Capital Expenditures
2016 OEB Approved vs. 2016 Actual

Description	2016 OEB Approved	2016 Actual	Variance from 2016 OEB Approved
System Access	977,305	600,057	- 377,248
System Renewal	204,847	209,047	4,200
System Service	177,879	53,323	- 124,556
General Plant	711,400	570,235	- 141,165
Total Capital Expenditure	**2,071,431**	**1,432,662**	**- 638,769**

<u>System Access</u>

A comparison of the 2016 OEB Approved budget against 2016 Actuals indicates a variance of $377k is observed within this investment category. The underspend of $377k in this investment portfolio was primarily associated with residential expansion which contains Assumed Plant, Customer Work Order, and Residential Subdivisions. Grimsby Power energized 22 connections in 2016, which was significantly lower than the forecasted plan. Grimsby Power works closely with all applicable agencies to forecast the approximate number of connections annually, but the actual timing of the connections is dependent on external factors that cannot be controlled by Grimsby Power (such as construction progress of new customer driven developments). Furthermore, System Access higher than planned expenditures of $292k took place in 2017, which was due to the connections forecasted in 2016 being connected in 2017.

<u>System Renewal</u>

In comparison of the 2016 OEB Approved budget against 2016 Actuals, there is a negligible variance (less than 2%) observed within this investment category. Grimsby

Power essentially had no variance in this investment category in 2016 and executed work accordingly.

System Service

In comparison of the 2016 OEB Approved budget against 2016 Actuals, there is a variance of $125k within this investment category. The underspend of $125k was primarily associated with a deferral of NW MTS automation improvements, as well as a reclosure installation that carried over to 2017.

General Plant

In comparison of the 2016 OEB Approved budget against 2016 Actuals, there is a variance of $141k observed within this investment category. The underspend of $141k was primarily associated with the deferral from 2016 to 2017 of the purchase of a SCADA system. General Plant higher than planned spending of $124k took place in 2017 as a result of the SCADA system deferral from 2016.

Table 2-21

Variance Analysis of Capital Expenditures

2020 Actual vs. 2021 Bridge Year

Description	2020 Actual	2021 Bridge	Variance from 2020 Actual
System Access	739,783	661,693	(78,090)
System Renewal	661,046	1,021,882	360,836
System Service	286,152	683,114	396,962
General Plant	277,564	216,040	(61,524)
Total Capital Expenditure	**1,964,545**	**2,582,729**	**618,185**

System Access

In comparison of the 2020 Actuals against 2021 Forecasts, a variance of $78k is observed within this investment category. A decrease in spending of $78k was primarily associated with the impact of COVID-19 over the 2020/2021 period when a significant amount of ongoing new development projects were delayed or placed on hold by the 3rd party developers during the pandemic. This was outside of the control of Grimsby Power.

System Renewal

In comparison of the 2020 Actuals against 2021 Forecasts, a variance of $361k is observed within this investment category. A forecasted increase of spend of $361k is primarily associated with catch-up from the reduced work execution capacity experienced due to COVID-19 which impacted the progress of most system renewal programs and projects in 2020. Another contributing factor to the forecasted increase in spending is related to the deferral of planned renewal activities along Casablanca Blvd. in order to coordinate with a Regional road widening project which has been deferred by the Region for partial execution in late 2021 and then full execution in 2022.

System Service

In comparison of the 2020 Actuals against 2021 Forecasts, a variance of $397k is observed within this investment category. A forecasted increase in spending of $361k is primarily associated with execution of the deferred work from 2020 related to adding a 3rd feeder from NW MTS. This deferral was due to design changes required to satisfy requirements of both Grimsby Power Inc. and Niagara Peninsula Energy Inc. This project is on track for completion in 2021.

General Plant

In comparison of the 2020 Actuals against 2021 Forecast, a variance of $62k is observed within this investment category. The forecasted decrease of spend of $62k is primarily associated with reduced requirements in 2021 for specialized General Plant items (i.e. New Forklift and Silverblaze e-billing & customer account portal) that were purchased in 2020.

Table 2-22
Variance Analysis of Capital Expenditures
2021 Bridge Year vs. 2022 Test Year

Description	2021 Bridge	2022 Test	Variance from 2021 Bridge
System Access	661,693	882,883	221,190
System Renewal	1,021,882	1,871,404	849,522
System Service	683,114	81,541	(601,573)
General Plant	216,040	101,063	(114,977)
Total Capital Expenditure	**2,582,729**	**2,936,891**	**354,162**

System Access

In comparison of the 2021 Forecasts against 2022 Forecast, a variance of $221k is observed within this investment category. A forecasted increase of spend of $221k in 2022 is primarily associated with the completion of activities associated with the Casablanca Blvd. road widening project that is initiated by the Region.

System Renewal

In comparison of the 2021 Forecast against 2022 Forecast, a variance of $850k is observed within this investment category. A forecasted increase in spending of $850k in 2022 is primarily associated with planned increases in investment plans in the Defective Poles replacement program, the Rear Lot conversion program and the CNR Pole Line relocation project.

System Service

In comparison of the 2021 Forecast against 2022 Forecast, a variance of $602k is observed within this investment category. A forecasted decrease in spending of $602k in 2022 is primarily associated with the completion in 2021 of the new feeder addition from NW MTS. Planned spend within this investment category will be back to 2021 planned levels in 2023 when an additional new feeder is constructed to address Grimsby Power capacity demands.

General Plant

In comparison of the 2021 Forecast against 2022 Forecast, a variance of $115k is observed within this investment category. A forecasted decrease of spend of $115k in 2022 is primarily associated with lower spend requirements for Grimsby Power's fleet. Grimsby Power has invested over the last filing period in the replacement of its aging fleet vehicles and there are no major investments required in 2022.

Capital Project Summary

Table 2-23 below provides a summary of all capital projects for the years 2016 through 2020, the 2021 Bridge Year and the 2022 Test Year. All projects above Grimsby Power's materiality threshold of $50,000 have been listed individually within the DSP categories and all individual projects below the threshold have been grouped together as miscellaneous within the applicable category. Grimsby Power's DSP, found in Exhibit 2, Tab 3, Attachment 1, provides capital project summaries with a full description and justification of all individual material projects listed in the table for the 2022 Test Year.

Table 2-23
Summary of Capital Projects
2016 – 2022 Test Year

Projects	2016	2017	2018	2019	2020	2021 Bridge Year	2022 Test Year
Reporting Basis	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS
System Access							
Residential Expansion	449,288	1,069,380	623,006	274,825	627,134	498,127	660,249
Project - New Customer Connections	62,147	25,395	74,406	76,580	65,127	77,947	46,154
Project - Residential Subdivision Development	50,438	101,452	24,861	43,717	7,064	74,738	30,194
Program - Modifications to Existing Customer Connections	9,784	18,602	12,283	82,504	40,458	10,881	12,286
Project - Metrolinx - Pole Line Relocation Due to Road Widening at Casablanca Blvd & Livingston Ave.							134,000
Program - Transformer Station - Modifications to Support Renewable Generation		64,871					
Program - Replace >50kW form Meters with Smart INTRVL	28,400		27,905				
Project - Load Transfer Elimination and Pole Line Relocation/Reconfiguration		7,718					
Sub-Total	600,057	1,287,418	762,461	477,626	739,783	661,693	882,883
System Renewal							
Program - Replace Defective Poles	67,972	81,748	119,410	258,744	251,174	286,591	521,019
Program - Secondary Bus Refurbishments		8,498			175,417	66,333	65,676
Program - Replace Sectionalizing Terminal	10,188	10,888	10,732	13,917	31,695	38,039	37,686
Program - Replace Gang Operated Load Break Switch	26,241		30,449	44,438		30,228	29,220
Program - Primary Cable Testing	69,822			125,739			
Program - Replace Pad Mounted Transformers	32,807	78,218	114,166	168,694	56,740	79,624	84,253
Program - Primary Cable Silicon Injection		15,833	4,440		38,815		
Program - Meter Replacements	2,016	13,136					
Program - Rear Lot Conversion					12,760	258,550	598,550
Program - Niagara West MTS			51,370	33,398	11,705	50,000	100,000
Program - Voltage Conversion			206,035	424,387	62,182		
Project - CNR Pole Line (18M4 Feeder) Relocation / Rerouting			28,017		20,557	212,517	435,000
Sub-Total	209,047	208,320	564,621	1,069,317	661,046	1,021,882	1,871,404
System Service							
Program - Primary OH Conductor and UG Cable Reinforcements					166,954	84,098	81,541
Program - Convert Radial Feeder Customers to Loop		544	70,613				
Project - Third Feeder from NW-MTS				99,969	36,927	599,015	
Project - NWTS Automation & Improvements	53,323	173,785		45,770	82,271		
Project - Automate Primary 3 Phase Switches - Install Reclosures		38,625					
Project - Replace Manually Operated Pad Mounted Switchgear with an Automated/Remote Controlled PVI		157,717		103,447			
Project - Pole Line Upgrade				233,275			
Sub-Total	53,323	370,672	70,613	482,460	286,152	683,114	81,541
General Plant							
Program - Computer Workstations	8,805	13,758	3,695	14,380	23,428	9,000	10,000
Program - Server/Network Hardware Upgrades due to Cyber Security				36,301	22,796	10,000	10,000
Software	36,259	28,702	24,245		39,370	15,000	
Project - SCADA System and Improvements		194,995	63,985	65,044	26,636	21,040	1,063
Vehicle - Trucks & Forklift	359,940	49,063	373,868	198,425	123,960	87,000	
Building Upgrades	142,411	27,259	21,137	10,399	17,819	15,000	80,000
Office Furniture			6,432			10,000	
NWTS - Upgrades		6,468	8,256	280			
Tools - Replacement	22,561		4,121	49,998	15,009	39,000	
Communication Equipment	260	5,953	1,310	3,200	6,573	10,000	
Miscellaneous				3,501	1,973		
Sub-Total	570,235	326,199	507,048	381,528	277,564	216,040	101,063
Miscellaneous							
Total	**1,432,662**	**2,192,609**	**1,904,743**	**2,410,931**	**1,964,545**	**2,582,729**	**2,936,891**
Less Renewable Generation Facility Assets and Other Non-Rate-Regulated Utility Assets *(input as negative)*							
Total	**1,432,662**	**2,192,609**	**1,904,743**	**2,410,931**	**1,964,545**	**2,582,729**	**2,936,891**
Deferred Revenue (Capital Contribution)	**(304,022)**	**(723,784)**	**(363,406)**	**(214,248)**	**(461,764)**	**(344,613)**	**(423,426)**
Total	**1,128,640**	**1,468,825**	**1,541,337**	**2,196,683**	**1,502,780**	**2,238,116**	**2,513,465**

Capital Project Variance – 2016 Board Approved vs. 2016 Actual

Table 2-24 provides a summary, by material capital project, of 2016 actual project costs compared to 2016 Board-Approved projects. The variances from the 2016 Board Approved expenditures to 2016 Actual expenditures are explained above in the variance analysis of capital expenditures.

Table 2-24
Capital Project Variance Table
2016 Board Approved vs. 2016 Actual

Projects	2016 OEB Approved	2016 Actual	Variance
Reporting Basis	**MIFRS**	**MIFRS**	**MIFRS**
System Access			
Residential Expansions	824,942	449,288	-375,654
Modifications to Existing Customer Connection	22,622	9,784	-12,838
Mandate Service Obligations	41,112	50,438	9,327
New Customers Connections	88,629	62,147	-26,482
Replace >50kW form Meters with Smart INTRVL		28,400	28,400
Sub-Total	**977,305**	**600,057**	**-377,247**
System Renewal			
Replace Sectionalizing Terminal	10,273	10,188	-85
Primary Cable Installation for Non-injectable Segments	49,824	69,822	19,998
Replace Pad Mounted Transformers	49,570	32,807	-16,763
Replace Defective Poles	68,169	67,972	-196
Replace Meters (includig primary metering units and components)		2,016	2,016
Replace Overhead Switches (including Gang Opreated Load Break Switches) and other equipment (OH Ttransformers)	27,012	26,241	-771
Sub-Total	**204,847**	**209,047**	**4,199**
System Service			
Automate Primary 3 Phase Switches - Install Reclosures	88,952		-88,952
Bucket Truck Rental	27,362		-27,362
Transformer Station - Modifications to Support Renewable Generation	61,565	53,323	-8,242
Sub-Total	**177,879**	**53,323**	**-124,556**
Total Distribution Plant	**1,360,031**	**862,427**	**-497,604**
General Plant			
Computer Software			
Software Licenses - Adobe, Microsoft Office, Unforeseen Software	29,000	36,259	7,259
ERP Software System - Implementation and Modifications to the Software	30,000		-30,000
Asset Management Planning & Systems Integration Software	110,000		-110,000
Inventory Software with scanners	5,000		-5,000
Software for the Server Disaster Recovery	3,000		-3,000
Sub-Total	**177,000**	**36,259**	**-140,741**
Buildings and Fixtures			
New office space - renovation (Engineering, Regulatory, Lobby)	96,000	142,411	46,411
Racking System - in the storeroom (gated area)	26,400		-26,400
Replace solid glass windows with solid plus window opening section	10,000		-10,000
Sub-Total	**132,400**	**142,411**	**10,011**
Office Furniture			
Office Renovation and Replacement furniture (Engineering, Regulatory, Billing, Exec)	9,000		-9,000
Sub-Total	**9,000**	**0**	**-9,000**
Computer Hardware			
Laptops	5,000		-5,000
Computer Workstations, Hardrives, Monitors	6,800	8,805	2,005
Servers (ESRI GIS, ERP Mac W for Ipad & Iphone, Small Business, Disaster Recovery, Outages)	25,200		-25,200
Sub-Total	**37,000**	**8,805**	**-28,195**
Tools		22,561	22,561
Sub-Total	**0**	**22,561**	**22,561**
Vehicles			
46ft Aerial Device and Fiberglass Body	356,000	359,940	3,940
Sub-Total	**356,000**	**359,940**	**3,940**
Communication Equipment		260	260
Sub-Total	**0**	**260**	**260**
Total General Plant	**711,400**	**570,235**	**-141,165**
Total	**2,071,431**	**1,432,662**	**-638,769**
Less Renewable Generation Facility Assets and Other Non-Rate-Regulated Utility Assets (input as negative)			
Total	**2,071,431**	**1,432,662**	**-638,769**
Deferred Revenue (Capital Contribution)	**- 561,250.86**	**-304,021.94**	**257,228.92**
Grand Total	**1,510,180**	**1,128,640**	**-381,540**

Summary

Table 2-25
Capital Investments over the Forecast Period
2022 Test Year to 2026

	2022	2023	2024	2025	2026	Total	Average
	$ '000						
System Access	883	713	550	605	611	3,362	672
System Renewal	1,871	891	1,304	1,295	1,443	6,805	1,361
System Service	82	1,138	611	362	231	2,424	485
General Plant	101	391	204	397	396	1,489	298
Contributed Capital	(423)	(327)	(322)	(347)	(354)	(1,774)	(355)
TOTAL EXPENDITURE	**2,513**	**2,806**	**2,348**	**2,312**	**2,326**	**12,306**	**2,461**
Percent Change from Previous Year		11.7%	-16.4%	-1.5%	0.6%		-1.4%

In 2022 GPI plans an overall increase in capital expenditures in order to align its overall goal towards a focus on System Renewal. In 2023 the overall capital expenditures increase to accommodate the addition of the new feeder from NW MTS and to also maintain the overall System Renewal focus. Moving forward from 2024 – 2026 GPI plans for a steady overall spend on average with its major focus on System Renewal.

System Access

System Access investments are forecasted based on the number of connections expected over the 5-year horizon. These connections are due to the influx of new condominium style developments being built along the Lake side of the Town of Grimsby over the next 3-4 years. Grimsby Power will accommodate all requests for new load connections and for service upgrades. New connections are expected to be mixed usage with residential and commercial customers.

System Renewal

System Renewal investments are based on the requirements of the asset replacement, mainly driven by ACA. The proactive replacement of system components prior to failure will reduce costs associated with outage response and reactive replacement. Adjustments to the programs were made by receiving an ACA study in early 2019 that contained more detailed asset condition information and records. Starting in 2022, Grimsby Power's short-term goal includes investment in general assets to support the services requested by customers, relating to OMS, outage reporting systems, social media, etc., In consideration of long-term goals, starting in 2022 GPI is increasing investments in the renewal of distribution assets to avoid potential negative impacts to reliability levels which would introduce a reactive need to significant increases in its renewal budget categories in the future. After 2024 GPI does not expect fluctuations year over year in this category, however, the total envelope of dollars is anticipated to be within an acceptable tolerance range. Substation expenditures have been eliminated and the majority of poor assets will have to be replaced by the end of the forecast period between 2022 and 2026. The level of capital expenditures increases during the forecast period due to the increased efforts on the defective poles replacement program, pole line relocations and backyard replacements.

<u>System Service</u>

System Service spending is focused on system reliability improvement projects, which are based on outage considerations, system impact, system capacity needs, smart grid upgrade scenarios, electrical loss reduction and customer preferences. The integration of smart grid technologies allowing more automation (e.g. automated transfer switchgears) and intelligence into the system (e.g. electronic reclosers) is a primary goal embedded in Grimsby Power`s capital investment strategy. The installation of these devices has been integrated into the plan for the next 5-year period smoothing costs year over year. These devices will help Grimsby Power with more effective outage response. Once a new feeder is constructed in 2021, Grimsby Power will have no potential capacity restrictions nor any major issues with the connection of any new customers within the current five-year plan.

<u>General Plant</u>

General Plant is focused on ensuring that adequate tools, such as OMS, are in place to support the day-to-day operations, and to improve customer communications in contingency scenarios of unplanned outages. GPI has incorporated the customer preferences obtained through targeted customer research and a customer engagement process. The short-term plan is to focus funding on customer-identified priorities, namely, a modern Outage Management System (OMS), with social media capability and website access to enhance customer communications. An OMS will also support the distribution system planning activities related to improving reliability by providing important outage statistics. Fleet and IT expenditures going forward will continue to follow a replacement strategy informed by the Fleet Assessment and Grimsby Power's knowledge of its assets. All other general plant expenditures will remain fairly consistent throughout the filing period.

Treatment of Cost of Funds

Grimsby Power's accounting practice is to expense borrowing costs. It does not capitalize interest on capital projects.

Components of Other Capital Expenditures

GPI does not have other capital expenditures, such as non-distribution activities, for which it needs to provide components.

2.3 CAPITALIZATION POLICY

Capitalization Policy Overview

Effective January 1, 2014 Grimsby Power adopted accounting policies that are compliant with Modified International Financial Reporting Standards (MIFRS). With respect to capitalization of certain expenses, Grimsby Power follows the guidance provided by IAS 16, whereby capital cost includes the following:

- Purchase price, including duties and non-refundable taxes after deducting trade discounts and rebates
- All expenditures attributable to bringing the asset to a working condition for its "intended use"
    - Directly attributable need to be incremental or external
    - Capable of being operated in the manner intended by management

- Cost of obligation of its dismantlement, removal or restoration PP&E include expenditures that directly attributable to the acquisition of the asset. The cost of self-constructed assets includes the cost of material, direct labour, third party subcontracting and other costs directly attributable to bringing the asset to a working condition for its intended use.
- Expenditures that create a physical betterment or improvement of an asset will be capitalized Capital Assets include property, plant and equipment that are held for use in the production or supply of goods and services and provide benefit lasting beyond one year.

Capital expenditures also include the improvement or "betterment" of existing assets. Intangible assets are also considered capital assets and are defined as assets that lack physical substance. They include computer software.

Changes to Capitalization Policy

Grimsby Power has not changed its capitalization policy since the last rebasing for 2016 rates (EB-2015-0072).

Guidelines for Capitalization

Betterment is a cost which enhances the service potential of a capital asset and/or increases its value and therefore capitalized. Betterment includes expenditures which increase the capacity of the asset, lower associated operating costs of the asset, improve quality of output or extend the asset's useful life. Betterment does not include general maintenance-related actions that seek to sustain an asset's current value.

Repairs – a "repair" is a cost incurred to maintain the service potential of a capital asset. Expenditures for repairs are expensed to the current operating period. Expenditures for repairs and/or maintenance designed to maintain an asset in its original state are not capital expenditures and are charged to a maintenance account.

Depreciation - Depreciation is recognized on a straight-line basis over the estimated useful life of each significant identifiable item of property, plant and equipment. Land is not depreciated.

Grimsby Power has used the Typical Useful Life provided in the Kinectrics Report as its basis for assigning the estimated service life of assets. As required under MIFRS, Grimsby Power reviews the useful lives assigned to each assets category on an ongoing basis. Depreciation of an asset begins in the year when it is available for use, i.e. when it is in the location and condition necessary for it to be capable of operating in the manner intended. In the first year of service, depreciation is calculated using the ½ year rule. Depreciation of an asset ceases when the asset is retired from active use, sold or is fully depreciated.

2.4 CAPITALIZATION OF OVERHEAD

Overhead Policy

Grimsby Power's overhead policy was reviewed by its external auditors during its transition period in 2011 and during each year-end audit since the transition to ensure that Grimsby Power's policy remains to be MIFRS compliant.

In 2012 Grimsby Power reviewed and changed its overhead policy. Grimsby Power does not capitalize general administrative costs related to Administration, HR, Regulatory Affairs, Information System Technology, Billing and Collections and Finance.

In addition to Grimsby Power's direct labour costs include costs that are generally considered labour burden. In this category Grimsby Power includes vacation, statutory holidays, health and safety, training costs, personal protective equipment costs, sick time, CPP, EI,EHT,OMERS, contribution, WSIB and EAP, health care and other benefits paid by the employer on behalf of the employees. These costs are related to the power line staff only. Through the time sheet process, the power line staff track their hours by work order which designates whether the work is expensed or capitalized. The labour burden is calculated and allocated to the capital or expense, based on the number of direct labour hours worked.

The overhead policy also addresses what Grimsby Power considers a cost that directly impacts its capital projects, the equipment costs.

Equipment Costs – these costs include the costs associated with maintaining Grimsby Power's fleet of pick-up trucks, bucket trucks with aerial devices, and trailers. These costs include fuel, repairs, insurance, depreciation and all other items of expense necessary to keep the fleet in service. Based on the hours of use, these costs are expensed or capitalized directly to the specific project through the timesheet process by work order.

As part of transition to MIFRS, Grimsby Power took determined that costs related to Inventory and Purchasing as well as facility costs were not going to be part of the capitalization process through its burden allocation. As a result, costs related to these functions are treated as OM&A costs and expensed annually.

Capitalization of Overhead

Grimsby Power has completed Appendix 2-D Overhead Expense showing a breakdown of OM&A before capitalization and capitalized OM&A.

Please see Appendix 2-D below in Table 2-26 and Table 2-27.

Table 2-26

Appendix 2-D

Summary of OM&A Before Capitalization

2017 to 2022 Test Year

	2017 Historical Year	2018 Historical Year	2019 Historical Year	2020 Historical Year	2021 Bridge Year	2022 Test Year
Lineman's Expenses	$ 187,584	$ 211,392	$ 208,068	$ 197,992	$ 197,696	$ 236,646
Truck Expenses	$ 98,872	$ 142,765	$ 149,032	$ 173,812	$ 189,497	$ 192,610
Total OM&A Before Capitalization (B)	$ 286,456	$ 354,157	$ 357,100	$ 371,805	$ 387,193	$ 429,256

Table 2-27

Appendix 2-D

Summary of Capitalized OM&A

2017 to 2022 Test Year

Capitalized OM&A	2017 Historical Year	2018 Historical Year	2019 Historical Year	2020 Historical Year	2021 Bridge Year	2022 Test Year	Directly Attributable?
Employee Benefits	$ 62,924	$ 94,217	$ 109,137	$ 83,672	$ 79,296	$ 113,722	Yes
Fleet Cost	$ 51,483	$ 71,675	$ 85,335	$ 68,255	$ 71,146	$ 58,498	Yes
Total Capitalized OM&A (A)	$ 114,406	$ 165,892	$ 194,473	$ 151,927	$ 150,442	$ 172,220	
% of Capitalized OM&A (=A/B)	39.94%	46.84%	54.46%	40.86%	38.85%	40.12%	

2.5 COSTS OF ELIGIBLE INVESTMENTS FOR DISTRIBUTORS

Section 2.2.2.7 of the Filing Requirements contemplates that a distributor will file for provincial rate protection associated with any costs incurred to make eligible investments, as described in section 79.1 of the Ontario Energy Board Act, 1998 (the "Act") and Regulation 330/09 (O.Reg.330/09) made under act.

Costs incurred by a distributor, in accordance with cost responsibility rules in the OEB's Distribution System Code for the purpose of connecting or enabling the connection of a Renewable Energy Generation facility to its distribution system are considered to be eligible investments for the purpose of provincial rate recovery under s.79.1 of the Act.

As of December 31, 2020, Grimsby Power has connected 44 renewable generation projects with a nameplate capacity of 2,378.2 kW.

Grimsby Power does not expect any capital expenditures related to the renewable energy generation in its distribution system plan. There are no additional OM&A costs related to renewable generation as Grimsby Power is able to processes renewable generation applications utilizing existing employees. Therefore, Grimsby Power does not require recovering costs incurred to make eligible investments as described in section 79.1 of the Act or O.Reg.330/09 under the Act.

Because Grimsby Power does not expect any capital expenditures related to renewable energy generation, Grimsby Power has not filed Appendix 2-FA to 2-FC.

2.6 NEW POLICY OPTIONS FOR THE FUNDING OF CAPITAL

On September 18, 2015, the Board released Report of the Board New Policy Options for the Funding of Capital Investments: The Advanced Capital Module and in it the Board has established the following mechanism to assist distributors in aligning capital expenditure timing and prioritization with rate predictability and smoothing:

> The review and approval of business cases for incremental capital requests that are subject to the criteria of materiality, need and prudence are advanced to coincide with the distributor's cost of service application. To distinguish this from the Incremental Capital Module ("ICM"), this new mechanism will be named the Advanced Capital Module (or "ACM").
>
> Advancing the reviews of eligible discrete capital projects, included as part of a distributor's Distribution System Plan and scheduled to go into service during the IR term, is expected to facilitate enhanced pacing and smoothing of rate impacts, as the distributor, the Board and other stakeholders will be examining the capital projects over the five-year horizon of the DSP.

GPI does not have any discrete capital projects within the five-year horizon that it believes would require this new policy option. The capital investment required by GPI from 2022 through 2026 is relatively flat and GPI believes it can be managed through the rates proposed within this application.

2.7 ADDITION OF ACM AND ICM ASSETS TO RATE BASE

Grimsby Power did not apply for an ICM in the IRM period following its 2016 Cost of Service. Therefore, Grimsby Power is not requesting ICM capital asset amounts to be incorporated into its rate base.

2.8 SERVICE QUALITY AND RELIABILITY PERFORMANCE

GPI follows the Board's Reporting and Record Keeping Requirements Guideline to report its service quality indicators annually. In accordance with the Filing

Requirements Board Appendix 2-G - Service Reliability Indicators 2016 – 2020 is shown below.

Grimsby Power's performance results over the 2016 to 2020 period meet or exceed the Board's approved standards. Grimsby Power's performance is within the range of acceptable performance over the previous five years and no corrective action is required. With respect to SAIDI and SAIFI, GPI has provisions in its capital budget to implement an OMS system which will aid in the tracking of the reliability metrics, including the analysis of worst performing feeder information which is not currently being monitored.

Table 2-28

Appendix 2-G

Service Quality and Reliability Performance

2016 – 2020

Index	Including outages caused by loss of supply					Excluding outages caused by loss of supply					Excluding Major Event Days				
	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020	2016	2017	2018	2019	2020
SAIDI	1.190	1.200	2.010	5.540	0.640	0.550	1.200	1.730	5.000	0.640	0.550	1.200	1.730	5.000	0.640
SAIFI	1.410	0.990	1.370	3.970	0.920	0.690	0.990	1.170	3.440	0.920	0.690	0.990	1.170	3.440	0.920
5 Year Historical Average															
SAIDI					2.116					1.824					1.824
SAIFI					1.732					1.442					1.442

Table 2-29

Appendix 2-G

Service Quality Indicators

2016 - 2020

Indicator	OEB Minimum	2016	2017	2018	2019	2020
Low Voltage Connections	90.0%	98.6%	98.0%	96.7%	100.0%	100.0%
High Voltage Connections	90.0%	N/A	N/A	N/A	N/A	N\A
Telephone Accessibility	65.0%	70.0%	75.4%	88.5%	90.2%	89.4%
Appointments Met	90.0%	100.0%	100.0%	99.5%	100.0%	100.0%
Written Response to Enquires	80.0%	100.0%	100.0%	100.0%	99.9%	99.4%
Emergency Urban Response	80.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Emergency Rural Response	80.0%	100.0%	100.0%	N/A	100.0%	100.0%
Telephone Call Abandon Rate	10.0%	4.2%	1.4%	0.9%	0.5%	1.8%
Appointment Scheduling	90.0%	100.0%	84.4%	91.2%	89.8%	100.0%
Rescheduling a Missed Appointment	100.0%	N/A	100.0%	100.0%	100.0%	100.0%
Reconnection Performance Standard	85.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Appendix 2-AB

Table 2 - Capital Expenditure Summary from Chapter 5 Consolidated Distribution System Plan Filing Requirements

First year of Forecast Period:

2022

CATEGORY	Historical Period (previous plan[1] & actual)																		Forecast Period (planned)				
	2016			2017			2018			2019			2020			2021			2022	2023	2024	2025	2026
	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual[2]	Var					
	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000				
System Access	977	600	-38.6%	995	1,287	29.3%	967	762	-21.2%	906	478	-47.3%	839	740	-11.9%		662	--	883	713	550	605	611
System Renewal	205	209	2.1%	918	208	-77.3%	977	565	-42.2%	1,062	1,069	0.7%	1,067	661	-38.1%		1,022	--	1,871	891	1,304	1,295	1,443
System Service	178	53	-70.0%	399	371	-7.1%	409	71	-82.7%	421	482	14.6%	428	286	-33.1%		683	--	82	1,138	611	362	231
General Plant	711	570	-19.8%	202	326	61.2%	170	507	198.2%	173	382	120.0%	177	278	56.9%		216	--	101	391	204	397	396
TOTAL EXPENDITURE	2,071	1,433	-30.8%	2,515	2,193	-12.8%	2,523	1,905	-24.5%	2,562	2,411	-5.9%	2,511	1,965	-21.8%	-	2,583	--	2,937	3,133	2,670	2,659	2,680
Capital Contributions	- 561	- 304	-45.8%	- 572	- 724	26.5%	- 554	- 363	-34.4%	- 518	- 214	-58.7%	- 482	- 462	-4.3%		- 345	--	- 423	- 327	- 322	- 347	- 354
Net Capital Expenditures	1,510	1,129	-25.3%	1,943	1,469	-24.4%	1,969	1,541	-21.7%	2,044	2,197	7.5%	2,029	1,503	-25.9%		2,238	--	2,513	2,806	2,348	2,312	2,326
System O&M	$ 1,448	$ 1,287	-11.1%	$ 1,709	$ 1,298	-24.0%	$ 1,777	$ 1,502	-15.5%	$ 1,848	$ 1,472	-20.4%	$ 1,922	$ 1,584	-17.6%		$ 1,475	--	$ 1,559	$ 1,681	$ 1,714	$ 1,749	$ 1,784

Notes to the Table:

1. Historical "previous plan" data is not required unless a plan has previously been filed. However, use the last OEB-approved, at least on a Total (Capital) Expenditure basis for the last cost of service rebasing year, and the applicant should include their planned budget in each subsequent historical year up to and including the Bridge Year.
2. Indicate the number of months of 'actual' data included in the last year of the Historical Period (normally a 'bridge' year):

Explanatory Notes on Variances (complete only if applicable)
Notes on shifts in forecast vs. historical budgets by category
Note 2021 values are projections
Notes on year over year Plan vs. Actual variances for Total Expenditures
Notes on Plan vs. Actual variance trends for individual expenditure categories

DISTRIBUTION SYSTEM PLAN

Grimsby Power's Distribution System Plan is provided as Exhibit 2, Tab 3, Attachment 1.

GRIMSBY POWER INC.

CONSOLIDATED DISTRIBUTION SYSTEM PLAN

2022 - 2026

June 2021

Table of Contents

5.0 Introduction

On May 14th, 2020 the Ontario Energy Board (OEB) issued its revised (2020 edition) Filing Requirements for Electricity Distribution Rate Applications. Chapter 5 (Consolidated Distribution System Plan Filing Requirements) provides a standard approach to a distributor's filing of asset management and capital expenditure plan information in support of a rate application and a distributor's Distribution System Plan.

Grimsby Power Incorporated (GPI) has compiled its consolidated 2022 – 2026 Distribution System Plan (DSP) in accordance with Chapter 5 requirements. This DSP has been formatted and organized to provide the information using the section and subsection numbers indicated in Chapter 5.

The 2022-2026 DSP reflects GPI's integrated approach to planning, prioritizing, managing assets and identifies the major initiatives to be undertaken over the planning period to meet customer expectations and stakeholder requirements that includes regional planning, local consultations and renewable generation connections. GPI has completed this DSP with focus on customer preferences and operational effectiveness while achieving optimal value for capital spending and supplying electricity in a safe, reliable, efficient, and cost effective manner.

Other terms used throughout this DSP are defined in Appendix A Glossary of Terms

The electric distribution system is capital intensive in nature and prudent capital investments and maintenance plans are essential to ensure the sustainability and reliability of the distribution network. GPI's DSP documents the practices, policies and processes that are in-place to ensure that decisions on capital investments and maintenance plans support GPI's desire outcomes in a cost-effective manner and provides value to the customers.

This DSP documents the capital and maintenance activities that GPI has completed in the 2016-2020 historical period, as well as GPI's plans for the 2021 Bridge Year, 2022 Test Year and GPI's plans for the 2023-2026 forecast period.

5.1 General & Administrative Matters

5.1.1 Utility Overview

GPI is an electricity distributor licensed by the OEB. In accordance with its Distribution License ED-2002-0554, GPI provides electricity distribution services within the Town of Grimsby (ToG), Ontario. GPI owns, maintains and operates the distribution system and infrastructure assets deployed within the Grimsby service area. GPI currently serves approximately 11,700 electricity distribution customers across its service area.

GPI is an Independent Electricity System Operator (IESO) registered wholesale market participant and is currently supplied power from Hydro One owned Beamsville Transformer Station (TS) and from the Niagara West Municipal Transformer Station (NW MTS) that is currently entirely owned by GPI following an amalgamation between GPI and the former owner (Niagara West Transformation Corporation - NWTC) executed on October 1, 2015. The NW MTS is classified as a distribution asset). Both stations, Beamsville TS and NW MTS, are supplied from Hydro One's transmission system.

GPI distributes electricity to the ToG at a primary distribution voltage of 27.6kV, with exception of just few pockets / areas where a legacy 8.3kV system remains. GPI also acts as a host to Niagara Peninsula Energy Incorporated (NPEI) which is also an IESO registered wholesale market participant, as some NPEI's loads are supplied from the NW MTS. NPEI owns two feeders that egress from the NW MTS.

GPI's licensed service area is 69 square kilometers and includes all geography within the borders of the ToG, in the Regional Municipality of Niagara. Out of the 69 square kilometers, 19 square kilometers are urban and 50 square kilometers are rural. The service territory is shown in Appendix B.

Revenue is earned by GPI by delivering electric power to the homes and businesses in the service area. The rates charged and the performance standards that the energy delivery system must meet are regulated by the OEB.

GPI is incorporated under the Ontario Business Corporations Act and has Niagara Power Incorporated (NPI) as its sole shareholder. The NPI is a holding company owned by the Town of Grimsby (90%) and FortisOntario Inc. (10%).

5.2 Distribution System Plan

GPI's DSP has been prepared in accordance with OEB's May 14, 2020 Filing Requirements for Electricity Distribution Rate Applications (2020 Edition).

GPI has organized the required information using the section headings in the DS Plan Filing Requirements. Investment projects and activities have been grouped into one of the four OEB defined investment categories listed below, based on the 'trigger' driver of the expenditure:

System Access investments are modifications (including asset relocation) to GPI's distribution system GPI is obligated to perform to provide a customer (including a generator customer) or group of customers with access to electricity services via GPI's distribution system.

System Renewal investments involve replacing and/or refurbishing system assets to extend the original service life of the assets and thereby maintain the ability of GPI's distribution system to provide customers with electricity services.

System Service investments are modifications to GPI's distribution system to ensure the distribution system continues to meet GPI operational objectives while addressing anticipated future customer electricity service requirements.

General Plant investments are modifications, replacements or additions to GPI's assets that are not part of the distribution system; including land and buildings; tools and equipment; rolling stock and electronic devices and software used to support day to day business and operations activities.

5.2.1 Distribution System Plan overview

5.2.1a Distribution System Plan key elements

GPI seeks to achieve the results of optimized cost-effective lifecycle Asset Management with focus in maintaining a high level of customer satisfaction. GPI believes in delivering quality services to customers, at a cost that represents good value for money.

GPI practices highly ethical business standards and aims to provide economically sound business opportunities for its shareholders. Ultimately, GPI's objective is to operate with a focus on profitability, and maximizing shareholder value while maintaining appropriate commitments to:

- Be adaptable;
- Continue to provide economical efficient energy;
- Be in business for our customers;
- Be a locally owned business;
- Strive to be efficient in any new operation to meet our customers' needs; and
- Partner with others to drive economies of scale and scope.

The Town of Grimsby has a population of over 27,000 and is one of the fastest growing municipalities in the Niagara Region with its population growing by 7.9 per cent between 2011 and 2016. Grimsby's population is expected to increase to 33,000 by 2031. The town's growth rate is greater than that of the provincial average of 4.6 per cent and the national average of 5 per cent. In addition, change in peak hour demand is forecasted to increase according to the Greenhouse Energy Profile Study commissioned by the IESO on September 27, 2019 (Refer to https://www.ieso.ca/-/media/Files/IESO/Document-Library/research/Greenhouse-Energy-Profile-Study.ashx).

It is expected that the operational and service requirements driving GPI's capital expenditures, and found within its DSP will generally remain stable through the 2022 to 2026 planning window. GPI's net total capital expenditure over the planning period 2022 through 2026 is forecasted to be approximately $14 million, which reflects average annual spends ranging from $2.6 million to $3.1 million from 2022 to 2026.

For each of the investment categories, GPI has identified key elements that are driving the size of the forecast spending in each investment category in a manner that ensures that the service to customer will continue to be provided in the most cost-effective manner:

- **System Access** (24% of the total expenditure over the forecast period)

  Customer needs drives this spending in this investment category. GPI has aligned the forecast investment in the development of new serviced residential lots based on the Town's forecast of infrastructure developments. Grimsby is geographically the most Western part of Niagara region, and there is an expectation to see influx of population from neighbouring Greater Toronto and Hamilton areas.

  Moreover, transportation needs also drive spending in this investment such as the new Go Rail Expansion that goes through GPI's service territory as highlighted in Schedule 5 of Ontario Place to Grow (See Appendix M), as well as accommodating service to the new Grimsby Go Station. Customer servicing obligations are a key objective in GPI's planning objectives. This is further highlighted in the priorities laid out in the Niagara Region Strategic and Implementation Plan (See Appendix N1).

- **System Renewal** (48% of the total expenditure over the forecast period)

  The number and type of assets that have reached or are nearing the end of service life drives the spending in this investment category. Based on the Asset Condition Assessment (ACA) completed in January 2019 (See Appendix D), GPI has identified the asset types that require capital spending in this investment category during the period covered by this DSP.

- **System Service** (17% of the total expenditure over the forecast period)

  The need to react to customer growth, customer reliability expectations, and increased load requirements (See Appendix J) drives the spending in this investment category. The changing needs will constrain the existing system's ability to reliably service anticipated loads, and it is imperative to put programs and projects to maintain adequate system reliability and capacity. GPI's customers identify reliability as a key driver of overall customer satisfaction with GPI's service.

- **General Plant** (11% of the total expenditure over the forecast period)

  The need to improve or renew the non-distribution operations processes and systems drives the spending in this investment category. GPI has identified the need to enhance the Outage Management System (OMS) to improve integration with other systems (CIS, GIS, SCADA) in order to facilitate and streamline the communications and the information that is shared with customers, especially when outages occur.

GPI's capital expenditure for the forecast period is summarized in Table 1 below.

Table 1. 2022 – 2026 Capital Investment Forecast (Gross)

CATEGORY	Forecast Period (planned)										Total	
	2022		2023		2024		2025		2026			
	$ '000	*%*	*$ '000*	*%*	*$ '000*	*%*	*$ '000*	*%*	*$ '000*	*%*	*$ '000*	*%*
System Access	883	30%	713	23%	550	21%	605	23%	611	23%	3,362	24%
System Renewal	1,871	64%	891	28%	1,304	49%	1,295	49%	1,443	54%	6,804	48%
System Service	82	3%	1,138	36%	611	23%	362	14%	231	9%	2,424	17%
General Plant	101	3%	391	12%	204	8%	397	15%	396	15%	1,489	11%
TOTAL EXPENDITURE	**2,937**	**100%**	**3,133**	**100%**	**2,669**	**100%**	**2,659**	**100%**	**2,681**	**100%**	**14,079**	**100%**

5.2.1b Consideration of Customer preferences and expectations

GPI actively communicates with its customers regarding ongoing business, accomplishments and changes in regulatory matters. Customers' feedback and experiences were collected through various means of communication and were incorporated into this DSP during the planning process.

Where practical, the voice of the customer has shaped GPI's business direction, with regard to its long-term strategy of improving reliability, service quality and communications.

GPI has used various means of communication for customer engagement to reach its customers, stakeholders and third parties as part of its business relations. The philosophy behind the engagement activities supports the primary business goal aimed at customer focus in shaping utility features and continuing with environmentally friendly paperless technologies, while increasing distribution system reliability through smart grid development. GPI considers this framework an important tool for continuous improvement. These various tools help transform customer service channels to help customers lower their own consumption costs, increase communication efficiency, improve on value, and drive greater return on investment.

GPI has committed to customer engagement, prioritizing customer engagement points, and offering educational components to help customers modify their behavior and allow them to take control over their energy usage choices. In the past, the relationship with the customer has been largely transactional; however, GPI has now taken the lead in the community to empower customers through customer education to help them to modify their consumption behaviors.

Current engagement touch points include:

- **Customer Surveys -** GPI continues to engage a third party to complete our bi-annual Customer Satisfaction and Public Awareness of Electrical Safety surveys. The results of the surveys help drive the content of customer communications and provide feedback on the service we provide.

- **Meetings with Small and Large Commercial Customers** – Grimsby Power has held several events with small and large commercial customers to gain insight into their needs and preferences. The events included presentations to the Grimsby Chamber of Commerce and GPI's Business Customer Engagement breakfasts. Grimsby Power also meets with any commercial customer to review opportunities for cost savings and learn about their needs.

- **Corporate Website** – GPI updated its website in 2019. The website provides a one-stop location for GPI's customers to gain access to important information on distribution services, rates, regulatory matters and decisions, customer initiatives, conservation and demand management programs, safety and an outage map. GPI's website now offers online forms for moving, Customer Choice and CEAP. Customers can also use the website to reach out to GPI with any general inquiries and provide feedback.

- **Customer Account Portal** – Grimsby Power has offered a portal to provide quick and easy access to electricity consumption and cost information for customers of Grimsby Power and access to e-billing. In 2021 Grimsby Power will launch a new portal that combines access to online bills, up to date account information and consumption history. With the Harris Silverblaze Customer Account portal customers can view their usage and costs at multiple levels of detail (e.g., hourly, daily, monthly, bill period) in a variety of graphical and, tabular formats. They can also set up usage and cost alerts to help customers in monitoring and managing their electricity consumption. Also, as customers have asked for, the portal will show up to day account information including payments on the account and easy links to make payments online.

- **Utilismart Commercial & Industrial Energy Manager** – Grimsby Power now offers its large commercial customers easy access to consumption and demand data. The C & I Energy Manager portal offers reports that allow commercial and industrial customers to better manage their energy use. It is ideal for large users of energy with considerable energy bills and complex loads to manage. C&I Energy Manager delivers energy reports, tracks peak demand and power factor and consumption as well as energy costs all in a single, user-friendly portal.

- **Bill Inserts** – GPI send bills inserts regularly to its customers with monthly invoices. This includes information on specific customer initiatives, distribution and cost of power rate information and programs that can help lower the electricity invoice.

- **Local Office** – Grimsby Power is committed to serving its community and has a local office open to the public.

- **Community Events** – GPI attended community events including the Grimsby Community Safety event, Happening in Grimsby and had a booth at the local farmer's market. GPI also made a special presentation to the Grimsby Seniors Club as part of its "Speaker Series".

GPI's DSP is designed to support the achievement of the four key OEB established performance outcomes:

- Customer focus
- Operational effectiveness
- Public policy responsiveness
- Financial performance

The DSP documents GPI's asset management processes and capital expenditure plan for the 2022-2026 period. The DSP documents the practices, policies and processes that are in place to ensure that investment decisions support GPI's desired outcomes in a cost-effective manner and provides value to the customer. The attainment of the performance outcomes is through prudent and measured investment in the distribution system as described in the OEB's investment categories for capital projects. The DSP integrates qualitative and quantitative information which results in an optimal investment plan covering:

- Customer value considerations
- Alignment with public policy objectives
- System expansion considerations
- System renewal considerations
- Regional planning considerations
- Grid modernization considerations

GPI has been mindful when incurring costs, considering that customer engagement activities indicate that affordability and reliability of service are key drivers of overall customer satisfaction.

In prudently controlling expenditures and therefore moderating any increases in its customers' bills, GPI's distribution system has evolved into an array of equipment of different vintages spanning several technological eras. Funds were not spent on replacing functioning equipment in order to simply have more modern technologies in place. In developing the long-term DSP, GPI's objective is to ensure that the future distribution system is designed to deliver power at the quality and reliability levels desired by customers, and to minimize the lifecycle cost by balancing preventive maintenance, life-extending refurbishment and end-of-life replacement. In short, the system will meet customer's needs for quality and reliability of power at a reasonable and affordable cost to customers into the future.

5.2.1c Sources of Cost Savings

GPI's planning, prioritization and investment processes follow good utility practices that are executed through the Distribution System Plan. Good utility practices have inherent cost savings through sound decision-making, thoughtful compromises, precise timing and optimal expenditure levels. Some specific GPI Distribution System Plan cost savings are expected to be achieved through the following:

1. Asset condition inspections and comprehensive (fully automated and paperless) data collection will provide a better understanding of each asset's stage in their lifecycle which

will lead to more cost-effective decisions with respect to maintenance, refurbishment and replacement decisions. In addition, the transition to the new fully automated and paperless system also yields significant cost savings associated with data entry labour hours and stationary expenses. GPI will quantify the capital or System O&M savings resulting from this as GPI will complete the first full 6-year cycle of inspections using this approach in 2024.

2. Asset Condition Assessment (ACA) utilizes the results of the asset condition inspections and the comprehensive data collection to formulate the assessment of the condition or health of assets in each of GPI's asset classes. This assessment determines the risk of failure on GPI's assets. Cost savings arise because this risk-based assessment can then be used to formulate asset investment plans directed to mitigating specific GPI and its customers risk of asset failure and then prioritize these asset management plans to maximize the risk mitigation. The Asset Condition Assessment is considered a key input in GPI's planning process as shown in Figure 1.

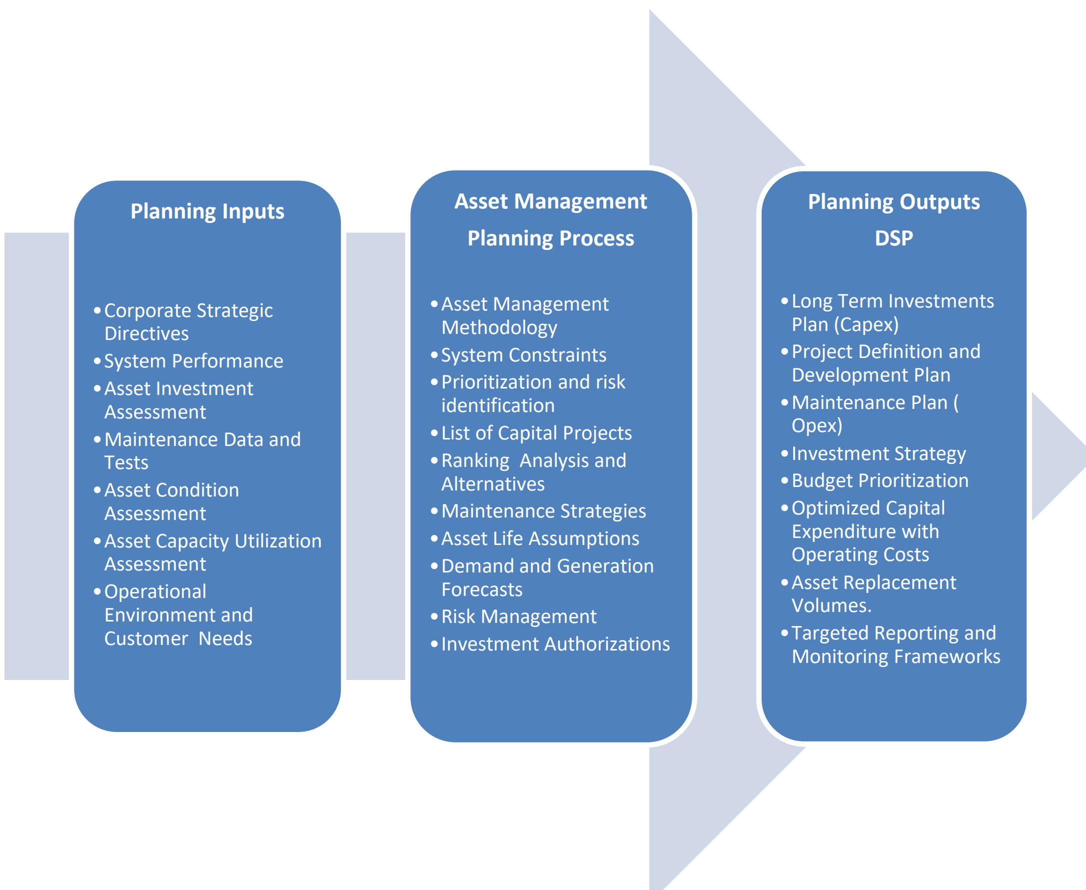


Figure 1. Planning Process Inputs and Outputs

3. GPI's Supervisory Control and Data Acquisition (SCADA) system is a computer system that collects and analyzes real time data used to monitor and control GPI's distribution electrical system. The SCADA system provides cost savings by quickly identifying electrical system problems so that they can be addressed and avoid incurring extra costs. The SCADA system also aids in the efficient and cost-effective day to day operation of GPI's distribution system.

4. The installation of sectionalizers and fault detectors on GPI's electrical distribution system provides a cost-effective way of locating problems such as storm damage to distribution lines so that restoration can be more quickly affected. Also, sectionalizers provide GPI with the ability to isolate electrical problems on distribution lines so that the rest of its distribution system can continue to operate, thereby providing savings of potentially costly outages to its customers.

5. GPI is completing its voltage conversion project which converts the primary voltage from 4.8/8.3kV to 16.0/27.6kV (single/three phase). Voltage conversion provides a number of cost savings. First, it standardizes the configuration of its distribution assets which will save in equipment inventory. Voltage conversion will also increase the reliability of GPI's distribution system by avoiding costly equipment outages from overloading the capacity of the current system. Increasing the voltage levels also reduces the cost of electrical losses on the system.

6. The installation of reclosers and smart Faulted Circuit Indicators (FCIs) will provide efficiencies and cost savings associated with operations effectiveness, system resilience, outage containment, reduced feeder patrols, and reduced restoration expenses (i.e. fuse replacement).

   Reclosers reduce the impact of transient and sustained interruptions by sensing fault current and responding accordingly. If fault is transient in nature, the reclosers will restore power automatically to the affected section of line, hence reducing frequency of fuse operations and need to dispatch trouble crew to patrol, locate and refuse affected portion of line. In addition, recloser placement will sectionalize feeders hence limiting service outages to smaller segments of the system for sustained interruptions. In the absence of reclosers, breaker-level faults require crews to patrol the entire feeder to locate the fault. Smart FCIs compliment reclosers effectively by providing additional system visibility capabilities.

When integrated with SCADA, reclosers and smart FCIs provide effective means for troubleshooting system issues, conducting system performance forensic analysis, and increased efficiencies during outage restorations.

7. The continuous improvement of GPI's Outage Management System (OMS) will also result in cost savings for its customers. The OMS will augment the SCADA capabilities by more quickly identifying the location of outages thereby making the restoration dispatch more efficient. The OMS will also improve the management of distribution system outages through coordinated operation of devices such as sectionalizers.

On an annual basis, each utility in Ontario is assigned an efficiency ranking based on its three-year average performance (See Appendix C). To determine a ranking, electrical distributors are divided into five groups based on the magnitude of the difference between their actual costs and predicted costs.

GPI achieved a three-year average (2017 to 2019) of 28.1% less than predicted costs. This was an improvement of 6.3% when compared against the 2016 to 2018 three-year average of 21.8% less than predicted costs. In terms of year over year comparison, GPI achieved 31.8% less than predicted costs for 2019 compared to 27.6% for 2018, which is a 4.2% improvement. These improvements represent a reflection of GPI's ongoing commitment to continuous performance improvement, which allowed GPI to achieve a Group 1 efficiency ranking in 2019 compared to the Group 2 efficiency ranking in 2018. It is GPI's goal to continue this trend, and maintain Group 1 efficiency ranking into future years.

5.2.1d Period covered by the DSP

GPI's DSP has been prepared for the following period:

Table 2. Period covered by the DSP

Historical Period					**Bridge Year**	**Test Year**	**Forecast Period**			
2016	2017	2018	2019	2020*	2021	2022	2023	2024	2025	2026

**** 2020 was original bridge year, and deferred to 2021***

5.2.1e Vintage of the Information in the DSP

The information generally used throughout the DSP are based on available information established to late 2020 and should be considered as current. Specific variances from this are as noted. GPI's statistics are based on its 2020 RRR filings.

5.2.1f Changes to GPI's Asset Management Processes

GPI has made a number of changes to its asset management process to improve value to its customers since its last DSP filing. GPI has enhanced asset data quality and scope by moving from just asset inspections to using that information in a full and complete Asset Condition Assessment (See Appendix D). This, in turn, has resulted in better understanding of System Renewal needs.

GPI also automated inspection data collection and fully integrated it with GIS (as of 2018). This gives GPI ability to do quick condition analysis, data uploads, data reporting and most importantly elimination of paper exchanges and data entry which is provides significant cost savings associated labour hours and stationary expenses.

As part of its Asset Management Process, GPI introduced its Cable Testing Program in 2017 (See Appendix G). This new program will have GPI underground cables tested every second year over the forecast period of this DSP. The results of this program will maintain the high reliability of electrical supply to GPI customers.

The Asset Management System has been improved in terms of maintenance activities for GPI's distribution system as well as the maintenance of its fleet which was first introduced in 2006. Together, these have resulted in improved maintenance plans to meet the ongoing requirements (see Appendix E "Distribution System Maintenance and Inspection Program" and Appendix F "Fleet Maintenance Policy")

Capital investment prioritization process that is aligned with corporate and asset management objectives is in the prioritization of discretionary capital investments. This occurs during the budgeting part of the planning process. During the budget process, capital investments are identified and investment justifications are put together for each one that identifies the cost of the project and its expected value. A value and risk deferral assessment of the investment is performed. Investment scores determine an initial priority of the investment for current or future budget periods. Detailed management review of the resulting priority listing may result in investment priority position movement within the 2022-2026 DSP period to accommodate resource availability and available funding.

5.2.1g Contingent aspects of the DSP

There are a number of ongoing and future activities in the GPI service area that may/will impact on capital project prioritization and spending as outlined in the DSP.

Customer Connections

Customer connection forecasts are based on timing information received from Town Planning staff, planning reports (provincial, regional, municipal), developer submissions and inquiries, and historical connection rates. Variances in connection timing/quantity over the period of the DSP will impact on actual connections and related System Access expenses.

Town of Grimsby (ToG) Road Projects

The Town carries out road improvements and road resurfacing on an annual basis. Timing and location for these works is subject to ongoing change. GPI will be required to react to road project work that affects the distribution plant, as it occurs during the period of the DSP.

Niagara Region Road Projects

A number of roads within ToG are owned and maintained by Niagara Region. GPI will be required to react to road project work that affects the distribution plant, as it occurs during the period of the DSP.

Metrolinx Rail GO Expansion – Grimsby GO Station

Grimsby GO Station is a proposed commuter rail station on the GO Transit train and bus network. It is a critical element of public infrastructure and is located west of Casablanca Blvd at the intersection of the South Service Road. The transit station area includes land on both sides of the CN rail corridor, and also includes lands which are reserved for a potential future Region of Niagara Transit Terminal (West Niagara Transit Terminal). GPI will be supporting this initiative through a multi phased project under Customer Access investment portfolio which includes installation of a new double circuit pole line along the road extension (Livingston Ave from Casablanca Blvd to Oakes St) to service new growth in the area and to enhance connectivity with adjacent feeders at either end of the road extension.

Meter re-verification

GPI is required to have its meters tested to ensure compliance with Measurement Canada standards. Through the forecast period of the DSP, a number of GPI's electronic meters will require testing by Measurement Canada compliance sampling methods. If the units pass the sample testing, their seal period will be extended and they can remain in service for the number of years determined by the statistical sampling process. If the units fail sample testing, they will have to be removed from service and replaced by the end of the year they are sampled in. The meter population for each year will be tested in one group. It is expected that the meters should pass compliance sampling however any failed groups would result in an unbudgeted capital expenditure ranging from $39k to $193k. The DSP assumes that the meters will successfully pass re-verification testing. All meter testing within the period of the DSP is summarized in the Table 3 below:

Table 3. 2022 – 2026 Meter Reverification Testing

Testing Year	Meters to be tested	Potential Replacement Cost
2022	1209	$193,440
2023	563	$90,080
2024	245	$39,200
2025	291	$46,560
2026	290	$46,400

5.2.1h Projects related to grid modernization, distributed energy resources, and climate change adaptation

GPI has a number of projects related to cost effective grid modernization that each address goals of GPI's long-term plan. These projects are:

<u>Voltage Conversion</u>

During the historical period, GPI completed a number of 4.8kV voltage conversion projects to target improvement of system reliability, loss reduction, and capacity. Voltage conversion projects typically contain assets considered to be at or near end-of-life status, requiring full rebuild as part of the conversion to 16kV supply. There is only one area with 4.8kV supply outstanding in GPI's distribution system and the goal is to complete this last portion during the forecast period. Once completed, GPI's distribution system will operate entirely at a primary voltage of 16/27.6kV to better accommodate future higher density load growth in different areas of the Town of Grimsby. This will standardize the configuration of GPI's distribution system which will save in equipment inventory. Voltage conversion will also increase the reliability of GPI's distribution system by avoiding costly outages from equipment overloading. Increasing the voltage levels also reduces the cost of electrical losses on the distribution system.

SCADA Improvements

GPI's Supervisory Control and Data Acquisition (SCADA) system is a computer system that collects and analyzes real time data used to monitor and control GPI's distribution electrical system. The SCADA system provides cost savings by identifying any electrical system problems so that they can be addressed quickly and avoid incurring extra costs. In this project, GPI will upgrade the existing server with an additional host which will increase reliability and operational effectiveness by providing redundancy to the system using a new dual server system.

Fault Detection Improvements

GPI's initiative in improved fault detection is through the installation of automated switches, and SCADA integrated fault current indicators. Automated switches have the capability to detect fault current flowing through them that can be used in automated fault restoration schemes. SCADA integrated fault current indicators provide added monitoring capabilities to enhance system visibility and reduce troubleshooting response time. The objective of these projects is to decrease sustained outage times on feeders and improve reliability Key Performance Indicators (KPI's).

Automate primary 3-phase switches (reclosers)

The installation of reclosers provide numerous benefits associated with reliability, safety and operational efficiencies. Reclosers improve reliability by reducing the impact of transient and sustained interruptions. Automated reclosers sense fault current and trip accordingly. If fault is transient in nature, the reclosers will restore power automatically to the affected section of line, hence reducing frequency of fuse operations and need to dispatch trouble crew to patrol, locate and refuse affected portion of line. In addition, recloser placement will sectionalize feeders hence limiting service outages to smaller segments of the system for sustained interruptions.

In terms of safety, reclosers help mitigate safety hazards by isolating downed wires downstream of the reclosers, as well as reducing the volume of manual switching required for crews to sectionalize a circuit.

Reclosers also provide efficiencies and cost savings associated with feeder patrols and restoration expenses (i.e. fuse replacement). In the absence of recloses, breaker-level faults require crews to patrol the entire feeder to locate the fault. Reclosers can reduce the amount of time and resources required to locate a fault.

Outage Management System

The continuous improvement of GPI's Outage Management System (OMS) will also result in cost savings for its customers. The OMS will augment the SCADA capabilities by more quickly identifying the location of outages thereby making the restoration dispatch more efficient. OMS will be integrated with other systems (CIS, SCADA, GIS) in order to facilitate and streamline the communications and the information that is shared with customers, especially when outages occur. The OMS also improves the management of distribution system outages through coordinated operation such as the operation of sectionalizers.

Distributed Energy Resources (DER)

There are no specific capital investments over the period of the DSP dedicated to implementation of DERs on GPI's distribution system. However, with the increasing demand and shift to green energy and increasing emergence of new technologies and regulatory/code changes, GPI plans on continuously evaluating GPI's distribution system capacity and readiness to facilitate seamless integration of DERs, and anticipated electric vehicle demand growth.

Climate Change Adaptation

There are no specific capital investments over the period of the DSP dedicated to hardening the distribution system to accommodate climate change adaptation. However, many of the capital investments proposed in the DSP including asset renewal programs such as the defective pole replacement program will directly contribute to hardening GPI's distribution system and increase its resiliency to climate change. Furthermore, GPI's detailed and diligent asset inspection process provides insight, and proactively identifies risks associated with inclement weather events. GPI plant will continue to be installed in accordance to the latest CSA and other applicable industry standards. It is expected that climate change impacts will be incorporated into the ongoing evolution of construction and material standards. For example, CSA is currently working on addendums to their design standards (i.e. CSA C22.3 No.1 and No.7) to incorporate anticipated risks associated with Climate Change Adaptation. These changes could in turn impact the cost and lead time required to complete projects when compared against projects designed using the current version of CSA design standards. GPI will continue to monitor the changes and advancements taking place in the industry and respond accordingly by continuously improving impacted processes, practices, and systems.

5.2.2 Coordinated planning with third parties

The following describes the consultations GPI has had with the Town of Grimsby, its customers, its neighbouring distribution utilities, Hydro One, and the Independent Electricity System Operator (IESO). An important product of coordinated planning with these third parties is the development of the Integrated Regional Resource Plan (IRRP).

5.2.2a Consultations

Town of Grimsby (ToG)

GPI has a close interaction with the Town of Grimsby (ToG). GPI and the Town discuss Town's capital program implementation through their regular meetings and discussions. The purpose of these meetings is to assist each other with respect to major development scheduling, power requirements, outage scheduling and third-party relocations where required. Each party is aware of the other's five-year capital plan and implementation schedule. GPI initiates discussions annually as it commences its budget preparation activities for the coming year. GPI officially receives the Town's approved current year capital plan and its ten-year capital forecast after the Town's budget has been approved by Town Council.

The Town's capital plan and forecast has a direct impact on GPI's capital planning, particularly in the System Access category. GPI treats Town projects that are part of the approved Town budget as confirmed and budgets accordingly. GPI treats Town projects that are part of the Town's forecast as confirmed only if the project timing and scope is unchanged from prior's years forecast documents. GPI maintains awareness of Town projects that are planned more than five years out of the current budget year.

Based on the Town's budget and forecast, the primary areas for residential and commercial growth have been identified as being in the North West side of the Town, more specifically on the north side of the QEW in between Casablanca Blvd. and the border with a neighbouring LDC just west of Kelson Ave. The primary area for industrial growth has also been identified as being in the North West side of the Town, between Casablanca Blvd. and the border with a neighbouring LDC just west of Kelson Ave., but on the south side of the QEW.

Neighbouring Utilities

GPI has positive and ongoing relations with its neighbouring utilities: Alectra, Niagara Peninsula Energy Incorporated (NPEI) and Hydro One Distribution.

GPI also interacts with NPEI regularly as NPEI is embedded utility to GPI at Niagara West Municipal Transformer Station (NW MTS). GPI is installing a third feeder from NW MTS in 2021 to supply loads in GPI's service area and increase the distribution system capacity to alleviate existing loading constraints.

There is also a consultative relationship with Hydro One Distribution. Two of the feeders that provide supply to GPI egress from the existing Beamsville TS, which is owned by Hydro One (Transmission) and located within the Niagara Peninsula Energy Inc. (NPEI) territory. Even though GPI owns all the feeder assets that fall within GPI service area, the portion of these two feeders that is between the station and GPI borders is owned by Hydro One. Both GPI and NPEI loads are connected to these feeders.

GPI also a member of the North Niagara Public Utilities Co-ordinating Committee (NNPUCC). Members of this committee include the Town of Grimsby, Town of Lincoln, Township of West Lincoln, Town of Niagara on the Lake, Region of Niagara, Bell Canada, Cogeco, Niagara Regional Broadband Network (NRBN), Enbridge Gas, Niagara on the Lake Hydro and NPEI. The NNPUCC is a committee that meets approximately seven times per year to discuss topics including new subdivision development, road widening projects, commercial development, etc. Information sources from this group come from its members, builders, and developers. The main benefits of this committee are to identify the impacts of development as it relates to providing the utilities services requested by these customers and to coordinate activities between the utilities present.

5.2.2b Consultation Deliverables

Regional Planning

GPI was an active participant in the Niagara Region Needs Assessment. The Niagara Region is shown below:

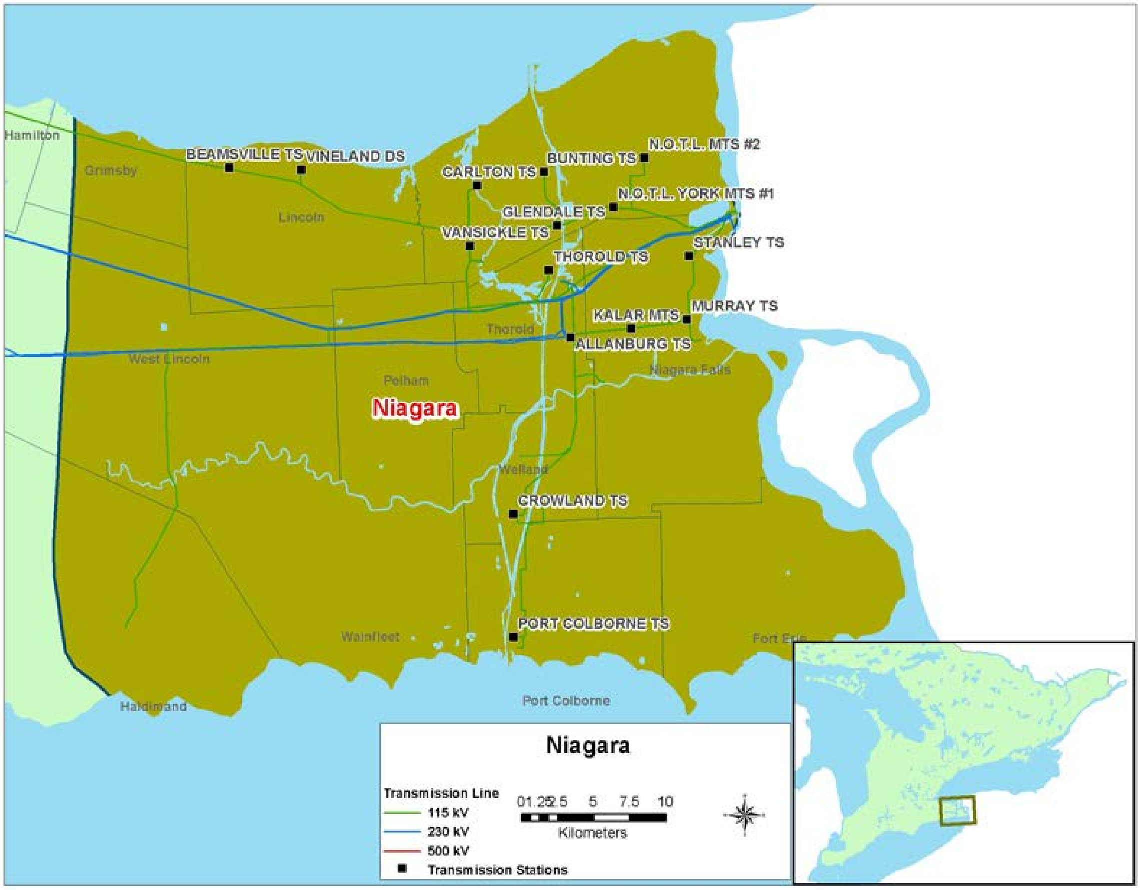


Figure 2. Niagara Region

Hydro One has completed the Needs Assessment in 2016 (issued in 2017) for this planning region and found that there were no needs that required regional coordination, completing the regional planning process for this planning cycle. There is no impact on the 2022 – 2026 DSP. The Niagara Regional Infrastructure Plan is in Appendix H. Hydro One has initiated in early 2021 a Needs Assessment for this planning region.

5.2.2c Material Documents used in the consultation process

As part of the consultation process, GPI provided its load forecast to the Regional Planning working group. The load forecast is shown below:

Table 4. Regional Planning Non-Coincident Winter Peak Load Forecast

Transformer Station Name	Customer Data (MW)	Historical Data (MW)			Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Allanburg TS	Net Load Forecast	33.4	35.4	29.6										
Hydro One	Gross Peak Load				31.1	31.3	31.4	31.6	32.0	32.4	32.6	32.7	32.9	33.1
NPEI - Embedded	Gross Peak Load - DG - CDM				30.8	30.7	30.6	30.4	30.4	30.5	30.5	30.5	30.5	30.5
Beamsville TS	Net Load Forecast	53.6	55.9	49.0										
Hydro One	Gross Peak Load				54.9	55.6	56.8	58.0	59.2	59.4	59.6	59.8	60.0	60.2
Grimsby Power, NPEI - Embedded	Gross Peak Load - DG - CDM				54.1	54.2	55.0	55.5	56.1	55.8	55.6	55.5	55.4	55.3
Niagara West MTS	Net Load Forecast	47.5	43.5	35.7										
Grimsby Power	Gross Peak Load				35.8	35.9	36.1	36.5	36.7	37.0	37.2	37.6	37.8	38.1
NPEI Embedded	Gross Peak Load - DG - CDM				34.4	34.2	34.0	34.0	33.8	31.2	31.2	31.4	31.4	31.5

5.2.2d Comment Letter from IESO Regarding REG Investments

GPI has not proposed any system REG investments during the 5-year DSP period, and as such, no letter from the IESO is required.

5.2.3 Performance Measurement for Continuous Improvement

Performance measurement for continuous improvement is an important aspect of GPI's asset management practice. The summary of the performance over the historical period of this DSP provides the basis for the explanation of how the historical performance affected this DSP.

5.2.3a Metrics used to monitor Distribution System Planning performance

Asset Management Key Performance Indicators (KPIs) include the following:

- Customer Oriented Performance
- Cost Efficiency and Effectiveness
- Asset and System Operations Performance

Customer Oriented Performance

GPI customer oriented key performance indicators include System Reliability, Service Quality, Customer Satisfaction, and Bill Impacts.

System Reliability

GPI utilizes effective methods of communication within the Outage Response team, and with customers via GPI's Outage Portal which provides an effective visual presentation of outages that occur within GPI's service territory. GPI calculates and monitors reliability values (SAIFI, SAIDI) for all customers in the service area. OEB defined baselines will be used to compare rolling 5-year averages for SAIDI and SAIFI (excluding loss of supply and major event days). For this DSP it is assumed that OEB baselines will be derived from 2015-2019 reliability performance and will remain in place for most of the DSP period. The baselines are used as targets for reliability performance expectations in the current year.

- **SAIFI** (System Average Interruption Frequency Index) - represents how often an average customer is without service in the measurement period. The larger the index number, the worse the reliability performance. GPI targets to maintain a 5-year average score of 1.07 or lower for this measure. SAIFI is calculated as:

$$\text{SAIFI} = \frac{\text{Total Customer Interruptions}}{\text{Total Customers Served}}$$

- **SAIDI** (System Average Interruption Duration Index) - represents how long an average customer is without service in the measurement period. The larger the index number, the worse the reliability performance. GPI targets to maintain a 5-year average score of 1.36 or lower for this measure. SAIDI is calculated as:

$$\text{SAIDI} = \frac{\text{Total Customer-Hours of Interruptions}}{\text{Total Customers Served}}$$

Service Quality

GPI measures Service Quality through the following measures:

- **New Residential/Small Business Services Connected On Time –** This measure focuses on the percentage of low voltage customers that GPI connected within a five-day timeline in a calendar year. GPI targets to maintain 90% annually or higher for this measure.

- **Scheduled Appointments Met On Time -** This measure focuses on appointments associated with customer disconnect/reconnects (upgrades to customer owned equipment) and any other related work requested by customers or their representative in a calendar year. GPI targets to maintain 90% annually or higher for this measure.

- **Telephone Calls Answered On Time –** This measure tracks the number of calls answered in a calendar year within 30 seconds, and GPI targets to maintain 65% annually or higher for this measure.

Customer Satisfaction

GPI measures Customer Satisfaction through the following measures:

- **First Contact Resolution -** Determined by taking the number of calls escalated to management over the total number of calls received by customer service representatives for each calendar year. GPI targets to maintain 90% annually or higher for this measure.

- **Billing Accuracy -** Determined by taking the total bills in a calendar year issued less the number of inaccurate bills, and then divide that number by the total number of bills issued. GPI targets to maintain 98% annually or higher for this measure.

- **Customer Satisfaction Survey Results –** Derived from customer surveys. On a periodic basis (bi-annually), GPI undertakes customer satisfaction surveys to obtain feedback on the overall value of service offered to customers. Customers (residential and commercial) are engaged to provide high level feedback on their perceptions of GPI performance and where they think GPI could improve service. GPI targets to maintain 65% bi-annually or higher for this measure.

Bill Impacts

In terms of bill impact, over 75% of a customer's bill is due to factors (i.e. generation, transmission, global uplift, etc.) outside the control of the LDC. Notwithstanding that, surveys indicate that it is the overall cost of the bill, and not the individual components, that are of concern to the customer. GPI considers the short and long-term customer bill impacts as part of the asset management process and bill impact mitigation is a consideration in investment planning decisions.

Where possible, GPI's forward-looking asset management plans and programs are structured to smooth customer bill impacts over the years. This is especially evident in discretionary programs, such as asset refurbishment/replacement, where risk and rate mitigation inputs are considerations to program scheduling. While the majority of investment scheduling can be smoothed, there are certain capital expenditures that are individually expensive and may result in small expenditure spikes in a specific year.

GPI's target for this measure is for rate impacts in residential and general service classes to remain within OEB rate mitigation guidelines.

Cost Efficiency and Effectiveness

GPI measures Cost Efficiency and Effectiveness through the following measures:

- **DSP Progress Variance -** GPI will be monitoring its execution of the projects and programs included in the DSP. On an annual basis, GPI will calculate for that year, and on a cumulative basis for the five years of the DSP, its actual capital spending compared to the approved capital budget. GPI's target for this measure is that DSP actual spending to be within 10% of approved DSP capital budget.

- **Project/Program Variance Analysis -** GPI monitors capital projects and maintenance program spending. Going forward, for material capital projects, actual costs are to be compared to estimates and variances exceeding designated thresholds will require detailed explanation by operating staff that executed the project, and engineering staff that planned the project. This will help improve the accuracy of estimate to actual spending. The performance measure is that these projects and programs are completed within the budget year unless carryover spending has been specifically identified. Planned maintenance programs are expected to be completed within the budget and calendar year. GPI's target for this measure is that actual variances shall be within 20% of estimate.

Asset and Systems Operation Performance KPIs

GPI measures Asset and Systems Operation Performance through the following measures:

Loading of feeders and/or stations - As part of GPI design and operating philosophy, 28kV feeders are loaded to optimal capacity to ensure that contingency situations can be addressed with minimal amount of service interruption to the customer. GPI's target for this measure is that feeder loading is planned to a max of 400A under normal operation and 600A under contingency conditions. GPI's transformer station NW MTS has been identified as being single most critical asset category within its distribution system. GPI looks to maintain station normal loading within the 10-day LTR rating of the transformers. Loss of a station transformer can be mitigated by load transfers, to adjacent station, and using the remaining transformer at its 10-day limited time rating (LTR). For a transformer outage greater than 10 days, the transformer loading must be brought down to its nameplate rating. Station loading information is collected and reviewed on a regular basis. The station loading indicates the effectiveness of GPI's asset utilization planning.

- **System Losses -** GPI system losses are monitored annually. System design and operation is managed such that system losses are maintained within OEB thresholds as defined in the OEB Practices Relating to Management of System Losses. Losses are monitored to ensure that the OEB 5% threshold is not exceeded.

<u>Safety Performance</u>

GPI measures safety performance through the following measure:

- **Ontario Regulation 22/04 Compliance -** GPI is audited on an annual basis to assess level of conformance to the provincial safety regulation. The audit is conducted by a third party which reviews GPI's existing processes, guidelines, standards, and conducts sit down meetings and site visits with knowledgeable personnel that look after the associated components of the audit. The audit highlights any identified Non-Conformances, as well as "Needs Improvement" and "Recommendation" observations. Observations are always welcomed as part of continuous improvement, but GPI target for this measure is to obtain zero non-compliances.

- **Zero Lost Time Incidents -** The measure of this metric is to continue the record of zero lost time incidents. From a subjective point of view this measure establishes the overall progress in health and safety over the year - or how well did management integrate H&S with the day-to-day activities of the organization.

<u>Performance Measurements Summary</u>

A summary of performance targets for the forecast period of the DSP are shown in Table 5 below. Annual performance variances that are not within target ranges or meet minimal performance thresholds would result in senior management review of the cause that may result in changes to immediate or future plans to direct future performance back to target levels.

Table 5 – DSP performance targets

Performance Indicator	**Targets**				
	2022	**2023**	**2024**	**2025**	**2026**
Reliability (SAIFI)	5 year average score of 1.07 or Lower				
Reliability (SAIDI)	5 year average score of 1.36 or Lower				
New Residential/Small Business Services Connected On Time	90% or higher	90% or higher	90% or higher	90% or higher	90% or higher
Scheduled Appointments Met On Time	90% or higher	90% or higher	90% or higher	90% or higher	90% or higher
Telephone Calls Answered On Time	65% of higher	65% of higher	65% of higher	65% of higher	65% of higher
First Contact Resolution	90% or higher	90% or higher	90% or higher	90% or higher	90% or higher
Billing Accuracy	98% or higher	98% or higher	98% or higher	98% or higher	98% or higher
Customer Satisfaction Survey Results	N/A	65% of higher	N/A	65% of higher	N/A
Billing Impact	Annual rates subject to OEB approval (within mitigation guidelines)				
DSP Progress Variance	<=+/- 10%	<=+/- 10%	<=+/- 10%	<=+/- 10%	<=+/- 10%
Project/Program Variance Analysis	<=+/- 20%	<=+/- 20%	<=+/- 20%	<=+/- 20%	<=+/- 20%
Station loading (Normal)	Peak demand < LTR	Peak demand < LTR	Peak demand < LTR	Peak demand < LTR	Peak demand < LTR
Non-Compliance to Ont.Reg 22/04	0	0	0	0	0
System Losses	<5%	<5%	<5%	<5%	<5%

*Service Quality index is the average of New Residential/Small Business Services Connected On Time, Scheduled Appointments Met On Time, and Telephone Calls Answered On Time.
**Customer satisfaction surveys performed bi-annually, and the score is the average of First Contact Resolution, Billing Accuracy, and Customer Satisfaction Survey Results.

5.2.3b Unit cost metrics as outlined in Appendix 5-A

Unit cost metrics for the 2015 – 2019 period are presented below as per prescribed format Appendix 5-A.

Table 6 – Unit Cost Metrics

Metric Category	Metric	Measures	
		2019	2015-2019 Average
Cost	Total Cost per Customer[1]	$ 333	$ 306
	Total Cost per km of Line[2]	$ 5,635	$ 8,576
	Total Cost per MW[3]	$ 70	$ 72
CAPEX	Total CAPEX per Customer	$ 207	$ 185
	Total CAPEX per km of Line	$ 3,499	$ 5,206
O&M	Total O&M per Customer	$ 126	$ 121
	Total O&M per km of Line	$ 2,136	$ 3,370

Notes to the Table:

1 The Total Cost per Customer is the sum of a distributor's capital and O&M costs divided by the total number of customers that the distributor serves.
2 The Total Cost per km of Line is the sum of a distributor's capital and O&M costs divided by the total number of kilometers of line that the distributor
3 The Total Cost per MW is the sum of the distributor's capital and O&M costs divided by the total peak MW that the distributor serves.

5.2.3c Summary of performance over historical period

Customer Oriented Performance

As discussed above, GPI customer oriented key performance indicators include System Reliability, Service Quality, Customer Satisfaction, and Bill Impacts.

System Reliability

GPI reliability statistics for the historical period (2016-2020) including all cause codes are shown in Table 7 and Figure 3 below:

Table 7 - Reliability Statistics Table for the Historical Period

	2016	2017	2018	2019	2020	5 Year Average
SAIDI	1.19	1.20	2.01	5.54	0.64	**2.11**
SAIFI	1.41	0.99	1.37	3.97	0.92	**1.73**

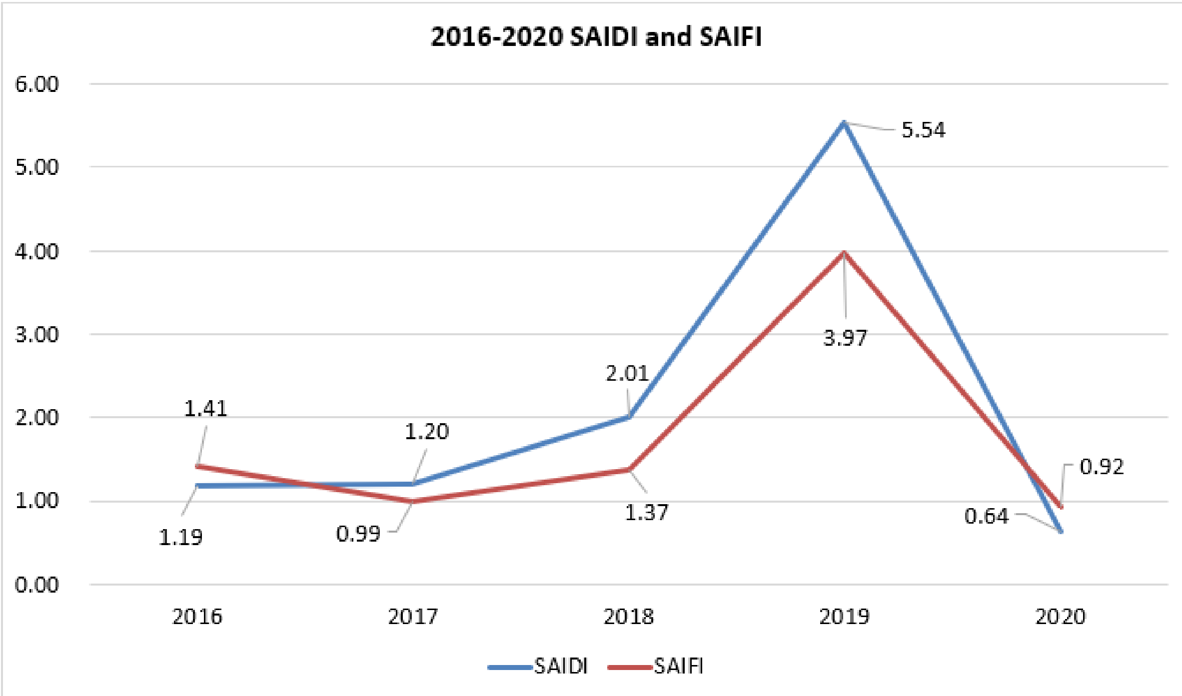


Figure 3 - Reliability Statistics Chart for the Historical Period

GPI's SAIDI and SAIFI reliability results over the historical period were better than planned target in 2017 and 2020, and better than industry averages in 2016 and 2018. GPI's reliability metrics results in 2019 were abnormally high due to Loss of Supply, and adverse weather that were not classified as Major Events. In 2019, GPI also encountered equipment failure issues.

Major outages in the town of Grimsby Ontario that occurred in April 2019 were correlated with the failure of GPI primary reclosing equipment (Recloser R2) along Woolverton Road, common to Niagara West MTS M3 27.6kV circuit (2508M3). These major outages caused a significant number of customers to be offline for an extended period on two separate occasions.

In April 2019, the failure of Recloser R2 had caused the upstream Niagara West MTS 27.6kV M3 circuit breaker to trip, resulting in all customers connected to the 2508M3 feeder to be taken offline. The feeder was restored by bypassing the failed recloser, which was removed from service and sent back to the manufacturer for failure analysis. The 2508M3 circuit at this junction feeds the western parts of the town of Grimsby and has been left without automatic reclosing capability for some time until the failure analysis were complete. New recloser was installed at that location to provide required system oversight and protection.

In May 2019, failure of a vertically mounted inline switch along Main Street West, at Casablanca Blvd, had caused the upstream Niagara West MTS 27.6kV M3 circuit breaker to trip and lockout. This fault event resulted in all customers connected to the 2508M3 feeder to be taken offline.

The outage time was further compounded by the inability of the remote command center to issue a control signal to close breaker M3 at Niagara West MTS to restore the 2508M3 feeder due to the failure in SCADA communication link to the station. The 2508M3 feeder was eventually restored by manual closing of circuit breaker M3. It should be noted that if Recloser R2 were in service, the recloser would have operated and locked out; under this scenario the outage would have only impacted about a third (as opposed to all) of the customers that are supplied from the 2508M3 circuit.

The April and May 2019 events had a significant impact to GPIs reliability metrics. Excluding these two events from the calculations would have yielded a SAIDI of 1.56 and SAIFI of 2.01 for 2019.

Table 8 and Figures 4-6 below provide a summary of the number of interruptions, number of customer interruptions, and number of customer-hours of interruptions during the historical period (2016-2020):

Table 8 – Interruption Data

	2016	**2017**	**2018**	**2019**	**2020**	**5 Year Average**
Number of Interruptions	119	92	131	109	94	**109**
Number of Customer interruptions	15,790	11,259	15,790	46,371	10,887	**20,019.40**
Number of customer-hours of interruptions	13,319	13,595	23,171	64,665	7,521	**24,453.98**

Although the incidents described above are very impactful to GPI' reliability, they are also considered low probability. GPI recognizes these events as opportunities for improvement, and are mitigating future occurrences in a number of ways including installation of remotely operated switches, sectionalizers, smart devices (i.e. reclosers and FCIs), loop systems, and completing remaining voltage conversions. Lastly, GPI has an Outage Management System in place, which will provide the ability to respond faster and minimize the impact of such weather events.

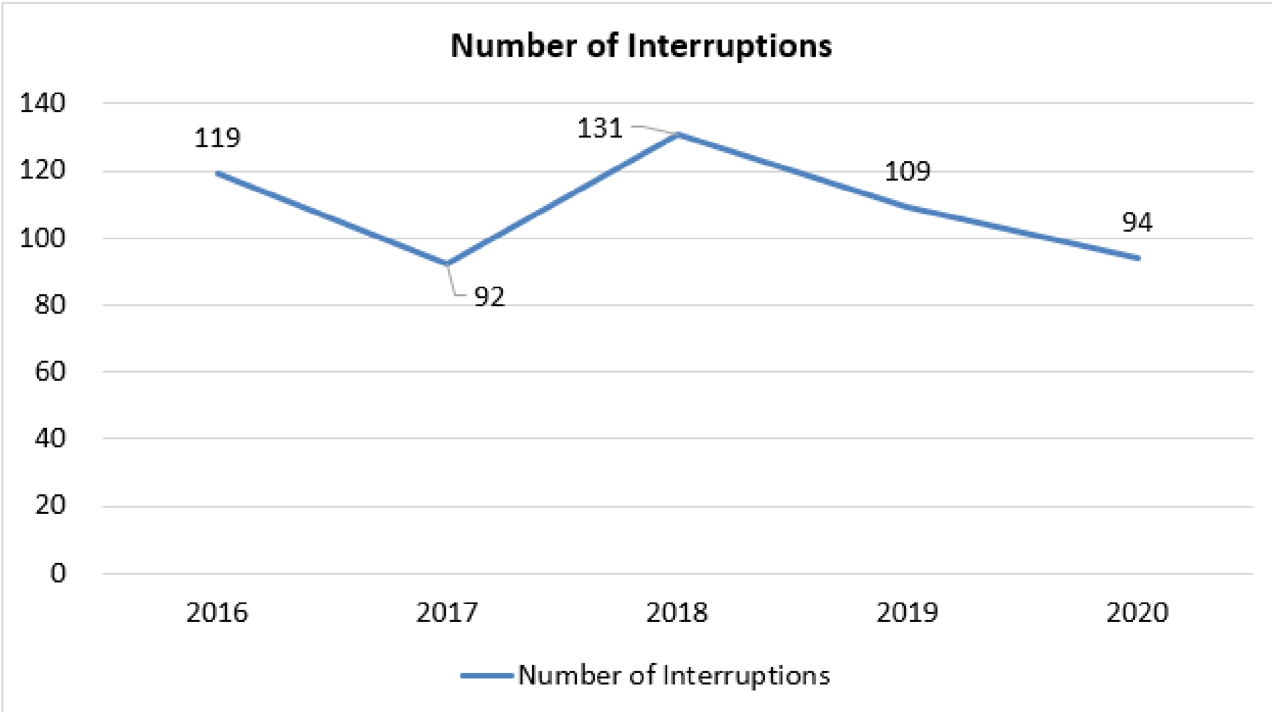


Figure 4 – Total Number of Interruptions

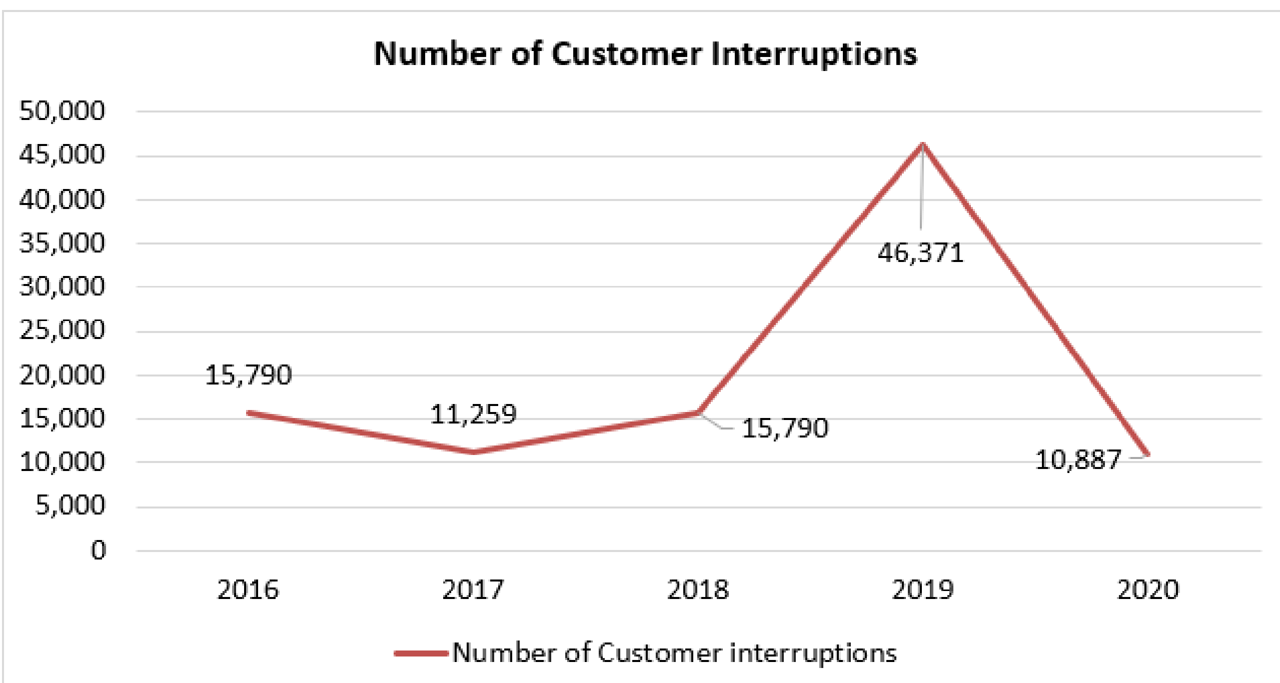


Figure 5 - Total Number of Customer Interruptions

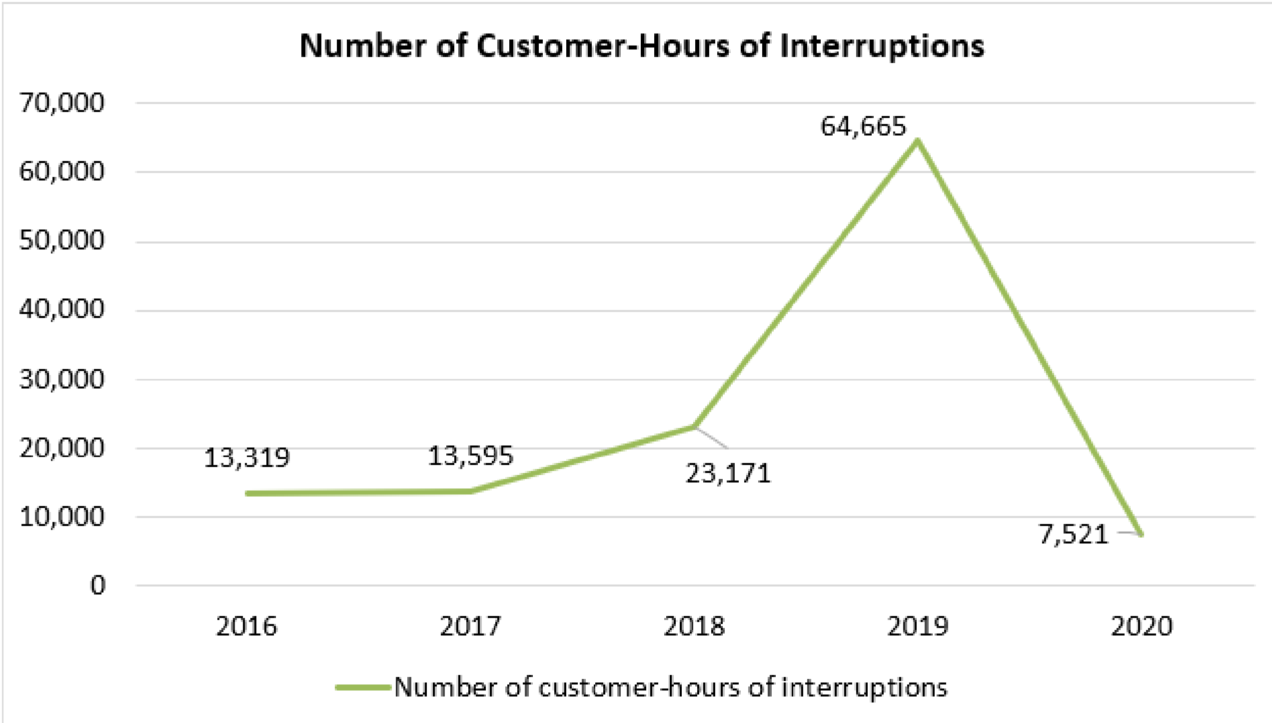


Figure 6 - Total Number of Customer-Hours Interruptions

GPI's reliability statistics for the historical period (2016-2020) excluding Loss of Supply are shown in Table 9 and Figure 7 below:

Table 9 - Reliability Statistics Table for the Historical Period (Excluding Loss of Supply)

	2016	2017	2018	2019	2020	5 Year Average
SAIDI	0.55	1.20	1.73	5.00	0.64	**1.82**
SAIFI	0.69	0.99	1.17	3.44	0.92	**1.45**

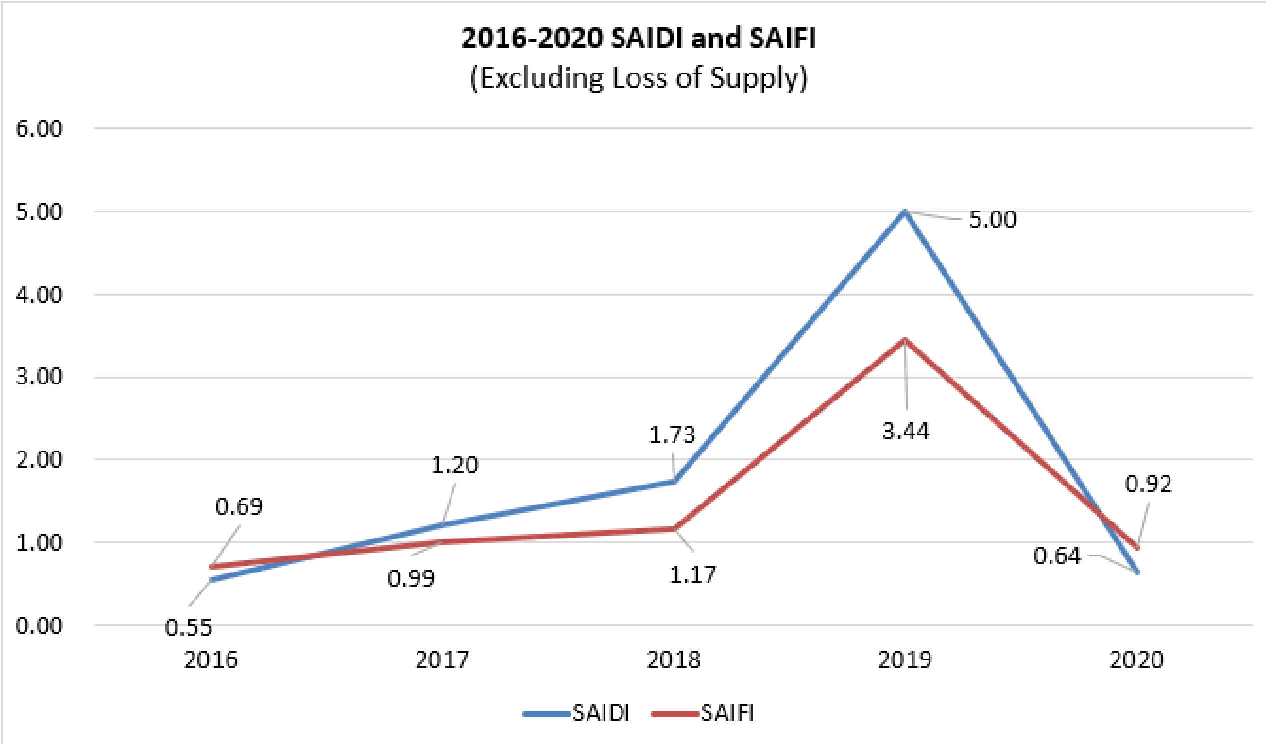


Figure 7 - Reliability Statistics Chart for the Historical Period (Excluding Loss of Supply)

Table 10 and Figures 8-10 below provide a summary of the number of interruptions, number of customer interruptions, and number of customer-hours of interruptions during the historical period (2016-2020). The summary below excludes Loss of Supply:

Table 10 – Interruption Data (Excluding Loss of Supply)

	2016	2017	2018	2019	2020	5 Year Average
Number of Interruptions	116	92	128	108	94	**108**
Number of Customer interruptions	7,780	11,259	13,519	40,216	10,887	**16,732.20**
Number of customer-hours of interruptions	6,122	13,595	19,918	58,408	7,521	**21,112.44**

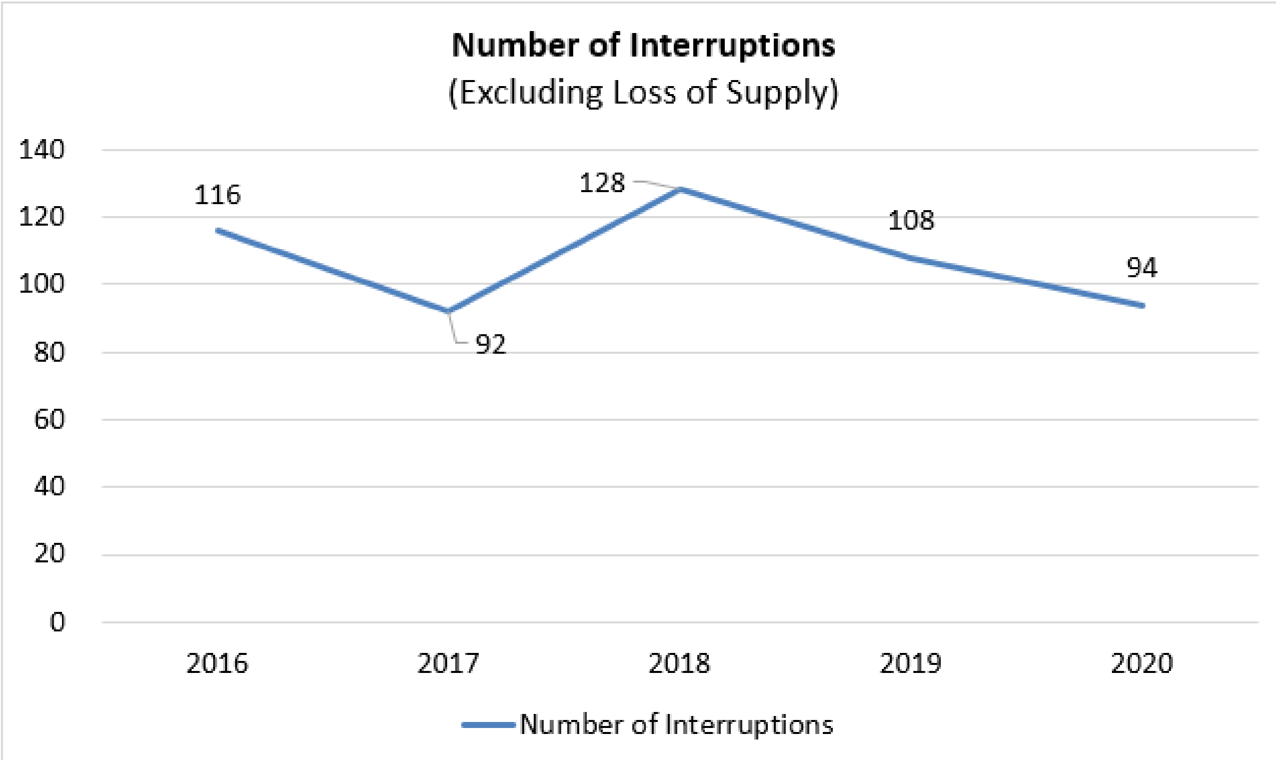


Figure 8 - Total Number of Interruptions (Excluding Loss of Supply)

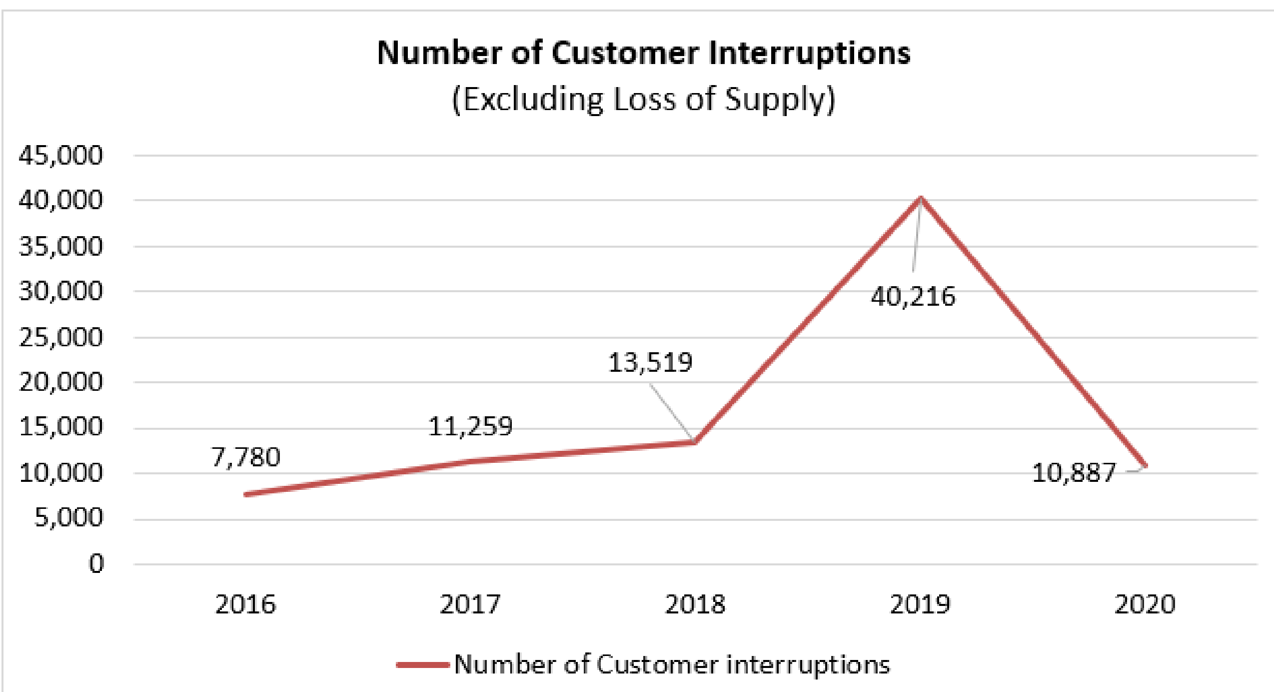


Figure 9 - Total Number of Customer Interruptions (Excluding Loss of Supply)

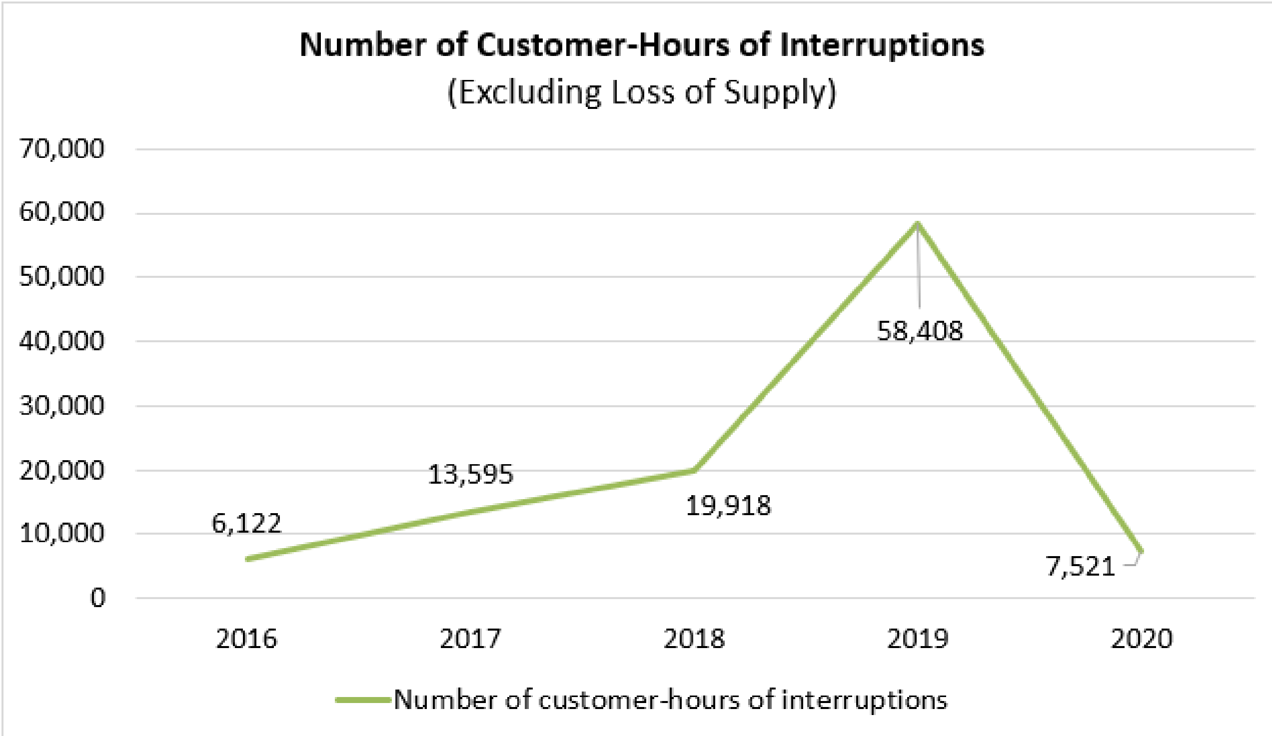


Figure 10 - Total Number of Customer-Hours Interruptions (Excluding Loss of Supply)

GPI reliability statistics for the historical period (2016-2020) excluding Major Events and Loss of Supply are shown in Table 11 and Figure 11 below:

Table 11 - Reliability Statistics Table for the Historical Period (Excluding Major Events and Loss of Supply)

	2016	2017	2018	2019	2020	5 Year Average
SAIDI	0.55	1.20	1.73	5.00	0.64	**1.82**
SAIFI	0.69	0.99	1.17	3.44	0.92	**1.45**

Note: GPI did not record any Major Event Days during historical period

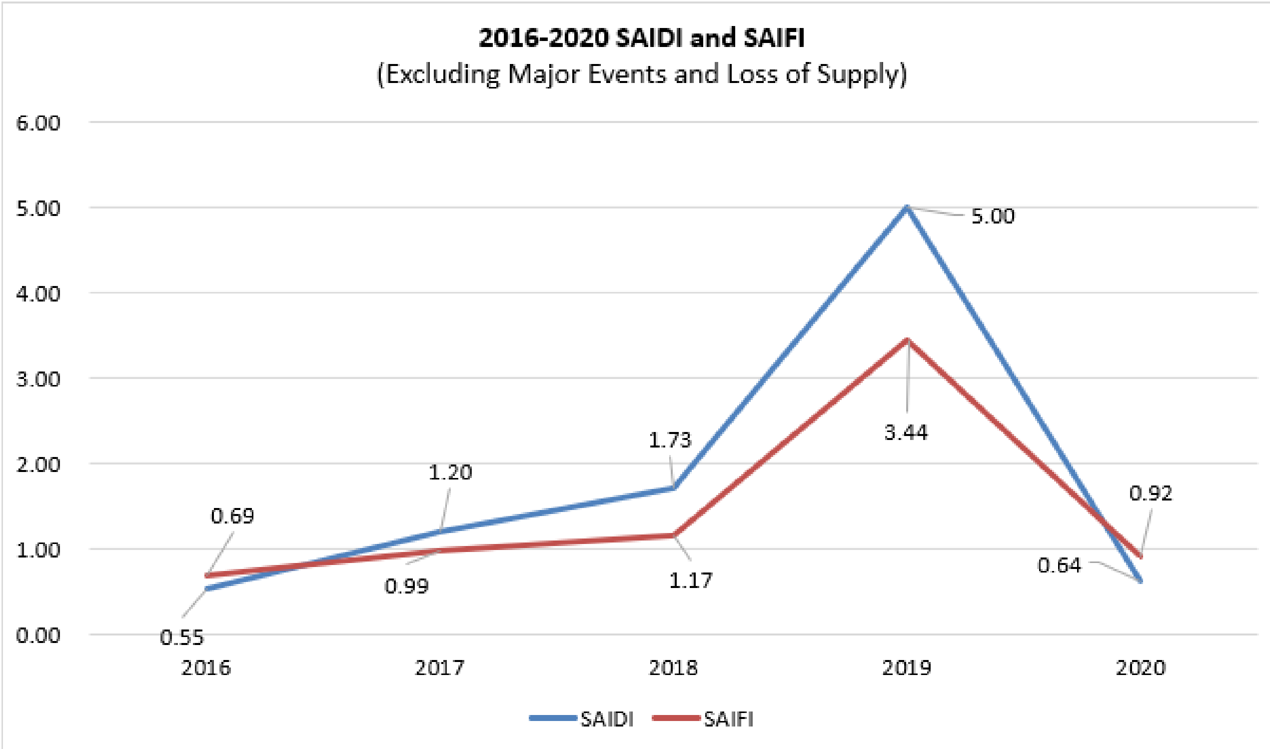


Figure 11 - Reliability Statistics Chart for the Historical Period (Excluding Major Events and Loss of Supply)

Table 12 and Figures 12-14 below provide a summary of the number of interruptions, number of customer interruptions, and number of customer-hours of interruptions during the historical period (2016-2020). The summary below excludes Major Events and Loss of Supply:

Table 12 – Interruption Data (Excluding Major Events and Loss of Supply)

	2016	2017	2018	2019	2020	5 Year Average
Number of Interruptions	116	92	128	108	94	**108**
Number of Customer interruptions	7,780	11,259	13,519	40,216	10,887	**16,732.20**
Number of customer-hours of interruptions	6,122	13,595	19,918	58,408	7,521	**21,112.44**

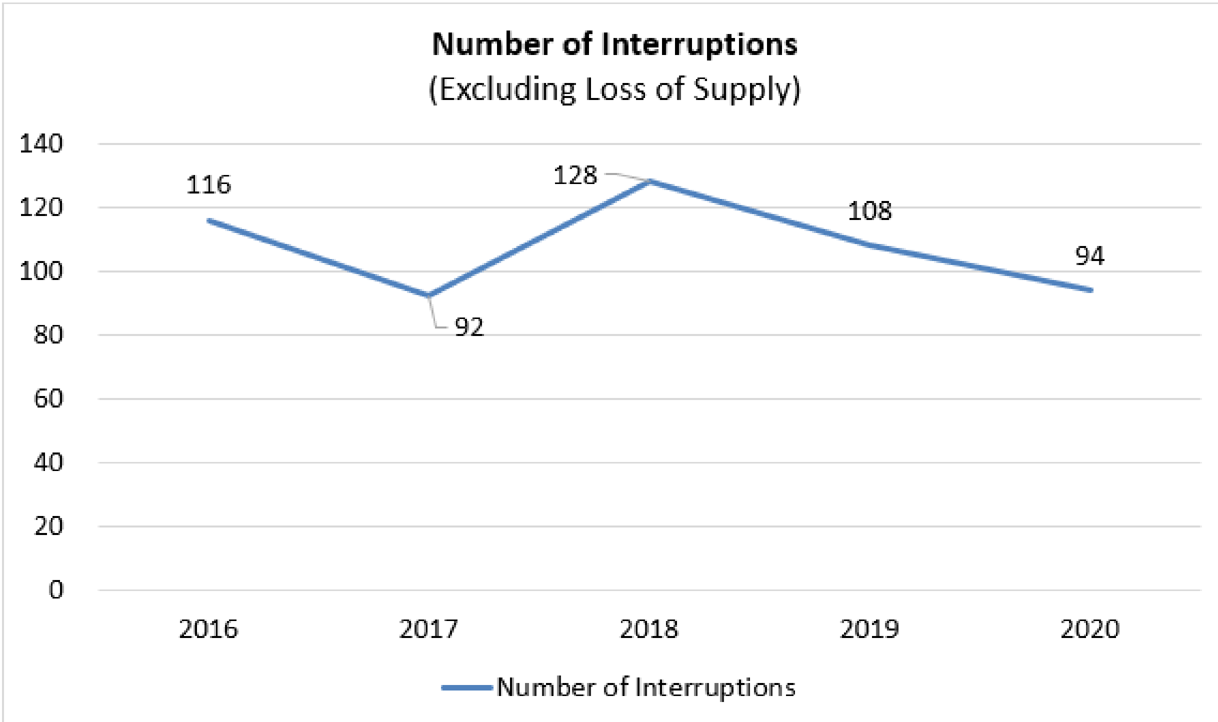


Figure 12 - Total Number of Interruptions (Excluding Major Events and Loss of Supply)

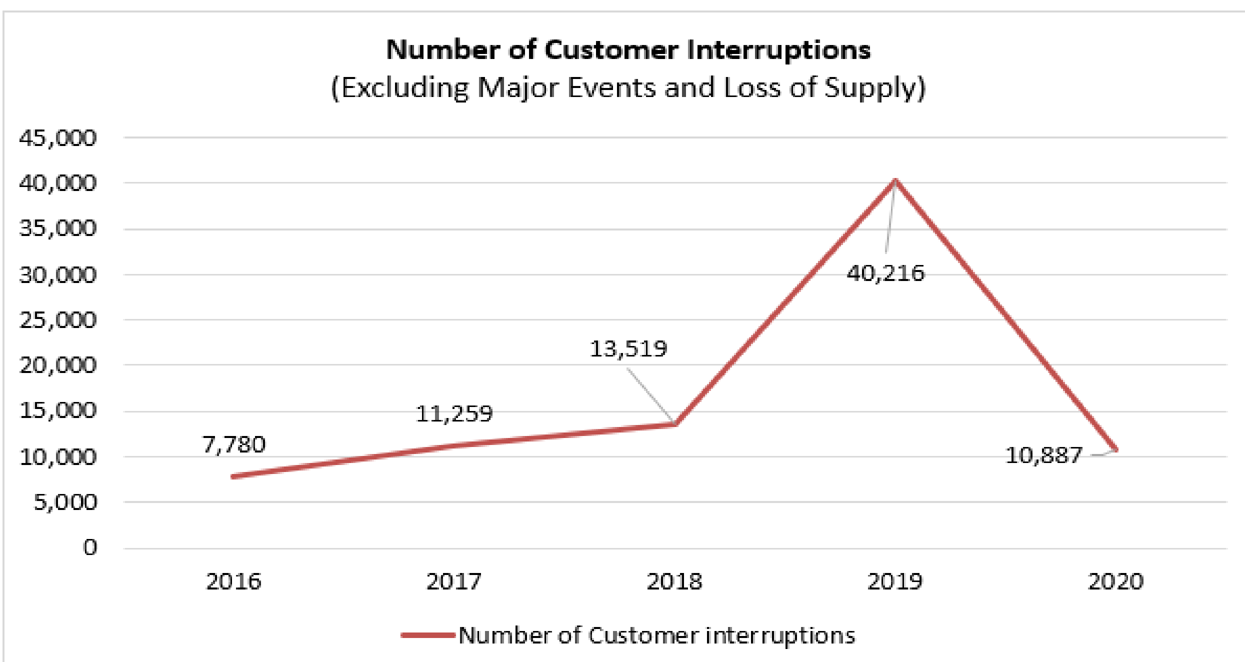


Figure 13 - Total Number of Customer Interruptions (Excluding Major Events and Loss of Supply)

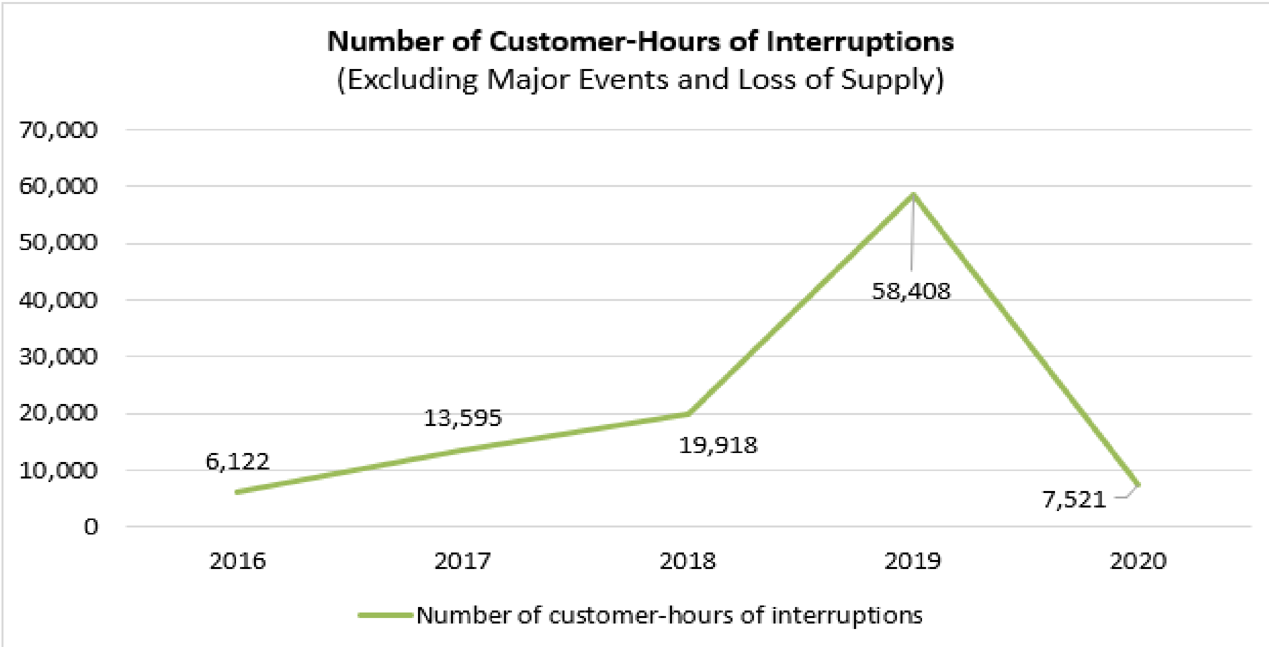


Figure 14 - Total Number of Customer-Hours Interruptions (Excluding Major Events and Loss of Supply)

<u>Service Quality</u>

As discussed in section 5.2.3a, GPI measures Service Quality through the following measures, and below is their historical performance:

- **New Residential/Small Business Services Connected On Time –** During the historical period between 2016 and 2020 GPI connected added 678 eligible low-voltage residential or small business customers (those utilizing connections under 750 volts) to its distribution system, and 98.67% (average of 5 years) of those customers were connected within a five-day timeline prescribed by the Ontario Energy Board. This result surpasses the Ontario Energy Board target of 90% for new residential/small business services connected on time.

- **Scheduled Appointments Met On Time -** During the historical period between 2016 and 2020, GPI was able to maintain 99.9% (average of 5 years). This result surpasses the Ontario Energy Board target of 90% for scheduled appointments met on time.

- **Telephone Calls Answered On Time –** The number of calls answered on time is a customer service focus for GPI. During the historical period between 2016 and 2020, GPI received 36,196 calls and 82.71% (average of 5 years) of them were answered on time. This result surpasses the Ontario Energy Board target of 65% for timely call response. Grimsby Power customers also continued to use other forms of communication including email and online forms from the Grimsby Power website. Communication by phone remains a consistent means for responding to complex enquires related to bill inquiries, energy use, e billing, conservation and low-income programs.

During 2016-2020 historical years, GPI surpassed the Service Quality Index Score by achieving a 5-year average of 93.76% compared to yearly target of 81.66%.

Customer Satisfaction

As discussed in section 5.2.3a, GPI measures Customer Satisfaction through the following measures, and below is their historical performance:

- **First Contact Resolution -** During the historical period between 2016 and 2020, GPI received 36,196 calls and 99.92% (average of 4 years) of those calls did not require the attention of management. GPI's continued focus on customer service and continued awareness of customer needs through customer satisfaction surveys empowers our human resources to have continued success in first contact resolution.

- **Billing Accuracy -** During the historical period between 2016 and 2020, GPI issued 693,914 bills and achieved a billing accuracy of 99.96% (average of 5 years). This result surpasses the Ontario Energy Board target of 98% for billing accuracy.

- **Customer Satisfaction Survey Results –** During the historical period between 2016 and 2020, GPI achieved a 5-year average of 77.48%.

During 2016-2020 historical years, GPI surpassed the Customer Satisfaction Index Score by achieving a 5-year average of 92.45% compared to bi-annual target of 84.33%.

Cost Efficiency and Effectiveness

As discussed in section 5.2.3a, GPI measures Cost Efficiency and Effectiveness through DSP spending variance, and project/program variance analysis (monitored moving forward). Below is historical performance for the DSP spending variance:

- **DSP spending variance –** Over the historical period (2016-2020), GPI spent $9.9M compared to the plan of $12.18M resulting in an underspend variance of 18.7% (Refer to section 5.4.2 for capital expenditure summary). This variance was due to several reasons including a variance in forecasted residential expansions and subdivision developments, delays with execution of Niagara West MTS M8 feeder, delays from the region that impacted execution of Casablanca Road Widening, and impacts of Covid-19 pandemic. During the forecast period, GPI will be strengthening short interval control mechanism to ensure spend alignment with the plan, including implementation of strategic work re-allocation contingency plans.

Asset and Systems Operation Performance KPIs

As discussed in section 5.2.3a, GPI measures Asset and System Operations Performance through the following measures, and below is their historical performance:

- **Loading of feeders and/or stations –** Existing supply for GPI is via four 27.6kV feeders from 2 transformer stations (see Appendix J), and as part of GPI design and operating philosophy, the feeders should be loaded to an optimal capacity to ensure that contingency situations can be addressed with minimal amount of service interruption to the customer. As shown in the Capacity Planning Study (see Appendix J), GPI is currently not aligned with the design and operating philosophy, and GPI is currently in the process of adding a fifth feeder (2508-M8), and has budgeted for a sixth feeder (2508-M7) to be operational by 2024 in order to stay within the 50% threshold when factoring in current and forecasted loads.

- **System Losses –** GPI is currently well within the 5% threshold for system losses. During the historical period (2016-2020), GPI averaged 1.02% losses per year within GPI's system. See Table 13 below:

Table 13 – Losses Within GPI's Distribution System

Description	2016	2017	2018	2019	2020	5-Year Average
Loss Factor In GPI's System	1.026%	1.017%	1.019%	1.019%	1.012%	1.020%

Safety Performance

- **Ontario Regulation 22/04 Compliance -** As discussed in section 5.2.3a, GPI measures Safety Performance through Ontario Regulation 22/04 compliance audits. Table 14 below provides a summary of the audit results during the historical period:

Table 14 – Ontario Regulation 22/04 Compliance Audit Results

ONTARIO REGULATION 22/04 AUDIT SUMMARY			
Year	**Non Compliances**	**Needs Improvement**	**Recommendations**
2016	0	0	8
2017	0	3	5
2018	0	0	8
2019	0	2	6
2020	0	0	9

As shown in Table 14, GPI successfully completed and passed all the audits with zero non-compliances. There were a few observations (Needs Improvements and Recommendations) issued throughout the historical period, which provide insight for GPI to continuously improve in this area and strive to maintain zero non-compliances during the forecast period.

- **Zero Lost Time Incidents –** As discussed in section 5.2.3a, GPI measures this metric through the total number of hours worked by GPI staff without an incident. As of May 25, 2021, GPI has achieved 408,858hrs without lost time injury.

5.2.3d Explanation of how Historical Performance has affected DSP

In terms of reliability, the historical results indicate that there are opportunities for improvement. Although the reliability statistics were better than targets and industry benchmarks for the majority of historical period, the 5-year averages were higher than the targets. GPI reliability statistics were heavily impacted by adverse weather and equipment failure, and resiliency from these 2 risks can be improved through automation, sectionalization, improved fault detection, and removal of legacy systems.

In order to increase resiliency to the aforementioned risks and maintain GPI's overall goal of sustaining and improving reliability, GPI included a number of projects and initiatives in the DSP that will help with system reliability through outage impact containment and restoration efficiencies. These projects include but are not limited to:

- **Fault Detection Improvements -** GPI's initiative in improved fault detection is through the installation of automated switches, and SCADA connected fault current indicators. Automated switches have the capability to detect fault current flowing through them that can be used in automated fault restoration schemes. SCADA fault current indicators provide added monitoring capabilities to enhance system visibility and reduce troubleshooting response time. The objective of these projects is to decrease sustained outage times on feeders and improve reliability Key Performance Indicators (KPI's).

- **Automate primary 3-phase switches (reclosers)** - Reclosers improve reliability by reducing the impact of transient and sustained interruptions. Automated reclosers sense fault current and trip accordingly. If fault is transient in nature, the reclosers will restore power automatically to the affected section of line, hence reducing the frequency of fuse operations and the need to dispatch trouble crews to patrol, locate and refuse affected portion of line. In addition, recloser placement will sectionalize feeders hence limiting service outages to smaller segments of the system for sustained interruptions.

- **SCADA Improvements -** GPI's Supervisory Control and Data Acquisition (SCADA) system is a computer system that collects and analyzes real time data used to monitor and control GPI's distribution electrical system. The scope of this project is to upgrade the SCADA system from single to dual server to increase reliability and operational effectiveness.

- **Rear Lot Conversions** - These projects involve the relocation of existing electrical plant located in customer's backyards to front yard supply. Existing rear lot plant is difficult to access for GPI staff to perform maintenance or power restoration when outages occur, and GPI plans on relocating the supply plant to the front side of the houses over the forecast period. This will enhance reliability by avoiding extended unplanned power outages associated with aged equipment failure, and lack of resiliency to adverse weather conditions.

- **Increased System Renewal Investments** - Most assets that are nearing end of life tend to be in deteriorated state and pose a risk to reliability especially when dealing with increased frequency of adverse weather events. Therefore, GPI plans on ramping up the spend on certain system renewal programs such as defective pole replacements and secondary bus refurbishment as an effort to increase system resiliency.

System capacity was another risk identified (See Appendix J). GPI is in the process of adding a fifth feeder (2508M8) to the distribution system supplied from NW MTS which is planned for completion in 2021. A sixth feeder (2508M7) will also be required to ensure alignment with operational and capacity requirements and is planned for execution during the forecast period. This project includes the installation of a primary feeder from NW MTS along newly installed and existing poles within GPI's and NPEI's service territory, that will then connect to tie-point to ensure feeder redundancy and operations flexibility during the restoration efforts.

5.2.4 Realized efficiencies due to smart meters

GPI has deployed smart meters to all its residential customers. GPI has completed MIST meter deployment to all its GS>50kW customers well in advance of the OEB target of 2020. Due to project prioritization and systems integration those MIST meters were not converted in CIS until end 2020.

Smart meters measure the total amount of electricity used over a billing period, record how much and when electricity is used (typically hourly), and transmit this information automatically to GPI's billing system. The smart meter will record total electricity consumption and send that information to GPI through a wireless communications network. Customers will then receive bills based on automated meter readings. Smart Meters, when teamed with Time-of-Use prices, are energy management tools that help customers manage their electricity use and costs, reduce the need for additional power generation during peak periods, and create real supply and environmental benefits.

Smart meter load profile data has proven to be beneficial in resolving a number of customer issues including high bill complaints, flickering lights and low/high voltage complaints. GPI Customer Service representatives can review consumption history in detail with the customer and this has led to successful resolution of most billing inquiries. Consumption reviews with the customer also educates them with respect to the benefits of energy conservation.

GPI is leveraging its investments in smart meters to improve operational decision making. New systems have been established that enable GPI to utilize smart meters to identify and isolate outages as well as confirm power restoration. All residential smart meters have "last gasp" technology ("last gasp" technology allows the meter to communicate to utility operations when power has been lost) incorporated into them.

With additional intelligent devices on GPI's distribution network, new data streams can be leveraged to improve distribution planning and operations. By leveraging data from the existing smart meters and the newly installed distribution automation devices, GPI will be able to produce new analytics that enable deeper insights into the distribution system. This includes more granular identification of distribution network loading.

Smart meters also send out a variety of alarms (i.e. tampering, part power, hot socket, etc.) that allow GPI to respond to the potential customer issue in a timely manner. The ultimate goal is for GPI to respond before the customer is aware of issue and this is exactly what GPI has managed to achieve on majority of the events. Some examples of this are underground burn offs and under voltage supply.

GPI has eliminated all manual reads which was a large benefit of smart meters or any meters that have remote access capability. Along with remote access capability another added value of smart meters is that they can be 'pinged' which is an effective benefit in trouble shooting and overall meter management process.

Smart meter consumption data will be especially useful with the continuing deployment of electric vehicles and associated home charging stations. The impact of these systems on the local distribution transformer can be determined and facilitate any decisions as to the necessity of upgrading the transformer to a higher capacity unit.

5.3 Asset Management Process

This section of the Distribution System Plan provides a high-level overview of GPI's asset management process.

GPI's asset management process is a systematic approach used to plan and optimize ongoing capital, operating and maintenance expenditures on the distribution system and general plant. Electricity distributors are capital intensive in nature and prudent capital investments and maintenance plans are essential to ensure the sustainability of the distribution network. GPI is continuing efforts to improve the information available to the asset management process for all major equipment.

5.3.1 Asset Management Process overview

5.3.1a Asset Management objectives and relationship to corporate goals

GPI's asset management objectives align with GPI's corporate goals and are implicitly summarized in GPI's Corporate Mission and Vision statements. Grimsby Power's **Mission Statement** is as follows:

"Grimsby Power Incorporated is committed to provide the customers of Grimsby with a safe and reliable electricity supply while operating effectively and efficiently at an equitable cost; Grimsby Power Incorporated will grow the business and increase shareholder value."

Grimsby Power **Vision** is to:

- Be adaptable;
- Continue to provide economical efficient energy;
- Be in business for our customers;
- Be a locally owned business;
- Strive to be efficient in any new operation to meet our customers' needs; and
- Partner with others to drive economies of scale and scope.

GPI's Mission and Vision form the foundation for GPI's Corporate Objectives, and are illustrated in Table 15:

Table 15 – Corporate Objectives

Category	Corporate Objective
Safety	- Continue the record of zero lost time incidents - Complete all target field audits of GPI staff.
Reliability	- Decrease the trend of the rolling average of the duration of customer power interruptions - Decrease the trend of the rolling average of the frequency of customer power interruptions
Customer Service	- Host events that will help customers to become engaged. - Answer customer calls within 30 seconds. - Resolve customer call needs without escalation. - Issue accurate customer bills
Financial	- Execute budget expenses as close to budget dollars as possible - Execute budget at a lower cost than originally anticipated - Demonstrate productivity or cost efficiency improvements - Promote the maintenance of a predetermined level of capital spend - Develop GPI's strategic Plan by: • Setting goals • Determining actions to achieve the goals, and • Mobilizing resources to execute actions - Document and communicate GPI's strategy and implementation - Demonstrate incremental OM&A cost savings - Promote the completion of capital projects
Regulatory Compliance	- Comply with all OEB requirements - Comply with all applicable industry regulations and standards

GPI also adheres to a set of Values that support day to day operations:

- GPI recognizes the importance employees play in the delivery of its mission and vision principles. Thus, GPI fosters an environment of employee involvement and empowerment, which encourages and nurtures the skill sets of all employees in their respective disciplines through provision of professional experiences and skill-specific development and training.

- GPI provides the environment in which employees, with enhanced skills development, work as a team to continuously improve systems and processes.
- GPI deploys mature technology, which further enhances current functionality, while ensuring future potential data collection for internal staff and external customer use.
- GPI creates business efficiencies, utilizing technology to capture business data, for conversion into business information, to improve and create seamless end-to-end business processes.
- GPI searches out new processes, technologies, and cost efficiencies to provide improved delivery of services to its customers.
- GPI values sustainable operations, within its technology framework, and is working towards a paperless environment and deployment of mobile solutions for internal (staff) and external (customers) use.

Asset Management Objectives are derived from GPI's Mission, Vision and Corporate Goals. GPI has identified five (5) Asset Management Objectives that align with corresponding Corporate Objectives:

Safety – This objective has been given the highest priority by GPI. "Safety first" comprises organizational efforts to ensure that worker and public safety is paramount in day-to-day activities and is explicitly ranked this way in the corporate strategy. It is recognized that some safety issues (i.e. live conductor on ground) require emergency remedial action (mandatory) and are not "planned investment" considerations. They are acted upon immediately and level of effort may impact other non-mandatory investments that would otherwise have had the resources (labour, funds) allocated to them. Other planned investments may impact long term safety "risk" and safety "value" and can be paced and prioritized where safety is just one of the Asset Management Objectives that is addressed by the investment. The Safety objective is assigned a weight of 0.25.

Reliability – This objective is ranked similar to safety in priority. Together with safety it is one of the two goals explicitly cited GPI's Mission Statement. In customer surveys, it has ranked high in importance of customer needs. The Reliability objective is assigned a weight of 0.25.

Customer Service – This objective is ranked high in ensuring that business outcomes meet the value needs of the customer. What customers "value" is determined through numerous customer engagement activities including daily interaction with staff, surveys, specific public information sessions and other means. The Customer objective is assigned a weight of 0.2.

Financial Integrity - This objective is ranked equally with the previous objective. A stable rate of return, low electricity rates and ability to sustainably invest in distribution system access, service, renewal and general plant are key to the long-term success of this objective. Balancing of stakeholder interests in this area is an ongoing exercise. In customer surveys, low electricity rates ranked high in importance of customer needs. In consideration that GPI's controllable portion of the customer bill is less than 25%, the Financial Integrity objective is assigned a weight of 0.20.

Regulatory Compliance – GPI is required to deliver on obligations mandated by government (e.g., in legislation and in regulatory requirements imposed further to Ministerial directives to the Ontario Energy Board). While obligations are mandated, the LDC does exercise some control over pace and level of annual effort depending on the issues at hand that can affect investment timing. The Regulatory Compliance objective is assigned a weight of 0.1.

The Corporate and Asset Management objectives form the high-level philosophy framework for GPI's investment program and are implicitly embedded in GPI's capital investment planning process and maintenance program. Table 16 below shows the linkages between RRFE Outcomes, Corporate Objectives and Asset Management objectives.

Table 16. RRFE Outcomes - Corporate Objectives - Asset Management linkage

RRFE Outcome	GPI Corporate Objectives	GPI's Asset Management Objectives are to:
Operational Effectiveness	Safety	Construct, maintain and operate all assets in a safe manner
	Reliability	Monitor and address asset condition issues in a timely manner to ensure the continued reliable supply of electricity delivery; ensure alignment with regional planning objectives
Customer Focus	Customer service	Ensure that decisions on capital investments and maintenance plans support GPI's desired outcomes in a cost-effective manner and provides value to the customer
Financial Performance	Financial integrity	Manage investment planning to mitigate rate impacts while maintaining corporate financial stability and long-term sustainable performance
Public Policy Responsiveness	Regulatory Compliance	Ensure responsiveness to public policy requirements and objectives; facilitation of new renewable generation; facilitation of the smart grid

For investment **value and risk assessment**, it is necessary to identify the relative priority of each Asset Management Objective with respect to each other. Different investments will have different values and risks with respect to the asset management objectives and weighting the asset management objectives will aid in identifying those investments that best align with them from an overall value and risk perspective. The five objectives are each assigned a relative weight of 0 - 1.0 with the total sum of the objectives equalling 1.0.

Table 17. Objective weighting summary

Objective	Weight
Safety	0.25
Reliability	0.25
Customer Focus	0.20
Financial Integrity	0.20
Regulatory Compliance	0.10
Total	**1.00**

An integral part of achieving the asset management objectives is a maintenance program to ensure system performance is sustained during the entire asset service life. GPI has in place inspection and routine maintenance programs to achieve this. The inspection and maintenance of distribution assets is detailed in GPI's "Distribution System Maintenance and Inspection Program", attached as Appendix E.

5.3.1b Asset Management Process components

This section provides information regarding the components of GPI's Asset Management Process that it uses to prepare its capital expenditure plan. The process is shown in Figure 15.

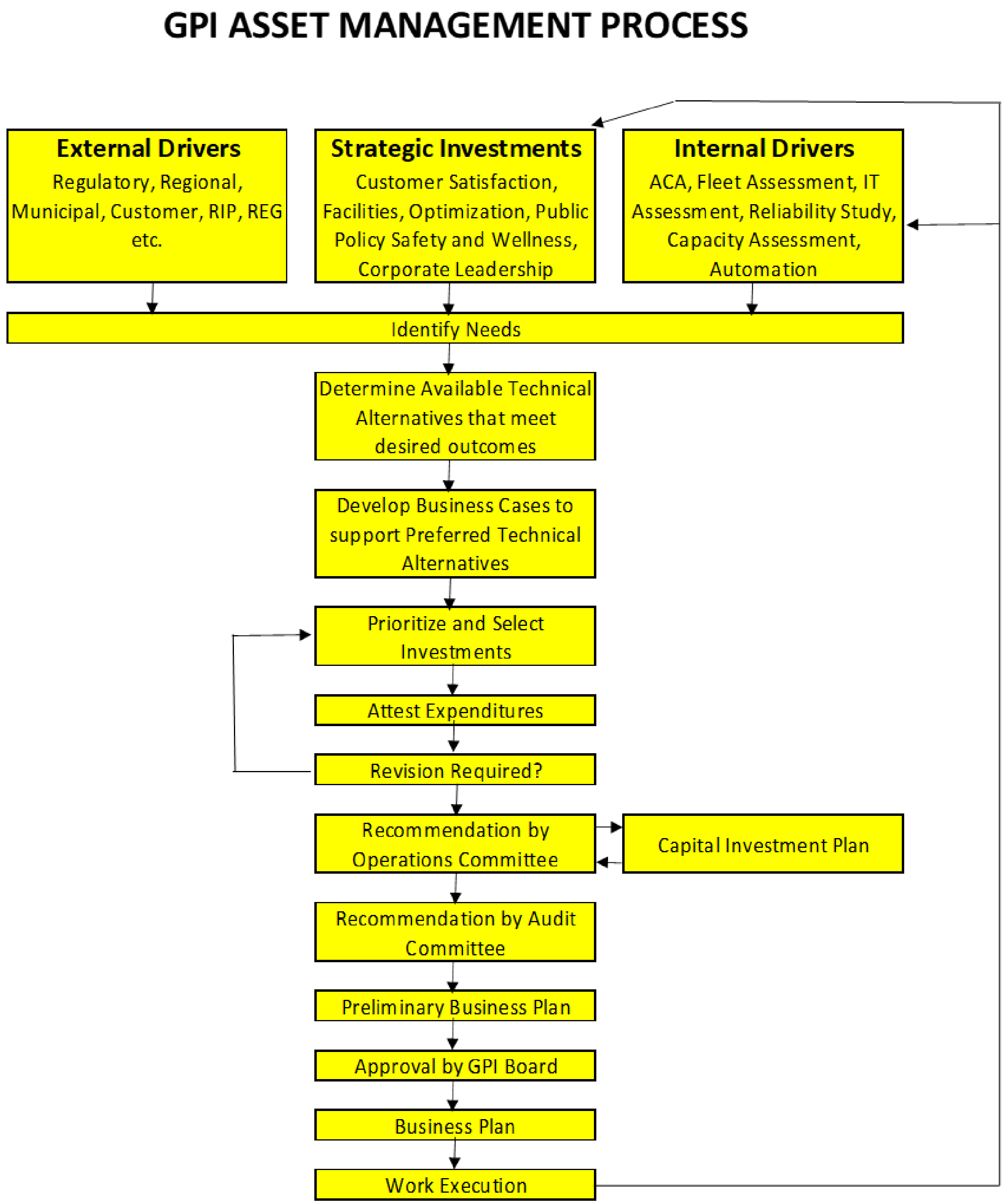


Figure 15. GPI Asset Management Process

The process begins with the identification of technical needs. These needs are identified from three sets of drivers:

- External Drivers
- Strategic Investment Drivers
- Internal Drivers

The External Drivers include inputs such as regulatory requirements, regional planning requirements, municipal requirements, customer requirements including load forecasts, and Renewable Energy Generation (REG) needs.

Strategic Investment Drivers include Customer Satisfaction objectives, Facilities Optimization objectives, Public Policy requirements, Safety and Wellness aims and Corporate Leadership.

Internal Drivers include Asset Condition Assessment, Fleet Assessment, IT Assessment, Reliability Assessment, Asset Capacity Utilization Assessment and Automation Assessment. These drivers provide the information GPI uses to formulate the technical needs for the capital plan.

The next step in GPI's Asset Management Process is to determine the available alternatives that address the technical needs. This flows into the development of Business Cases to support the preferred technical alternatives.

The selected investments are then reviewed to ensure that there were no errors or other issues that would require the business case to be revised and sent back through the prioritization and selection process. Once the selected Business Cases have passed the review stage, they are assembled as the draft Capital Investment Plan.

The GPI Capital Investment Plan then goes through a number of approval stages. The first is the examination by the Operations Committee. This Committee may make changes or modifications to the Capital Investment Plan before the Plan is sent to the Audit Committee. The product of the Audit Committee becomes the Preliminary Capital Plan.

The Preliminary Capital Plan is sent to the GPI Board of Directors for its approval. The product of this approval is the final Capital Plan aligned with Corporate Objectives.

All work is then executed to implement the projects in the Capital Plan. Upon completion of this work and the in-servicing of new assets, the full scope of the executed projects is examined for lessons learned to continually improve the Asset Management Process. These learnings typically influence the beginning of the Asset Management Process in terms of modifying the Internal Drivers and the Strategic Investment Drivers.

The asset management process has at its foundation an asset register where asset information is held. For GPI, the asset register is not a single information source but is composed of digital and paper records in separate locations with specific owners. The four key components that comprise the Asset Register are the ESRI Geographical Information System (ArcGIS), the Financial Management System, the Customer Information System (CIS) and Operations Records databases/files.

Table 18. GPI Asset Register

GPI Asset Register			
Asset register component	**Owner/Location**	**Asset information**	**Information media**
ArcGIS	Engineering/ GPI servers	- Asset location (pole GPS coordinates) - Work order history - All attributes (voltage, size, conductor length)	- digital database composed of multiple map layers of assets
Financial Management System	Accounting/Regulatory	- IFRS and Regulatory asset value - asset useful life studies - contributed capital	-digital database
	Accounting/Regulatory	Distribution Plant (bulk GL) - purchase history - depreciation amounts General Plant - purchase history - depreciation amounts (land, buildings, hardware, software, fleet)	-digital database
CIS	Customer Service	- meter information (physical attributes, consumption, etc.)	digital database
ESRI Survey123 (ArcGIS)	Operations / GPI Servers	Outage history -SAIFI, SAIDI stats database, trouble reports	digital files
	Operations / GPI Servers	Maintenance Records -transformers, switchgear, poles, stations, meters	digital files stored on ArcGIS
	Operations / GPI Servers	Inspection Records - transformers, switchgear, poles, stations	digital files
	Operations / GPI Servers	Asset utilization records -station, feeder loading	digital and paper files
	Operations / GPI Servers	Fleet history Tool, test equipment history	digital and paper files GPI Servers

5.3.2 Overview of Assets Managed

This section provides an overview of the assets of GPI's Distribution System that GPI manages.

5.3.2a Features of the distribution service area

GPI's service area covers 69 square kilometers, and includes all geography within the borders of The Town of Grimsby, in the Regional Municipality of Niagara. Out of the 69 square kilometers, 19 square kilometers is urban and 50 kilometers is rural. The Town of Grimsby is bounded by Lake Ontario and the Niagara Escarpment. Town of Grimsby is the most western Municipality in Niagara Region with a population of over 27,000.

The GPI service area has warm and sometimes hot summers with cold, longer winters (Köppen climate classification Dfb). The service territory is shown in Appendix B.

The main function of GPI is to receive power in bulk from points on the high-voltage transmission grid and distribute it to the local consumers in Grimsby. Delivery involves reducing the voltage of bulk power supply to the levels used in end-use electrical equipment. Delivery is achieved via conductors held above or below ground.

GPI assets include poles, conductors, line transformers, switches, transformer station equipment, conduits, computer systems and software, transportation equipment, storage areas, and office buildings. GPI's neighbouring utilities include Alectra Utilities Inc., and Niagara Peninsula Energy Inc (NPEI) which is also an embedded distributor to GPI from NW MTS.

The GPI distribution system supplies approximately 11,631 residential and business customers throughout the Town of Grimsby. In 2019, GPI delivered 239,983,774 kWh of total billed energy.

5.3.2b Summary description of the system configuration

GPI's distribution system is made up of:

- 356 kilometers of overhead lines (167 km of primary and 189 km of secondary lines)
- 333 kilometers of underground lines (84 km of primary and 249 km of secondary lines)
- 3,675 poles (3,605 wood and 70 concrete)
- 1,497 distribution transformers (835 pole mounted and 744 pad mounted)
- Other equipment (Gang Operated Switches, Reclosers, Pad Mounted Switchgears, etc.)

System Configuration

GPI is connected to the Ontario power transmission grid at two (2) transformer stations, each with a typical Dual Element Spot Network (DESN) configuration (2 power transformers per station). One (1) transformer station (Beamsville TS – supplied from 115kV) is owned by Hydro One (HO) and the other one (1) is owned by GPI (Niagara West MTS or NW MTS – supplied form 230kV). NW MTS has a nominal capacity of 66.7MVA (63.4MW @ 0.95PF).

GPI customers are supplied via four (4) 27.6kV feeder circuits. Within GPI's service territory there are still a few step-down transformers fed from the 27.6kV circuits, which supply GPI customers at 8.32kV. Responsibility for maintaining the circuits lies with the respective owners of the equipment. The current configuration of GPI's Distribution System is shown in the two graphics below.

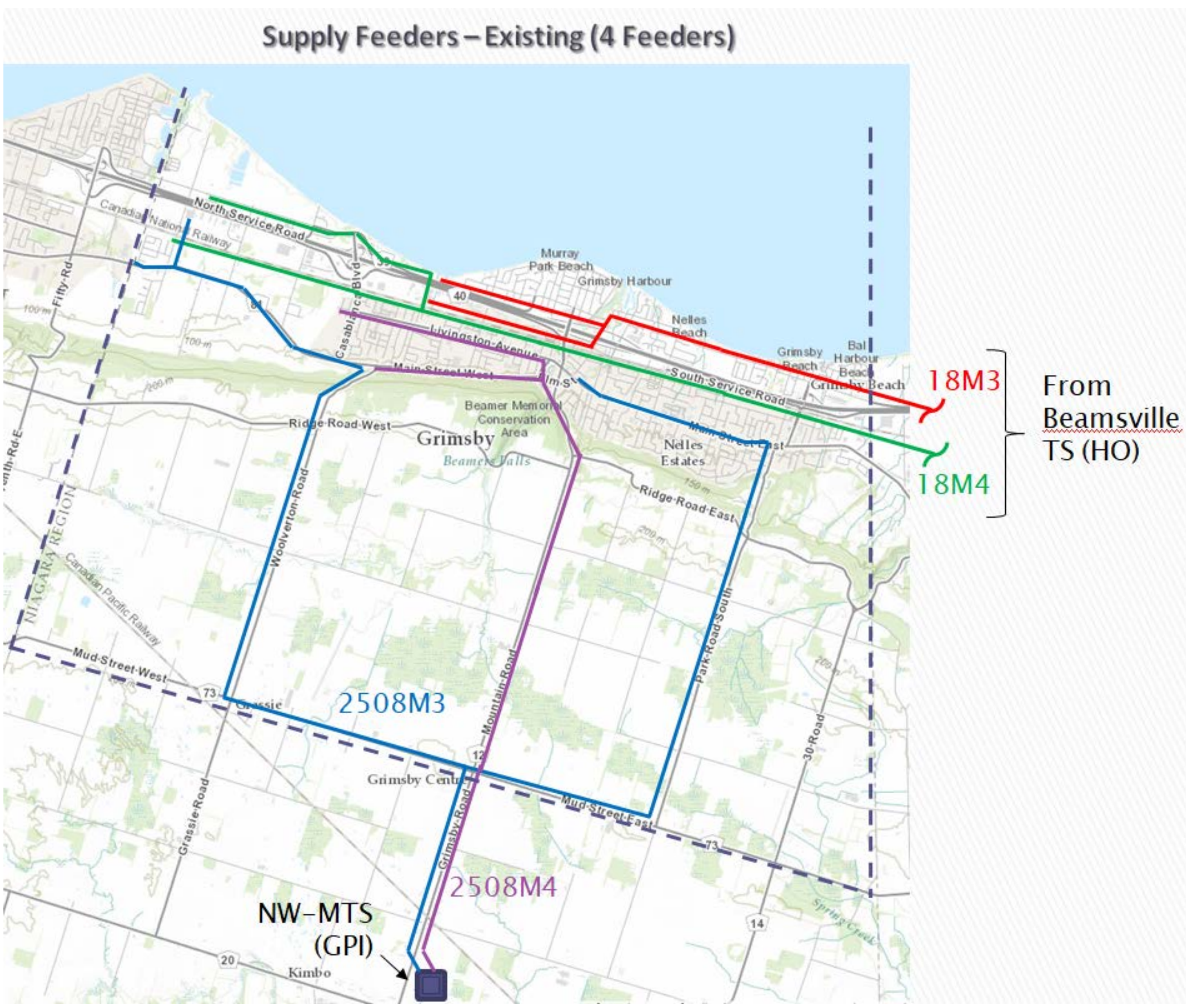


Figure 16. GPI Circuit Map

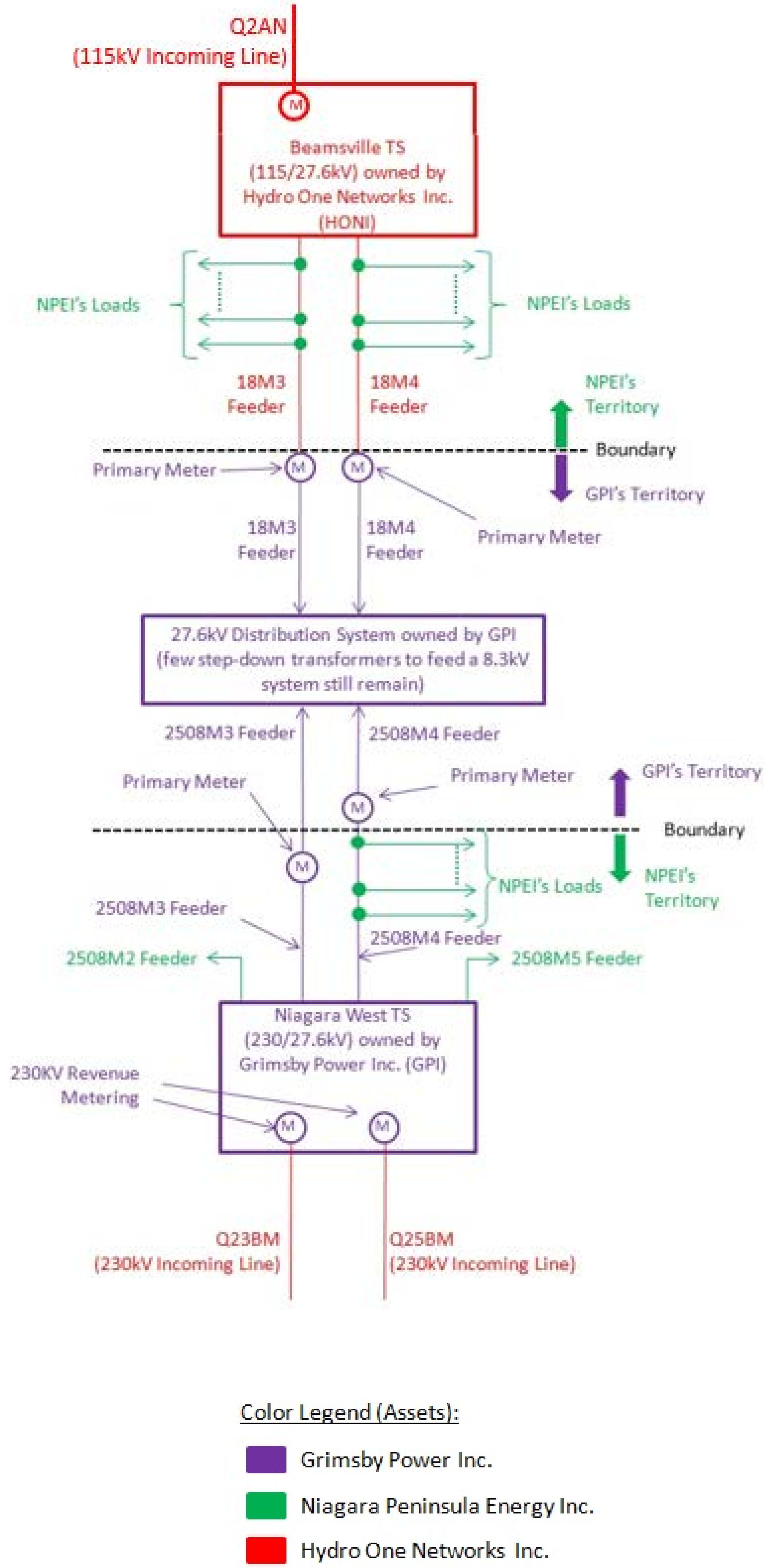


Figure 17. GPI Circuit Diagram

5.3.2c Information by asset type

Condition assessment of assets is typically performed as part of regular inspections. GPI staff uses electronic devices (phones, tablets, laptops) to aid in the recording of field data gathered during the assessment. Applications are present on these devices that allow crews to input field information which is later analyzed and used as an input to the asset management and project prioritization process. These results were then leveraged as inputs for the Asset Condition Assessment (See Appendix D) in order to determine asset health index as well as developing a condition-based Flagged for Action Plan for each asset group.

A summary of the Health Index evaluation results is shown in Table 19. For each asset category the population, sample size (number of assets with sufficient data for Health Indexing), average age, age availability and average Data Availability Indicator (DAI) are given. The average Health Index and distribution are also shown. A summary of the Health Index distribution for all asset categories are shown in Figure 18. This data was compiled as part of the Asset Condition Assessment study in completed on January 10th, 2019 (See Appendix D). Note that the Health Index distribution percentages are based on the asset group's sample size.

It can be observed that out of the 18 sub-categories, 15 of them had over 70% of their units classified as "good" or "very good". Also 15 of them had an average Health Index score of greater than 80%. The asset groups that had all the units in "very good" condition included Station Transformers, Station Circuit Breakers, Pole Mounted Transformers (2-Phase, 3-Phase), OH Switches (1-Phase) and Underground Cables (2-Phase).

It can be seen from the results that among all the asset categories, Poles (Wood) and OH Lines (1-Phase, 3-Phase) were relatively speaking the ones of major concern. More than 20% of the units in these asset groups were classified as "poor" or "very poor". Other asset group of concern included Poles (Concrete), having over 10% of units classified as "poor" or "very poor".

Table 19. Health Index Results Summary

Asset Category		Population	Sample Size	Average Health Index	Health Index Distribution: Very Poor (< 25%)	Poor (25 - <50%)	Fair (50 - <70%)	Good (70 - <85%)	Very Good (>= 85%)	Average Age	Average DAI	Age Availability
Station Transformers		2	2	92%	0	0	0	0	2	15	88%	100%
Station Circuit Breakers		11	11	98%	0	0	0	0	11	12	100%	100%
Poles	Wood	3607	3603	73%	614	344	110	511	2024	29	74%	100%
	Concrete	69	69	81%	0	12	13	2	42	36	75%	100%
Pole Mounted Transformers	1 Phase	681	678	97%	0	0	4	15	659	19	Age Only	100%
	2 Phase	3	3	98%	0	0	0	0	3	22	Age Only	100%
	3 Phase	39	39	98%	0	0	0	0	39	21	Age Only	100%
OH Lines *	1 Phase	85.7	81.0	67%	13.6	17.7	7.3	1.6	40.7	33	Age Only	95%
	2 Phase	0.1	0.1	64%	0.0	0.0	0.1	0.0	0.0	45	Age Only	94%
	3 Phase	95.6	92.3	80%	16.4	5.7	0.0	0.0	70.1	29	Age Only	96%
OH Switches	1 Phase	10	3	99%	0	0	0	0	3	4	Age Only	30%
	3 Phase	137	51	88%	0	4	0	12	35	10	Age Only	37%
Pad Mounted Transformers	1 Phase	557	557	98%	0	0	8	13	536	18	98%	100%
	3 Phase	129	127	98%	0	0	0	3	124	20	93%	98%
Pad Mounted Switchgear		24	19	88%	0	0	3	5	11	11	4%	79%
Underground Cables *	1 Phase	73.5	72.5	90%	2.9	1.5	3.6	7.0	57.6	18	Age Only	99%
	2 Phase	0.04	0.04	100%	0.00	0.00	0.00	0.00	0.04	19	Age Only	100%
	3 Phase	15.4	12.2	97%	0.0	0.0	0.0	1.3	10.9	12	Age Only	79%

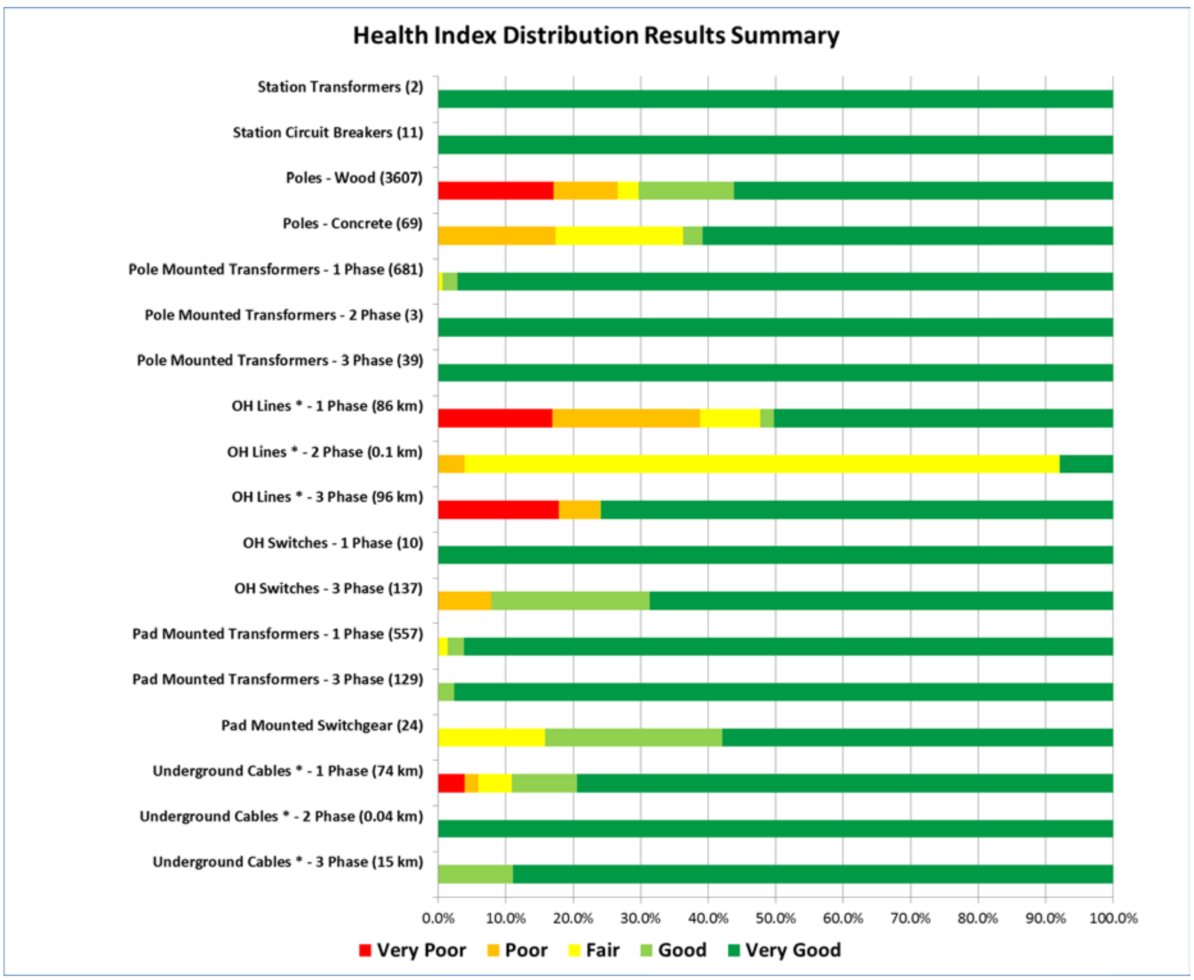


Figure 18. Health Index Distribution Results Summary

The Flagged for Action Plan estimates the number of units expected to require attention in a given year. Table 20 shows the Year 0 (year 2018) and 10 Year cumulative Flagged for Action Plan. Table 21 shows the 10 Year Flagged for Action Plan annually.

In general, the overwhelming majority of the sub-categories (except for Poles-Wood) had their flagged for action plans showing smooth variation throughout the next 10 years. In other words, for these asset groups GPI does not have any substantial backlog action work.

In the short term, it was determined that Poles (Wood), Poles (Concrete) and OH Lines (1-Phase) had the highest percentages of units flagged for action in first year, each exceeding 4% of population.

Furthermore, within the next 10 years, more than 20% of the Poles (Wood), Poles (Concrete), OH Lines (1-Phase), OH Switches (3-Phase) and UG Cables (1-Phase) are expected to require some action to be taken to address their condition.

The actual replacement plans might be only a subset of the Flagged for Action plans after GPI's review based on GPI's maintenance and replacement strategy. GPI continuously optimizes its replacement plans and incorporates this data in its proactive replacement strategy for any equipment that has been identified at the end of its life.

Table 20. Health Index Results Summary

Asset Category		1st Year		10 Year Replacement		Replacement Strategy
		Quantity	Percentage	Quantity	Percentage	
Station Transformers		0	0.0%	0	0.0%	Proactive
Station Circuit Breakers		0	0.0%	0	0.0%	Proactive
Poles	Wood	143	4.0%	993	27.6%	Proactive/Reactive
	Concrete	3	4.3%	20	29.0%	Proactive/Reactive
Pole Mounted Transformers	1 Phase	3	0.4%	45	6.6%	Reactive
	2 Phase	0	0.0%	0	0.0%	Reactive
	3 Phase	0	0.0%	0	0.0%	Reactive
OH Lines *	1 Phase	4	4.7%	29.1	34.0%	Reactive
	2 Phase	0	0.0%	0	0.0%	Reactive
	3 Phase	3	3.1%	21	22.0%	Reactive
OH Switches	1 Phase	0	0.0%	0	0.0%	Proactive/Reactive
	3 Phase	4	2.9%	38	27.7%	Proactive/Reactive
Pad Mounted Transformers	1 Phase	2	0.4%	14	2.5%	Reactive
	3 Phase	0	0.0%	0	0.0%	Reactive
Pad Mounted Switchgear		0	0.0%	0	0.0%	Proactive/Reactive
Underground Cables *	1 Phase	2.1	2.9%	18.1	24.6%	Reactive
	2 Phase	0	0.0%	0	0.0%	Reactive
	3 Phase	0	0.0%	0	0.0%	Reactive

* by length (km)

Table 21. Ten Year Flagged for Action Plan

Asset Category		Flagged for Action Plan by Year									
		1	2	3	4	5	6	7	8	9	10
Station Transformers		0	0	0	0	0	0	0	0	0	0
Station Circuit Breakers		0	0	0	0	0	0	0	0	0	0
Poles	Wood	143	109	109	109	109	109	109	109	43	44
	Concrete	3	3	3	2	2	2	2	1	1	1
Pole Mounted Transformers	1 Phase	3	3	4	4	4	5	5	5	6	6
	2 Phase	0	0	0	0	0	0	0	0	0	0
	3 Phase	0	0	0	0	0	0	0	0	0	0
OH Lines *	1 Phase	4	3.7	3.4	3.3	3	2.6	2.5	2.4	2.3	1.9
	2 Phase	0	0	0	0	0	0	0	0	0	0
	3 Phase	3	2.7	2.6	2.4	2.3	2	1.6	1.6	1.6	1.2
OH Switches	1 Phase	0	0	0	0	0	0	0	0	0	0
	3 Phase	4	3	4	4	4	4	4	4	4	3
Pad Mounted Transformers	1 Phase	2	2	2	2	1	1	1	1	1	1
	3 Phase	0	0	0	0	0	0	0	0	0	0
Pad Mounted Switchgear		0	0	0	0	0	0	0	0	0	0
Underground Cables *	1 Phase	2.1	1.8	1.7	1.8	1.5	1.3	2	2	1.9	2
	2 Phase	0	0	0	0	0	0	0	0	0	0
	3 Phase	0	0	0	0	0	0	0	0	0	0

* by length (km)

Note: Year 0 = 2018, year 1 = 2019, year 2 = 2020 … etc

5.3.2d System asset utilization - capacity assessment

Apart from the sustainment of existing assets in the distribution system, GPI has considered the needs of potential demand related expenditures. They are required to supply the needs of a new customer, or to enhance reliability in an area where system capacity is constrained. In 2021, GPI performed a System Capacity Study (See Appendix J). The capacity study reviewed the existing supply capacity and anticipated load growth (including population grown and economy and effectiveness of conservation programs) to determine what capital investment should be planned to ensure a reliable and efficient electrical supply to the Town of Grimsby.

Table 22. Existing GPI Feeder Capacity

TS	Feeder	MVA
Beamsville TS Feeders	18M3	9.6
	18M4	12
Niagara West	2508M3	19.1
	2508M4	19.1
	2508M8*	19.1
Total		**78.9**

* 2508M8 planned to be energized in Q4 2021

As shown in Table 22, the total existing supply capacity for 2021 is 78.9 MVA (74.9 MW @ 0.95 PF), including committed feeder 2508M8. When contingency conditions are considered, available capacity is reduced by the loss of the largest unit. The supply capacity with the largest feeder out of service is 59.8 MVA (56.8 MW @ 0.95PF).

Load flow studies were performed using DESS System Analysis software and the existing system model. Studies included modelling future load growth and running load flows under various single contingency scenarios. There is currently 10.9 MW of planned load growth to be connected by the 2021 summer peak, primarily located in the north west corner of the service territory. The cannabis industry is the main component of this growth, and the remainder of planned development is residential.

A ten-year growth forecast was developed based on a combination of planned developments and percentage load growth. A high growth scenario and a low growth scenario were developed to address future uncertainty. As shown in Table 23 and Figure 19, under the low growth scenario, peak load is projected to increase to 61.4 MW by 2025, and 63.8 MW by 2030. Under the high growth scenario, peak load is projected to increase to 63.6 MW by 2025, and 73.8 MW by 2030.

Table 23. Required Timing for Additional Feeders

	Total Load (MW)		Number of Feeders Required	
Year	**Low Load Growth**	**High Load Growth**	**Normal Supply**	**Single Contingency**
2021	57.1	57.6	**5**	**5+**
2022	58.6	59.7	**5**	**5+**
2023	59.8	61.4	**5**	**5+**
2024	60.7	63.0	**5**	**6**
2025	60.7	63.6	**5**	**6**
2026	61.4	65.5	**5**	**6**
2027	62.0	67.5	**5**	**6**
2028	62.6	69.5	**5**	**6**
2029	63.2	71.6	**5**	**6**
2030	63.8	73.8	**5**	**6**

Note: *"5+" refers to 5 feeders plus an additional 6.5MW of capacity from Beamsville TS*

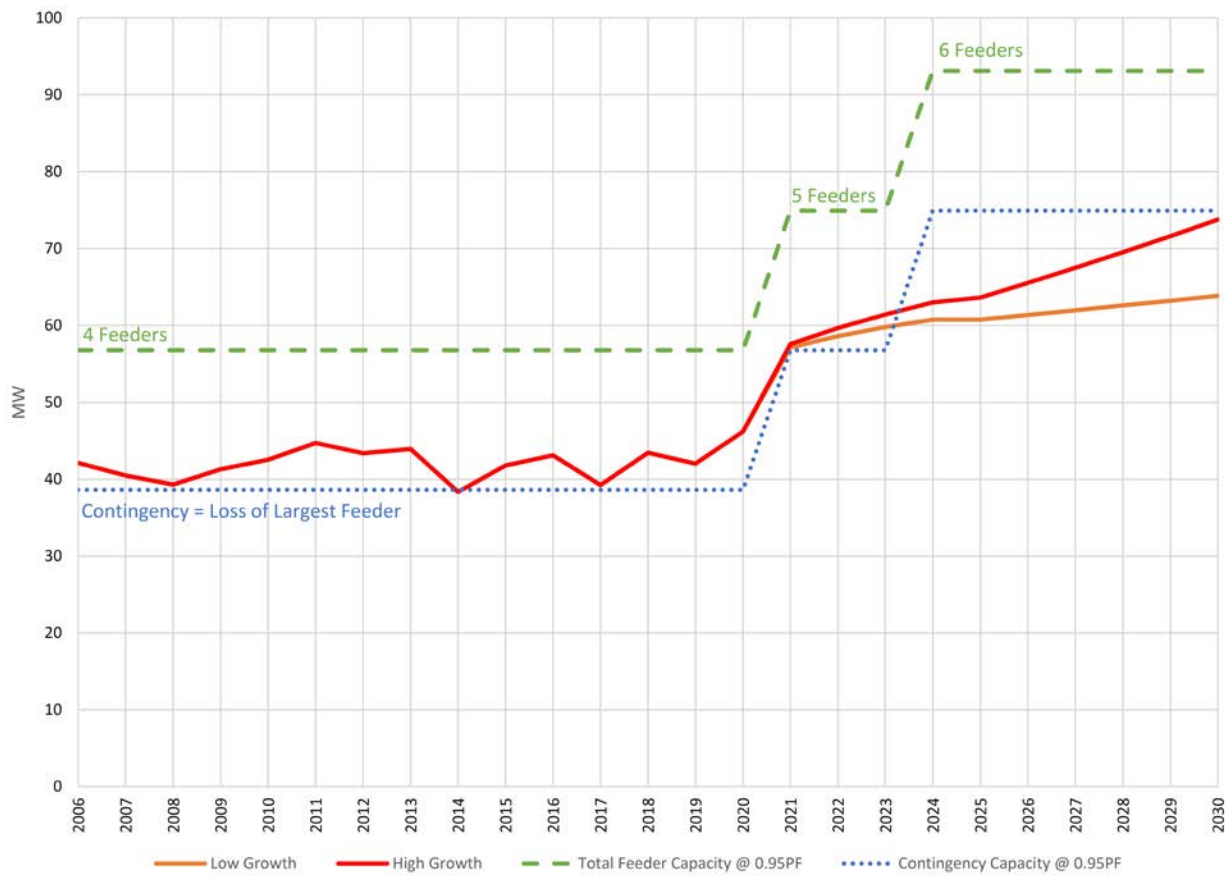


Figure 19. Load Forecast Vs Capacity

The load flow studies confirmed the need to add new facilities in order to meet the projected load growth. These facilities include addition of 2508M8 feeder (already committed and planned for completion in 2021), as well as 2508M7 feeder which has been budgeted in this DSP and planned for execution during the forecast period. The addition of 2508M7 is required by 2021, but can be deferred until 2024 by acquiring 6.5 MW (143 amps @ 0.95pf) of additional capacity from Hydro One Beamsville TS.

5.3.3 Asset lifecycle optimization policies and practices

In this section, GPI provides its asset lifecycle optimization policies and practices to support the investments put forward in this DSP on System Renewal, and its decisions to refurbish rather than replace system assets.

5.3.3a Asset lifecycle optimization policies and practices

GPI's policies and practices towards asset lifecycle optimization are derived from GPI's Asset Management Process described in section 5.3.1 in the DSP. In managing its distribution system assets, GPI's main objective can be summarized as to optimize performance of assets at a reasonable cost with due regard for system reliability, public & worker safety and customer service expectations.

GPI takes a lifecycle Asset Management approach as the basis for longer-term planning and predictable investment levels that optimize operational and financial risks. This lifecycle approach is holistic in nature and takes into consideration the combined implications of managing all types of assets, including physical assets, financial and human capital. GPI will focus on a System and Process approach of Asset Management and Planning, considering assets in their operating context, and optimizing the value of the overall assets system rather than the individual asset.

Electricity assets, like any other type of physical assets, have a lifecycle. The below describes how GPI assets are managed over their entire lifecycle, from conception to retirement:

<u>Asset Register</u>

GPI's ESRI based GIS is the designated asset register for field assets. The asset register is intended to hold/link to asset attribute information as well as linkages to historical financial and non-financial information over each asset's lifecycle.

<u>Asset Refurbishment/Replacement</u>

GPI considers a wide range of factors when deciding whether to refurbish or replace a distribution asset, including public and employee safety, service quality, rate impacts, maintenance costs, fault frequency, asset condition, and life expectancy so that investment in replacement plant is a prudent one. Plant is replaced at the end of life when all refurbishment options have been exhausted.

When an asset has reached end of life and the cost of maintenance and/or the frequency of service disruptions have reached an unacceptable or uneconomic level, the asset is identified for refurbishment or replacement. If the malfunction of these identified assets would create a significant safety, reliability or service impact, the assets are replaced within the current year's budget. Assets that have not reached their end of life are left in service and refurbished as required based on service reliability, condition assessment and regular inspections as required under the Distribution System Code. Fleet and other general plant assets are assessed through in-house developed approaches.

Replacement of end of life plant with new plant will still require the allocation of resources for ongoing O&M purposes. Repair would be the most significant O&M activity impacted by new plant. Certain assets, such as poles, offer few opportunities for repair related activities and generally require replacement when deemed at end of normal life or critically damaged.

Other assets such as direct buried cable offer opportunities for repair related activities (e.g. splices) up to a point where further repairs are not warranted due to end of life conditions. In a few areas cable faults will not be repaired due to cable end of life. When faulted, the faulted cable section will be replaced, normally a section between two distribution transformers.

For planned cable replacement in a subdivision, new primary cable installed in duct replaces direct buried primary cable and is expected to provide higher reliability and life. This will shift response activity for a cable failure from repair (O&M) to replacement (Capital). If assets approaching end of life are replaced at a rate that maintains equipment class average condition, then one would expect little or no change to O&M costs under no growth scenarios but would still see upward O&M cost pressure on positive growth scenarios (more cumulative assets to maintain each year). Replacement rates that improve equipment class average condition could result in lowering certain maintenance activities costs (e.g. pole testing, reactive repairs, etc.). Overall, this is expected to put downward pressure on O&M repair related costs.

Asset replacement is considered annually as part of GPI’s investment planning process along with the other capital projects scheduled for completion in the upcoming year. Mandatory asset replacements, due to near term significant safety or reliability issues are automatically included in the budget spend envelope. Non-Mandatory asset replacements are prioritized and scheduled. Non-Mandatory replacements provide a degree of planning flexibility to help keep annual capital expenditures stable. The outcomes of the investment planning process will align with the proposed budget or may indicate that the budget needs revision to adequately address underinvestment Risks. With increasing need to address assets at end of life, multi-year asset replacement programs have been structured to smooth out budget and resource impacts.

When assets are replaced as a result of system renewal investments, the new assets are incorporated into the inspection and maintenance programs. As the average health index of the group (i.e. poles) improves through system renewal investments, it should have a beneficial impact on how much effort is spent on reactive emergency maintenance.

Maintenance Planning

Distribution transformers are manufactured with the intent that there is no need to provide regular maintenance (maintenance-free) for the duration of their lifecycle. Generally speaking, they remain in service, providing continuous service until they reach the end of their lifecycle – they fail in service.

Some distribution assets remain in service delivering electricity with little required maintenance. However, a small percentage of the distribution assets, such as substation transformers do require regular maintenance. These transformers generally supply many hundreds or thousands of customers, and a failure would likely result in a lengthy outage and a significant number of resources to replace a failed unit. This maintenance involves regular condition testing, which highlights or identifies possible problems.

The inspection and maintenance of distribution assets is detailed in GPI's "Distribution System Maintenance and Inspection Program", attached as Appendix E. The maintenance and inspection program was introduced in 2006. The document is continuously updated with new information upon which maintenance or inspections of equipment are based. Maintenance standards in the program are built upon manufacturers' recommendations, industry regulatory requirements, industry best practices, and GPI's own experience with performing the maintenance or inspection.

The initial intent of the program is to build a knowledge base to provide enough information to make informed decisions on future maintenance activities. Initial intervals for maintenance may be changed, based on actual experience with field data collected. For example, most of the maintenance forms have the following questions, which are filled out by the maintainer:

> Indicate which one of the following statements applies to this particular maintenance activity:
> ☐ A The maintenance was unnecessary; it could have been done later
> ☐ B The maintenance was performed at the right time; only normal maintenance was required
> ☐ C The maintenance should have been done earlier; major faults were found

This process will allow GPI to collect information and base future intervals on the actual existing condition of the asset. In this way, the cost to perform maintenance can be optimized. The data collected from the maintenance provides valuable information upon which to base repair work, refurbishment activities, and asset replacement schedules.

In addition to actual asset maintenance, a number of programs exist to enhance the reliability of the assets, or to identify problems with assets. These programs include but not limited to:

- **Ultrasound and Infrared Thermography Inspection** – An ultrasound detection patrol was first conducted at GPI in 2005. The purpose of ultrasound detection is to identify poor electrical connections and overloaded equipment on the distribution system. Concerns detected were visually inspected and verified by the line crew. Since then, ultrasound detection has been added as a regular inspection technique. It is conducted on all pad-mounted transformers once every three (3) years in urban areas and once every six (6) years in rural areas. Critical items identified are corrected immediately and non-critical items are scheduled for repair in conjunction with other planned work.

  Infrared thermography can detect several conditions that may undermine the operational efficiency of your systems including overloads, loose connections, inductive heating, open circuits, unbalanced loads and defective equipment.

- **Line Clearing and Tree Trimming** – The purpose of this program is to clear all lines from encroachment of trees and branches to eliminate tree contact with lines. Tree contacts are a major cause of distribution system outages and momentary interruptions for GPI customers. This program cycles through the service territory on a five-year basis.

  In 2011, the program was changed to an area-by-area program. Currently, the schedule aims to complete each area at least once in a three-year period, subject to change based on conditions found. Bids are tendered out each year and GPI follows up with inspections to ensure that the contractor is performing the work to GPI standards.

- **Distribution System Plant Inspections and Ground Level Maintenance -** These inspections are regulated under the OEB Distribution System Code (DSC). The code specifies the minimum requirements to inspect urban areas on a 3-year cycle and rural areas on a 6-year cycle.

  GPI utilizes the same maintenance program and map as the Line Clearing and Tree Line Trimming program. The inspections involve a visit to each asset location. For overhead distribution plant this means every pole, and for underground distribution this means all pad mounted equipment. The visual inspection is to be completed by meeting the minimum requirements of the DSC. The GPI condition of assets will be documented by completing all required fields in the inspection database form.

- **Off Road High Voltage Line inspection and Maintenance -** Within the boundaries of Grimsby a number of line sections are off road and inaccessible by truck for parts of the year and in some cases all year round. All of these line sections are overhead and are located on unopened road allowances and private land. Inspection and maintenance of these lines is necessary on a regular basis to safeguard the reliability of the electrical supply. All sections are patrolled by foot once per year and inspected once every 10 years.

- **Switch Maintenance Program (Overhead and Pad Mounted) –** This program is to ensure the reliability of all switching devices in the electrical distribution system. The program maintains switches on a 3-year rotational basis. The program consists of physically cleaning, lubricating and ensuring the switch operates smoothly.

- **Transformer Station** – GPI completes weekly routine station inspections. Moreover, over a 5-year maintenance period at NW MTS, GPI undertakes the following scope of work:

  I- Visual / Non-Contact Inspections Main Outdoor/Indoor:
    - 230kV Structure / Insulators Inspection.
    - Ultra Sonic Survey: (All 230 – 27.6kV outdoor / indoor electrical equipment).
    - AREVA GIS SF6 Gas Pressure Inspection and Log Gauge Read-Outs. (Performed During Monthly Inspections)

  II- Thermographic Inspection:
    - 230kV Substation yard structure and connected equipment.
    - DC Battery Bank.
    - AREVA - 27.6kV Pfisterer connections.
    - Termination points at overhead riser pole locations.

  III- Transformers T1/T2 and Station Service SS1/SS2 - Mechanical Inspections:
    - Porcelain Insulator condition inspected for chips, cracks or tracking.
    - All current carrying connections inspected and tightened, as required.
    - Inspected the general physical condition, including any evidence of oil leaks.
    - Inspected all tank grounding cables.
    - Inspected the control box for debris, corrosion, moisture or any sign of overheating.
    - Inspected and recorded the lightning discharge counter readings.
    - Verified liquid level of the conservator.
    - Checked for and remove any debris from radiators.
    - Checked for and reported any paint damage and signs of rusting.
    - Visually checked all gauges.
    - Checked physical condition, operation and rotation of the cooling fan blades.
    - Cleaned any debris from fan housing.

- Inspected the condition of the Silica-Gel breather and the colour of the desiccant.

IV- Transformers T1/T2 Electrical Inspections:

- Turns ratio on all available tap positions by electrically operating OLTC through the upper and lower range limits.
- Winding resistance on high and low side windings – including attached neutral reactor.
- Insulation resistance on high and low side windings – including attached neutral reactor.
- Insulation resistance of the core.
- Polarization Index.
- Double power factor and capacitance tests:
    - Windings in accordance with IEEE method II.
    - 10kV winding excitation current.
    - Bushing C1 and C2 capacitance taps.
    - Lightning Arrester.
- Checked sudden pressure / rise, winding and oil temperature alarm and trip contacts.
- Current transformer tests:
    - Ratio.
    - Polarity.
    - Resistance.
    - Saturation.
    - Insulation Resistance.

VI- Transformers T1/T2 and Station Service SS1/SS2 Insulating Fluid Analysis:

- Dielectric Breakdown to ASTM D1816 – (2mm Gap).
- Water Content per ASTM D1533.
- Power Factor @ 25°C per ASTM D924.
- Interfacial Tension per ASTM D971.
- Acidity per ASTM D974.
- Colour per ASTM D1500.
- Visual per ASTM D1524.
- Dissolved Gas Analysis per ASTM D3612.
- Furan Analysis per ASTM D5837.

VII- SS1/SS2 - Station Service Switchgear:

- All switchgear components were thoroughly cleaned and inspected.
- The main disconnecting devices were exercised and lubricated.
- Contact Resistance of the main devices was measured.
- All cable and bus connections were inspected and tightened as required.
- All feeder and distribution devices were cleaned and inspected.
- Insulation resistance was measured.

- Current transformer and wiring was inspected.

VIII- Maintenance – Bus-B-230kV & Bus-Y-230kV

- 230kV switch/bus/insulators were inspected/cleaned – (power washed)/ lubricated and electrically tested

IX- 230/27.6kV - B-Bus & Y-Bus - Relay Protection

- Confirmed applied settings with current approved engineered setting sheets
- Simulated meter functions by secondary injection to verify the voltage and current ratios
- Calibrated as per the engineered approved settings and drawings
- Testing of all digital inputs and outputs as per schematic drawings
- Verified trip circuits via secondary injection
- On-load measurements and verification following energizing to confirm correct phasor relationship

X- DC Battery Bank:

- Check overall general condition of batteries, cabinet and charger
- Check for physical damage and evidence of corrosion
- Check inter-cell bus link integrity
- Verify the presence of flame arresters
- Check for proper battery support racks, mounting, anchorage and clearances
- Clean and grease battery posts as required and verify tightness of bolted electrical connections
- Verify all indicating lamps and alarms for proper operation
- Measure and record each cell voltage and total battery voltage with charger energized and in the float mode of operation
- Perform thermographic inspection under normal operation
- Perform a capacity load test in accordance with manufacturer's specifications or ANSI/IEEE 450

5.3.3b Asset lifecycle risk management policies and practices

GPI’s Distribution System Maintenance and Inspection Program document is aimed, in part, at protecting the public from physical, electrical, and environmental hazards, by maintaining a schedule of regular asset inspections and maintenance activities.

GPI’s Asset Condition Assessment (ACA) utilizes the results of the asset condition inspections and the comprehensive data collection to formulate the assessment of the condition or health of assets in each of GPI’s asset classes. This assessment determines the risk of failure on GPI’s assets which is then used to formulate asset investment plans directed to mitigating specific GPI and its customers risk of asset failure and then prioritize these asset management plans to maximize the risk mitigation. GPI plans to continuously improve the ACA by continuing annual inspections, and proactively expanding GPI's data collection for additional assets as GPI's equipment base increases.

Ontario Regulation 22/04 - Electrical Distribution Safety is a key regulation that requires GPI and all other LDCs maintain the distribution system safely including approval and installation of assets compliant with industry standards and construction standards. Moreover, it lays out requirements for construction verification programs to safeguard the public from hazards associated with the distribution system. The Electrical Safety Authority (ESA) is responsible for enforcing the regulation and is ensured through a system of annual audits and regular field inspections.

GPI promotes excellence in health and safety management in order to prevent losses to people, assets, environment, and reputation. Keys to this H&S Management system are the evaluation of risk for all workplace hazards, regular H&S meetings with staff, and feedback on losses or near losses occurring in the workplace.

Moreover, GPI follows all regulatory requirements and guidelines to ensure the distribution system has a low risk impact on the environment. A series of key assumptions form the basis of the development of this DSP. These key assumptions, provide a foundation for planning and forecasting predictions of future activities, whether to maintain, replace or develop new assets (discretionary capital projects).

The key assumptions for this DSP are as follows:

- Electricity growth rates will continue to be low in the next five (5) years due to an economy in recovery and the impact of the Conservation and Demand Management (CDM) Programs in lowering demand and electricity usage. Appendix J provides information about the electricity growth rate based on load forecast model.
- Renewable Energy Generation will not drastically impact the system.
- Recognition that the economy and future economic development of the Town of Grimsby depends on a secure and reliable supply of electricity.
- In the next five (5) years, regulatory activities by the Ontario Energy Board (OEB) will continue at the current pace putting a heavy strain on GPI's resources.
- Present service levels will continue to be improved, but will remain in balance with customer needs, price quality trade-offs, and industry best practice(s). Service levels may change as a result of continuing efforts by the OEB to quantify certain measures as are

contained in the LDC's Scorecard. There is a certain degree of uncertainty with respect to where the measures of the Scorecard will lead performance outcomes, as the OEB entertains comparing utilities' performance metrics.

- GPI's DSP is a strategic document to convey future distribution system development and maintenance plans to stakeholders.
- GPI's asset management systems will continue to evolve, in order to process performance information to meet demand, capacity, security, and reliability levels in a timely manner.
- Use of outside line construction firms to perform distribution maintenance, replace, and install assets (as prescribed by work plans of projects) will continue and will ensure major components of work are completed at competitive price levels.
- Compliance with relevant regulatory requirements, as they pertain to electricity rates, filing requirements, health & safety, and environmental protection, will be maintained.
- Meeting the requirements of our Shareholder by achieving the objectives set in GPI's mission statement.
- Asset management planning involves forecasts based on information collected from many sources. Distribution system development for the next five (5) years has been projected; however, some planning areas in the last three (3) years of the plan are less certain and are based solely on trending.

5.3.4 System Capability Assessment for Renewable Energy Generation

GPI has not identified the need for renewable generation enabling capital expansion expenditures. GPI is aware of the capacity of its feeders to accept generation and currently does not have any constraints. There are no other REG investments contemplated at this time.

The Ontario Energy Board Scorecard indicates that Grimsby Power achieved 100% of 'Renewable Generation Connection Impact Assessments ("CIA") Completed On Time' in all applicable years. GPI also scored 100% each year between 2015 and 2019 on 'New Micro-Embedded Generation Facilities Connected on Time".

5.3.4a Renewable Generator Applications over 10 kW

As of end of 2020, excluding net metered connections, GPI connected 8 Micro-Embedded Generation Facilities totalling 72.8kW, and 1 Embedded Generation Facilities totalling 280kW. Table 24 below summarizes all the REG connections during the historical period (2016-2020):

Table 24. GPI REG Connections During Historical Period

Connection Type / Program	Sites Connected to Grid									
	2016		2017		2018		2019		2020	
	#	Total Capacity (kW)	#	Total Capacity (kW)	#	Total Capacity (kW)	#	Total Capacity (kW)	#	Total Capacity (kW)
Micro-Embedded Generation Facility Connection (<10kW)	2	20	3	27.6	2	15.2	-	-	1	10
Embedded Generation Facility Connection (>10kW)	-	-	-	-	1	280	-	-	-	-
Net Metered	1	10	1	100	1	100	1	22.8	-	-
TOTAL	**3**	**30**	**4**	**127.6**	**4**	**395.2**	**1**	**22.8**	**1**	**10**

5.3.4b Anticipated Number & Capacity of REG Connections 2022-2026

Based on historical trend, GPI does not anticipate more than 2 micro-embedded connections per year, which poses minimal impact to GPI's system. GPI does not expect this activity to be increased due to discontinuation of IESO FIT and MicroFIT programs. Moreover, GPI also does not expect any large FIT connections during the forecast period of the DSP.

5.3.4c REG Connection Capacity (MW)

GPI has available system capacity and will be able to accommodate the REG connections within the five-year planning period of the DSP. Refer to section 5.3.2d in this DSP for feeder loading details.

5.3.4d REG Connection Constraints

There are no upstream constraints limiting the ability to connect REGs.

5.3.4e Embedded Distributor Connection Constraints

GPI has one embedded distributor, Niagara Peninsula Energy Inc. (NPEI), who has two 27.6kV circuits from Niagara West MTS. Currently there are no current or known or future constraints for NPEI.

5.4 Capital Expenditure Plan

This section details GPI's Capital Expenditure Plan, which provides justification for proposed investment on its distribution system as well as general plant over the five years of the forecast period (i.e. 2022 through 2026) of this DSP.

5.4a Capital Expenditure Plans – Customer Engagement Activities

Customer engagement is considered essential to achieving GPI's Customer Focus outcomes. As described in section 5.2.1b of this DSP, GPI uses a variety of activities to engage customers and determine their preferences for the development of GPI's distribution system going forward. In addition to the Customer Surveys, Meetings with Commercial and Industrial Customers, Corporate Website, and Bill Inserts mentioned in section 5.2.1b, GPI also leverages the following mediums:

- **North Niagara Public Utilities Co-ordinating Committee (NNPUCC) Membership -** Members of this committee include the Town of Grimsby, Town of Lincoln, Township of West Lincoln, Town of Niagara on the Lake, Region of Niagara, Bell Canada, Cogeco, Niagara Regional Broadband Network (NRBN), Enbridge Gas, Niagara on the Lake Hydro and NPEI. The NNPUCC is a committee that meets approximately seven times per year to discuss topics including new subdivision development, road widening projects, commercial development, etc. Information sources from this group come from its members, builders, and developers. The main benefits of this committee are to identify the impacts of development as it relates to providing the utilities services requested by these customers and to coordinate activities between the utilities present.

- **Access to Interval Meter Data** – GPI offers a service (from an outside company) to provide meter reading with hourly readings. Companies can log on to a database to see their usage and can adjust the reporting parameters to acquire the information needed.

- **Conservation and Demand Management ("CDM") Programs** – GPI remains diligent in promoting and engaging customers through its CDM programs through a variety of outreach efforts, including the placement of ads in municipal publications, marketing material displays in keys areas of all municipal and community outreach events. GPI has engaged Burman Energy Consultants Group to administer CDM programs for GPI customers.

In carrying out distribution activities to support the Corporate Mission and Vision statements, stakeholder/customer interests have to be considered and factored into the short and long term planning processes. Stakeholder interests vary and at times can be either complementary or conflicting. As a part of the planning process, some basic assumptions are made about the stakeholder interests. The assumptions represent high level utility assessments of key stakeholder class attributes that the utility has observed from many years of historical interaction with each respective stakeholder group. The assumptions and related stakeholder interests are shown in Table 25 below:

Table 25. Stakeholder Needs, Interests, and Perceptions

Stakeholders	Stakeholder Needs	Stakeholder Interests	Stakeholder Perception of Planning Risks
GPI Employees	Safe and stable work environment; skills development	Long term productive relationship with employer	Employment instability; unsafe work environment
Shareholders	Stable rate of return	Safe long-term investment	Financial and political pitfalls
IESO	Accurate load forecasting; accurate real-time information and market rule compliance by market participants	Comprehensive utility forecasting process; LDC adherence to technical and communication protocols	Inaccurate information contribution to Regional planning processes; inaccurate or untimely information for market operations
HONI	Information to determine short, medium and long term local and regional infrastructure needs.	Coordination of transmission and distribution growth needs; LDC participation in Regional Planning	Inaccurate forecasts affecting resource commitments; Inaccurate information contribution to Regional planning processes
Generators	Stable market and ability to connect to distribution system	Clear rules and processes for connection	Distribution congestion affecting plant location and costs
Retailers	Reliable supply to customers; efficient business processes	Maximize contract revenues; customer relationship	Loss of revenue; loss of customers
Provincial Government	Efficient, low cost and reliable market	Reliable supply to stimulate growth and political goodwill	Localized negative political impact
OEB	Efficient, low cost and reliable market; regulator compliance	Minimization of regulatory intervention	Regulatory intervention and political impact risks

ESA	Public electrical safety	Utility construction built to Reg. 22/04	Public safety Risk if plant not built/maintained to code(s)
Municipalities(non-shareholders)	Reliable supply to customers	Consultations on activities within municipal boundaries; visual aesthetics	Supply/reliability shortfalls affecting their constituents
Residential Customer	Reliable supply and low rates	Aesthetics	Supply/reliability shortfalls; price concerns
Small Commercial	Reliable supply and low rates	Rate stabilization or reduction	Supply/reliability shortfalls; price concerns affecting business plans
Large Commercial/Industrial	Reliable supply and low rates	Rate stabilization or reduction	Supply/reliability shortfalls; price concerns affecting business plans

5.4b Capital Expenditure Plans – System Development

GPI has developed its system in a manner that addresses known and estimated customer load growth, anticipated climate changes, and utilizing grid modernization mechanisms. GPI considers all viable alternatives for resolving system capacity issues or operational constraints. For all identified issues and constraints, a “do-nothing” alternative is considered in order to determine whether the risks associated with the issue/constraint merit any significant investment. Once a capacity issue or operational constraint has been identified for which “do-nothing” is not an acceptable approach, GPI considers all reasonable alternatives to resolve the issue.

In terms of assumptions associated with Town of Grimsby, GPI assumes that projects approved by the Town in the current year will proceed as indicated in the Town's approved budget documents. For Town projects in forecast years, GPI assumes that projects that have appeared in prior forecasts whose timing remains unchanged are likely to proceed in the Town's planned forecast year. New projects forecast to proceed in the next two years are also assumed to be likely to proceed in the Town's planned forecast year. Town projects that are more than five years into the forecast are assumed to be tentative.

In terms of customer forecasts, GPI assumes that information from developers is likely to proceed as per any plans shared with GPI. For individual commercial and/or industrial customers, GPI assumes that these customers will share information with GPI on timing and capacity no more than a year in advance. GPI assumes that this kind of development will keep pace with the most recent historical trends.

Moreover, GPI also assumes that new Go Rail Expansion that goes through GPI's service territory as highlighted in Schedule 5 of Ontario Place to Grow (See Appendix M), as well as accommodating service to the new Grimsby Go Station will proceed as planned. Customer servicing obligations are a key objective in GPI's planning objectives.

GPI does expect capacity related issues within the distribution system over the 5-year planning horizon, and has put a plan in place to add new feeders (1 feeder ongoing, and 1 planned for 2023) to stay within required capacity thresholds. The Regional Planning Process is expected to result in a more formal approach for considering upstream transmission system capacity constraints. This process has not started yet and will be addressed later.

At this point in time GPI expects no system development requirements due to REG projects over the forecast period.

5.4.1 Capital expenditure planning process overview

GPI's capital objectives flow from GPI's corporate objectives, vision, mission and values. In priority order, the capital objectives are:

1. Facilitate and enable customer connections including load and generation connections.
2. Ensure all regulatory obligations are met including those required by the OEB, Measurement Canada, Electrical Safety Authority and other jurisdictions having authority.
3. Manage existing assets through their normal lifecycle including installation, inspection, repair, refurbishment, relocation and renewal as required.
4. Optimize systems including business processes and business tools to manage the business and retain value.
5. Invest in the support systems such as the non-distribution system assets like buildings, land, vehicles, computer hardware and software required to operate the business.

Table 26 shows the linkage between GPI's asset management objectives and GPI's capital objectives.

Table 26. GPI's Asset Management Objectives and Capital Objectives

GPI Asset Management Objective	GPI Capital Objectives
Construct, maintain and operate all assets in a safe manner	● Facilitate and enable customer connections including load and generation connections. ● Ensure all regulatory obligations are met including those required by the OEB, Measurement Canada, Electrical Safety Authority and other jurisdictions having authority. ● Manage existing assets through their normal lifecycle including installation, inspection, repair, refurbishment, relocation and renewal as required. ● Invest in the support systems such as the non-distribution system assets like buildings, lands, vehicles, computer hardware and software required to operate the business.
Monitor and address asset condition issues in a timely manner to ensure the continued reliable supply of electricity delivery; ensure alignment with regional planning purposes	● Ensure all regulatory obligations are met including those required by the OEB, Measurement Canada, Electrical Safety Authority and other jurisdictions having authority. ● Manage existing assets through their normal lifecycle including installation, inspection, repair, refurbishment, relocation and renewal as required. ● Invest in the support systems such as the non-distribution system assets like buildings, land, vehicles, computer hardware and software required to operate the business.
Ensure that decisions on capital investments and maintenance plans support GPI's desired outcomes in a cost-effective manner and provides value to the customer	● Manage existing assets through their normal lifecycle including installation, inspection, repair, refurbishment, relocation and renewal as required. ● Optimize systems including business processes and business tools to manage the business and retain value. ● Invest in the support systems such as the non-distribution system assets like buildings, land, vehicles, computer hardware and software required to operate the business.
Manage investment planning to mitigate rate impacts while maintaining corporate financial stability and long-term sustainable performance	● Manage existing assets through their normal lifecycle including installation, inspection, repair, refurbishment, relocation and renewal as required. ● Optimize systems including business processes and business tools to manage the business and retain value. ● Invest in the support systems such as the non-distribution system assets like buildings, land, vehicles, computer hardware and software required to operate the business.

Ensure responsiveness to public policy requirements and objectives; facilitation of new renewable generation; facilitation of the smart grid	● Facilitate and enable customer connections including load and generation connections. ● Ensure all regulatory obligations are met including those required by the OEB, Measurement Canada, Electrical Safety Authority and other jurisdictions having authority. ● Invest in the support systems such as the non-distribution system assets like buildings, lands, vehicles, computer hardware and software required to operate the business.

The assumptions made in the GPI investment decisions are based on the best available data which are obtained through many sources including field collection, analysis and consultation.

5.4.1a Risk management and its correlation to the capital expenditure plan

During the planning process of the DSP, a Business Risk Management approach was leveraged to identify residual operational risks relative to current performance outcomes. Some of the factors in consideration during the planning process include service reliability, safety, obsolescence, operational and environment considerations. Figure 20 below summarizes the overall asset planning approach.

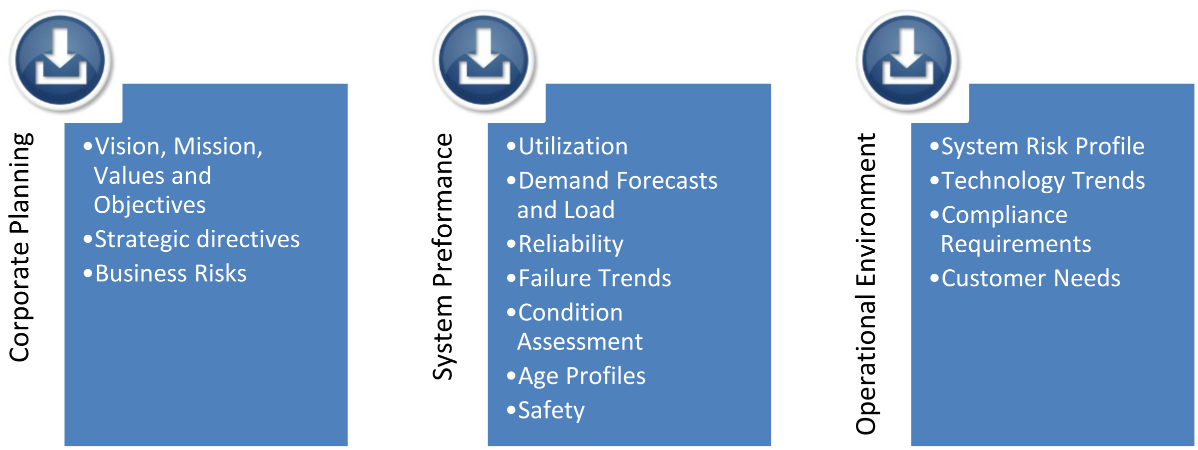


Figure 20. Risks Components in Asset Planning Approach

Distribution planning is not a static process; as circumstances affecting GPI assets change (e.g. standards, knowledge, etc..), there are likely to be changes in projects and programs, and changes to the level of expenditures.

System Risk Profile, as reflected in asset management planning includes operational risks, natural environmental events, cyber security risks, regulatory and legal risks, and risks associated with the different lifecycle stages of an asset.

GPI's Distribution System Maintenance and Inspection Program (See Appendix E) document is aimed, in part, at managing risks associated with protecting the public from physical, electrical, and environmental hazards by maintaining a schedule of regular asset inspections and maintenance activities.

GPI developed a detailed emergency plan (See Appendix K) for distribution system risks associated with weather, equipment failure, vehicular damage, acts of sabotage, etc.. Distribution system resiliency to climate change is a risk that GPI is continuously considering, and efforts to mitigate this risk is associated with efficient system renewal, and designing and building to the latest industry standards.

GPI also developed several cyber security policies including Cellular Device Policy, Internet Usage Policy, and Use of Computer Resources Policy (See Appendix L1, Appendix L2, and Appendix L3) to mitigate cyber security risks.

5.4.1b Process for Identification, selection, prioritization and pacing of investments

GPI's Distribution System Plan details the program of system investment decisions developed on the basis of information derived from GPI's asset management and capital expenditure planning process.

GPI takes a prudent, cost-effective approach to asset management and capital planning to align with the overarching goal mandated by the utility's mission statement. Safety and reliability are the first considerations in capital planning. Customer satisfaction is a key to providing distribution excellence. As a result, customer driven projects are also given high priority in the planning process. As part of the planning process, the engineering and operations departments prepare detailed project sheets and budgets for each project. GPI's annually approved the coming year's budget and reviews the full five-year financial forecast.

GPI service territory has seen modest growth over the past number of years. This growth primarily comes in the form of system access projects for new residential development and commercial/industrial connections. The capital planning process strikes a balance between system renewal, system service project and general plant projects to ensure that the distribution system will support the growth in the Town. The utility includes customer driven (System Access) projects to ensure regulatory requirements are met. Some factors that affect decision making and drive projects include:

- System access projects required to meet DSC obligations;
- Regulatory obligations (e.g. municipal road widening);
- System renewal projects are, in the case of failure, required in order to maintain service and, in cases of assets nearing the end of life, required to maintain current levels of reliability performance;
- Asset condition - What are the conditions of the asset or asset group? Is there a public safety risk in allowing deteriorated assets to remain in service?
- System service projects, are usually required in order to improve customer (both current and future) experience;
- Load growth - Where is load growth planned? What does municipal planning have scheduled?
- System optimizations - What can we do to optimize the expenditures and have the greatest impact? Determine key locations for automated switches?
- System constrains - Do we have constrained areas of the distribution system that would make it difficult to perform switching operations?
- General plant projects are required in order to improve GPI's efficiency.

Project Identification

The projects that GPI selects for its capital budget are the ones that are required to ensure the safety, efficiency, and reliability of its distribution system to allow GPI to carry out its obligation to distribute electricity within its service area as defined by the Distribution System Code.

System Access projects such as development and municipal plant pole relocation projects are identified throughout the year by external proponents. Most of these projects are mandatory in nature and are budgeted and scheduled to meet the timing needs of the external proponents.

System renewal projects are non-mandatory in nature and are identified through GPI’s Asset Management process. The project needs for a particular period are supported by a combination of asset inspection, individual asset performance, and asset condition assessments.

System Service projects are non-mandatory in nature and are identified through GPI’s Asset Management process and operational needs to ensure that any forecasted load changes that constrain the ability of the system to provide consistent service delivery are dealt with in a timely manner.

General plant projects, such as fleet vehicle acquisition or replacement, software/hardware, etc., are non-mandatory in nature and are identified internally by specific departments (engineering, finance, operations, administration, etc.) and supported through specific business cases for the particular need.

Project Selection and Prioritization

As per GPI's planning process, various inputs are used to determine priority of project execution which are heavily influenced by safety and reliability. GPI has prepared a detailed emergency plan (See Appendix K), and is leveraged as an input for prioritizing reliability driven projects.

Mandatory projects are automatically selected and prioritized based on externally driven schedules and needs. Most System Access projects fall into this category and may involve multi-year investments to meet proponent needs. Pole relocations due to road widening are examples of this.

Non-mandatory projects are selected and prioritized based on value and risk assessments for each project. Most System Renewal, System Service and General Plant projects fall into this category and some projects, such as System Renewal – Poles, may involve multi-year program investments to meet Asset Management objective needs.

5.4.1c Methods and criteria used to prioritize REG investments

The prioritization process for REG expansions is the same as for distribution system expansion projects where the REG expansion is triggered and driven by customer requirements.

When GPI is required to do an expansion or enhancement to the distribution system to connect an embedded generation facility, the provisions of the OEB DSC Section 3.2 will apply. GPI will perform an economic evaluation to determine the generator's share of the present value of the projected capital costs and ongoing maintenance costs of the expansion. GPI assumes that future revenue and avoided costs will be zero.

GPI does not plan to connect any GPI owned renewable generation during the period covered by the Distribution System Plan.

5.4.1d GPI policy and procedure on incorporating Non-distribution system alternatives

GPI does not have any specific policy or procedure related to utilizing non-distribution system alternatives for system capacity or operational constraint relief. GPI's activities in this area are delivered through the facilitation of distributed generation connection.

The amount of distributed generation impact, during the period of the Distribution System Plan does not offer any significant capacity or operational constraint relief to GPI's distribution system.

GPI actively participates in the Regional Planning process to identify any system capacity or operational constraint relief that can be achieved through cooperative planning and program execution with regional distributors and transmitters.

GPI notes that non-distribution investments to relieve capacity or operational constraints need to be optimal solutions. The solution must be optimal with respect to the uncertainty of future system loading. The non-distribution system investments need to ensure that distribution system investments can be deferred by a specific duration with certainty. Future uncertainties about local distribution capacity demand need to be factored into the value of the non-distribution system investment.

5.4.1e Strategy to implement cost-effective modernization of the distribution system

GPI's strategy implemented the following cost-effective modernization initiatives:

Customer Account Portal – Grimsby Power has offered a portal to provide quick and easy access to electricity consumption and cost information for customers of Grimsby Power and access to e-billing. In 2021 Grimsby Power will launch a new portal that combines access to online bills, up to date account information and consumption history. With the Harris Silverblaze Customer Account portal, customers can view their usage and costs at multiple levels of detail (e.g., hourly, daily, monthly, bill period) in a variety of graphical and, tabular formats. They can also set up usage and cost alerts to help customers in monitoring and managing their electricity consumption. Also, as customers have asked for, the portal will show up to day account information including payments on the account and easy links to make payments online.

- **Utilismart Commercial & Industrial Energy Manager** – Grimsby Power now offers its large commercial customers easy access to consumption and demand data. The C & I Energy Manager portal offers reports that allow commercial and industrial customers to better manage their energy use. It is ideal for large users of energy with considerable energy bills and complex loads to manage. C&I Energy Manager delivers energy reports, tracks peak demand and power factor and consumption as well as energy costs all in a single, user friendly portal.

- **Outage Management System** – GPI is focussing on investing in general assets that support the type of services customers have been requesting (e.g., Outage Management System, outage reporting). The enhancement of GPI's Outage Management System (OMS) will augment the SCADA capabilities by more quickly identifying the location of outages thereby making the restoration dispatch more efficient. GPI will implement an OMS that, integrated with other systems (CIS, SCADA, GIS), facilitates and streamlines the communications and improve efficiency.

- **GIS Enhancements** – GPI is continuously enhancing the capabilities of the GIS to leverage technology enabling opportunities to increase operational efficiencies and optimize asset management processes.

- **GPI's Supervisory Control and Data Acquisition (SCADA)** system is a computer system that collects and analyzes real time data used to monitor and control GPI's distribution electrical system. Enhancement of existing SCADA system provides cost savings by quickly identifying electrical system problems so that they can be addressed and avoid incurring extra costs. The SCADA system also aids in the efficient and cost-effective day to day operation of GPI's distribution system.

- **The installation of sectionalizers and fault detectors** on GPI's electrical distribution system provides a cost-effective way of locating problems such as storm damage to distribution lines so that restoration can be more quickly affected. Also, sectionalizers provide GPI with the ability to isolate electrical problems on distribution lines so that the rest of its distribution system can continue to operate, thereby providing savings of potentially costly outages to its customers.

- **The installation of reclosers** will provide efficiencies and cost savings associated with outage containment, feeder patrols and restoration expenses (i.e. fuse replacement). Reclosers reduce the impact of transient and sustained interruptions by sensing fault current and responding accordingly. If a fault is transient in nature, the reclosers will restore power automatically to the affected section of line, hence reducing frequency of fuse operations and the need to dispatch trouble crews to patrol, locate and refuse affected portion of line. In addition, recloser placement will sectionalize feeders hence limiting service outages to smaller segments of the system for sustained interruptions. In the absence of recloses, breaker-level faults require crews to patrol the entire feeder to locate the fault. Reclosers can reduce the amount of time and resources required to locate a fault.

5.4.1.1 Rate-funded activities to defer distribution infrastructure

Proposed distribution rate funded programs may consist of:

1. CDM programs that target peak demand (kW) reductions to address a local constraint of GPI's distribution system.

2. Demand response programs whose primary purpose is peak demand reduction in order to defer capital investment for specific GPI distribution infrastructure.

3. Programs to improve the efficiency of the distribution system and reduce distribution losses. (i.e. re-conductor to larger size, voltage conversion, etc.).

4. Energy storage programs whose primary purpose is to defer specific capital spending for the GPI distribution system.

5.4.1.1a CDM programs to target peak demand (kW) reduction

Rate-funded programs are now administered through IESO.

5.4.1.1b Demand Response programs to defer distributions infrastructure

GPI has no demand response programs to defer distributions infrastructure. However, as mentioned in section 5.4a, GPI remains diligent in promoting and engaging customers through its CDM programs, and GPI has two with a potential third customer that will enroll in the IESO Industrial Conservation Initiative and become Class A customer.

5.4.1.1c Programs to improve efficiency and reduce losses

System losses and asset utilization are within guidelines. There are no specific CDM rate-funded programs to improve the efficiency of the distribution system. Opportunistic improvements to distribution system efficiency, in conjunction with other investment needs, are considered.

During the historical period, GPI completed a number of 4.8kV voltage conversion projects to target improvement of system reliability, loss reduction, and capacity. Voltage conversion projects typically contain assets considered to be at or near end-of-life status, requiring full rebuild as part of the conversion to 16kV supply. There is only one area with 4.8kV supply outstanding in GPI's distribution system and the goal is to complete this last portion during the forecast period. Once completed, GPI's distribution system will operate entirely at a primary voltage of 16.0/27.6kV to better accommodate future higher density load growth in different areas of the Town of Grimsby. This will also standardize the configuration of GPI's distribution system at an increased voltage level which will reduce the cost of electrical losses on the distribution system.

GPI's Supervisory Control and Data Acquisition (SCADA) system collects and analyzes real time data from SCADA connected distribution devices. (i.e. reclosers, smart faulted circuit indicators, etc.) which can be used to monitor and control GPI's distribution electrical system. The efficiency of the SCADA system is limited by the amount of devices connected to it. By increasing the volume of SCADA connected devices, GPI will be able to increase operational efficiencies and cost savings associated with operations effectiveness, system resilience, outage containment, reduced feeder patrols, and reduced restoration expenses. Moreover, it will enhance GPIs ability to troubleshoot system issues and conduct system performance forensic analysis.

The enhancement of GPI's Outage Management System (OMS) will augment the SCADA capabilities by more quickly identifying the location of outages thereby making the restoration dispatch more efficient. GPI will implement an OMS that, integrated with other systems (CIS, SCADA, GIS), would facilitate and streamline the communications and improve efficiency.

5.4.1.1d Energy storage programs to defer capital spending

There are no rate-funded energy storage programs to defer capital spending.

5.4.2 Capital expenditure summary

The Capital Expenditure Summary (See Tables 27 and 28) provide a ‘snapshot’ of GPI’s capital expenditures over the DSP 10-year period referenced in section 5.2.1d, including the historical and forecast years using Chapter 2 Appendix 2-AB

For ‘summary’ purposes the entire costs of individual projects or activities are allocated to one of four investment categories on the basis of the primary (i.e. initial or ‘trigger’) driver of the investment. The investment categories are:

1. System Access
2. System Renewal
3. System Service
4. General Plant

Table 27 – Capital Expenditure Summary (Historical Period) Using Chapter 2 Appendix 2-AB

CATEGORY	**Historical Period** (Previous plan[1] & actual)																	
	2016			**2017**			**2018**			**2019**			**2020**			**2021**		
	Plan	**Actual**	**Var**	**Plan**	**Actual**	**Var**	**Plan**	**Actual**	**Var**	**Plan**	**Actual**	**Var**	**Plan**	**Actual**	**Var**	**Plan**	**Actual2**	**Var**
	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%
System Access	977	600	-38.6%	995	1,287	29.3%	967	762	-21.2%	906	478	-47.3%	839	740	-11.9%		662	-
System Renewal	205	209	2.1%	918	208	-77.3%	977	565	-42.1%	1,062	1,069	0.7%	1,067	661	-38.1%		1,022	-
System Service	178	53	-70.0%	399	371	-7.1%	409	71	-82.6%	421	482	14.6%	428	286	-33.1%		683	-
General Plant	711	570	-19.8%	202	326	61.2%	170	507	198.2%	173	382	120.0%	177	278	56.9%		216	-
TOTAL EXPENDITURE	2,071	1,433	-30.8%	2,515	2,193	-12.8%	2,523	1,905	-24.5%	2,562	2,410	-5.9%	2,511	1,965	-21.8%		2,583	-
Capital Contributions	- 561	- 304	-45.8%	- 572	- 724	26.5%	- 554	- 363	-34.4%	- 518	- 214	-58.7%	- 482	- 462	-4.3%		- 345	-
Net Capital Expenditures	1,510	1,129	-25.3%	1,943	1,469	-24.4%	1,969	1,541	-21.7%	2,044	2,197	7.5%	2,029	1,503	-25.9%		2,238	-
System O&M	1,448	1,287	-11.1%	1,709	1,298	-24.0%	1,777	1,502	-15.5%	1,848	1,472	-20.4%	1,922	1,584	-17.6%		1,475	-

Table 28 – Capital Expenditure Summary (Forecast Period) Using Chapter 2 Appendix 2-AB

CATEGORY	**Forecast Period** (planned)				
	2022	**2023**	**2024**	**2025**	**2026**
	$ '000				
System Access	883	713	550	605	611
System Renewal	1,871	891	1,304	1,295	1,443
System Service	82	1,138	611	362	231
General Plant	101	391	204	397	396
TOTAL EXPENDITURE	2,937	3,133	2,670	2,659	2,680
Capital Contributions	- 423	- 327	- 322	- 347	- 354
Net Capital Expenditures	2,513	2,806	2,348	2,312	2,326
System O&M	1,559	1,681	1,714	1,749	1,784

Table 29 provides a detailed summary on a project and program level during the historical period as well as bridge year. Table 29 provides the summary using Chapter 2 Appendix 2-AA

Table 29 – Capital Expenditure Summary Using Chapter 2 Appendix 2-AA

Projects	2016	2017	2018	2019	2020	2021 Bridge Year
Reporting Basis	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**
System Access						
Residential Expansion	449,288	1,069,380	623,006	274,825	627,134	498,127
Project - New Customer Connections	62,147	25,395	74,406	76,580	65,127	77,947
Project - Residential Subdivision Development	50,438	101,452	24,861	43,717	7,064	74,738
Program - Modifications to Existing Customer Connections	9,784	18,602	12,283	82,504	40,458	10,881
Project - Metrolinx - Pole Line Relocation Due to Road Widening at Casablanca Blvd & Livingston Ave.						
Program - Transformer Station - Modifications to Support Renewable Generation		64,871				
Program - Replace >50kW form Meters with Smart INTRVL	28,400		27,905			
Project - Load Transfer Elimination and Pole Line Relocation/Reconfiguration		7,718				
Sub-Total	600,057	1,287,418	762,461	477,626	739,783	661,693
System Renewal						
Program - Replace Defective Poles	67,972	81,748	119,410	258,744	251,174	286,591
Program - Secondary Bus Refurbishments		8,498			175,417	66,333
Program - Replace Sectionalizing Terminal	10,188	10,888	10,732	13,917	31,695	38,039
Program - Replace Gang Operated Load Break Switch	26,241		30,449	44,438		30,228
Program - Primary Cable Testing	69,822			125,739		
Program - Replace Pad Mounted Transformers	32,807	78,218	114,166	168,694	56,740	79,624
Program - Primary Cable Silicon Injection		15,833	4,440		38,815	
Program - Meter Replacements	2,016	13,136				
Program - Rear Lot Conversion					12,760	258,550
Program - Niagara West MTS			51,370	33,398	11,705	50,000
Program - Voltage Conversion			206,035	424,387	62,182	
Project - CNR Pole Line (18M4 Feeder) Relocation / Rerouting			28,017		20,557	212,517
Sub-Total	209,047	208,320	564,621	1,069,317	661,046	1,021,882
System Service						
Program - Primary OH Conductor and UG Cable Reinforcements					166,954	84,098
Program - Convert Radial Feeder Customers to Loop		544	70,613			
Project - Third Feeder from NW-MTS				99,969	36,927	599,015
Project - NWTS Automation & Improvements	53,323	173,785		45,770	82,271	
Project - Automate Primary 3 Phase Switches - Install Reclosures		38,625				
Project - Replace Manually Operated Pad Mounted Switchgear with an Automated/Remote Controlled PVI		157,717		103,447		
Project - Pole Line Upgrade				233,275		
Sub-Total	53,323	370,672	70,613	482,460	286,152	683,114
General Plant						
Program - Computer Workstations	8,805	13,758	3,695	14,380	23,428	9,000
Program - Server/Network Hardware Upgrades due to Cyber Security				36,301	22,796	10,000
Software	36,259	28,702	24,245		39,370	15,000
Project - SCADA System and Improvements		194,995	63,985	65,044	26,636	21,040
Vehicle - Trucks & Forklift	359,940	49,063	373,868	198,425	123,960	87,000
Building Upgrades	142,411	27,259	21,137	10,399	17,819	15,000
Office Furniture			6,432			10,000
NWTS - Upgrades		6,468	8,256	280		
Tools - Replacement	22,561		4,121	49,998	15,009	39,000
Communication Equipment	260	5,953	1,310	3,200	6,573	10,000
Miscellaneous				3,501	1,973	
Sub-Total	570,235	326,199	507,048	381,528	277,564	216,040
Miscellaneous						
Total	**1,432,662**	**2,192,609**	**1,904,743**	**2,410,931**	**1,964,545**	**2,582,729**
Less Renewable Generation Facility Assets and Other Non-Rate-Regulated Utility Assets *(input as negative)*						
Total	**1,432,662**	**2,192,609**	**1,904,743**	**2,410,931**	**1,964,545**	**2,582,729**
Deferred Revenue (Capital Contribution)	(304,022)	(723,784)	(363,406)	(214,248)	(461,764)	(344,613)
Total	**1,128,640**	**1,468,825**	**1,541,337**	**2,196,683**	**1,502,780**	**2,238,116**

As described in section 5.2.3a, GPI monitors its execution of the projects and programs included in the DSP. On an annual basis, GPI calculates for that year, and on a cumulative basis for the five years of the DSP, its actual capital spending compared to the approved capital budget. GPI's target for this measure is that DSP actual spending to be within 10% of approved DSP capital budget. Hence, any Planned Vs Actual variances larger than 10% have been flagged as "significant" and have been captured in the variance analysis described in this section.

As shown in the table below, during the 2016-2020 historical period, GPI's total capital expenditures were $9.9M actual compared to the plan line of $12.2M yielding an underspend of approximately 18.7%.

Certain programs, particularly under system renewal such as rear lot conversions and cable replacements are expected to impact O&M costs due to reduced maintenance requirements. GPI did not see an impact during the historical period but will be closely tracking O&M costs associated with emergency response in order to quantify impacts to O&M during forecast period.

Table 30 – Capital Expenditure Summary (Historical Period Total)

CATEGORY	Historical Period Total (2016-2020)		
	Plan	Actual	Var
	$ '000		%
System Access	4,685	3,868	-17.5%
System Renewal	4,228	2,712	-35.8%
System Service	1,835	1,263	-31.2%
General Plant	1,434	2,063	43.8%
TOTAL EXPENDITURE	12,182	9,905	-18.7%
Capital Contributions	- 2,688	- 2,067	-23.1%
Net Capital Expenditures	9,494	7,838	-17.4%
System O&M	8,704	7,143	-17.9%

Below is a detailed yearly variance analysis on an investment portfolio level:

<u>2016 Variance Analysis</u>

As shown in the table below, System Access, System Service, and General Plant had significant variances between plan and actual.

Table 31 – Plan vs Actual for 2016

CATEGORY	2016		
	Plan	Actual	Var
	$ '000		%
System Access	977	600	-38.6%
System Renewal	205	209	2.1%
System Service	178	53	-70.0%
General Plant	711	570	-19.8%
TOTAL EXPENDITURE	2,071	1,433	-30.8%
Capital Contributions	- 561	- 304	-45.8%
Net Capital Expenditures	1,510	1,129	-25.3%
System O&M	1,448	1,287	-11.1%

System Access: The underspend of $377k in this investment portfolio was primarily associated with residential expansion which contains Assumed Plant, Customer Work Order, and Residential subdivisions. GPI energized 22 connections in 2016, which was significantly lower than forecasted plan. GPI works closely with all applicable agencies to forecast approximate number of connections annually, but the actual timing of the connections is dependent on external factors that cannot be controlled by GPI such as development construction progress. System Access overspend of $292k took place in 2017, which was due to the connections forecasted in 2016 but connected in 2017.

System Service: The underspend variance in this investment portfolio was primarily associated with deferral of NW MTS automation improvements, as well as reclosure installations that carried over to 2017.

General Plant: The underspend $141k in this investment portfolio was primarily associated with deferred purchasing of SCADA system equipment from 2016 to 2017. General Plant overspend of $124k took place in 2017 as a result of the SCADA system deferral from 2016.

2017 Variance Analysis

As shown in the table below, System Access, System Renewal, and General Plant had significant variances between plan and actual.

Table 32 – Plan vs Actual for 2017

CATEGORY	2017		
	Plan	Actual	Var
	$ '000		%
System Access	995	1,287	29.3%
System Renewal	918	208	-77.3%
System Service	399	371	-7.1%
General Plant	202	326	61.2%
TOTAL EXPENDITURE	2,515	2,193	-12.8%
Capital Contributions	- 572	- 724	26.5%
Net Capital Expenditures	1,943	1,469	-24.4%
System O&M	1,709	1,298	-24.0%

System Access: The overspend of $292k in this investment portfolio was primarily associated with residential expansion including the number of connections that were forecasted in 2016 but connected in 2017 instead. GPI completed 119 connections in 2017 compared to the 22 connections in 2016. As mentioned in the 2016 variance analysis, there was an underspend in this portfolio of $277k in 2016 which would have mitigated the overspend in 2017 if the connections were completed in alignment with forecast.

System Renewal: Underspend in this category can be accredited to underspend in Pole Replacement Program (note that ACA did not get published yet at the time), no activity on 18M4 CNR Feeder Relocation (it was budgeted at $155k and nothing was spent), and miscellaneous deferrals of some renewal project such as switchgear replacements (budgeted at $49k and yet nothing was spent).

General Plant: The overspend of $124k in this investment portfolio was primarily associated with deferral of purchasing SCADA system from 2016 to 2017. General Plant underspend of $141k took place in 2016 as a result of the SCADA system deferral from 2016.

2018 Variance Analysis

As shown in the table below, System Access, System Renewal, System Service and General Plant had significant variances between plan and actual.

Table 33 – Plan vs Actual for 2018

CATEGORY	2018		
	Plan	Actual	Var
	$ '000		%
System Access	967	762	-21.2%
System Renewal	977	565	-42.1%
System Service	409	71	-82.6%
General Plant	170	507	198.2%
TOTAL EXPENDITURE	2,523	1,905	-24.5%
Capital Contributions	- 554	- 363	-34.4%
Net Capital Expenditures	1,969	1,541	-21.7%
System O&M	1,777	1,502	-15.5%

System Access: The underspend of $205k in this investment portfolio was primarily associated with the forecast for suite metering project (Lakehouse at 10 and 40 Esplanade Lane) which did materialize in 2018. All other connections were completed in alignment with plan.

System Renewal: Underspend in this category can be accredited to steady spend in Pole Replacement Program (note that ACA did not get published yet at the time), reduced spending on 18M4 CNR Feeder Relocation (it was budgeted at $59k and spent $28k) and miscellaneous deferrals of some renewal project such as 3ph pad mounts replacements (budgeted at $22k).

System Service: The variance in this portfolio was primarily due to costs that carried over to 2019 associated with the delayed start of the work at the Niagara West MTS, which included overall feeder protection and integration to support renewable generation. This resulted in an overspend in System Service for 2019.

General Plant: The overspend of $337k on General Plant was primarily associated with the purchase of a new RBD truck.

2019 Variance Analysis

As shown in the figure below, System Access, System Service and General Plant had significant variances between plan and actual.

Table 34 – Plan vs Actual for 2019

CATEGORY	2019		
	Plan	Actual	Var
	$ '000		%
System Access	906	478	-47.3%
System Renewal	1,062	1,069	0.7%
System Service	421	482	14.6%
General Plant	173	382	120.0%
TOTAL EXPENDITURE	2,562	2,410	-5.9%
Capital Contributions	- 518	- 214	-58.7%
Net Capital Expenditures	2,044	2,197	7.5%
System O&M	1,848	1,472	-20.4%

System Access: The underspend of $428k in this investment portfolio was primarily associated with residential expansion which contains Assumed Plant, Customer Work Order, and Residential subdivisions. The number of connections that materialized in 2019 was significantly lower than the forecasted number. As mentioned in the 2016 variance analysis, GPI works closely with all applicable agencies to forecast the approximate number of connections annually, but the actual timing of the connections is dependent on external factors that cannot be controlled by GPI such as development construction progress and changes to occupancy dates.

System Service: The $61k overspend in this investment portfolio was primarily associated with the costs that were carried from 2018 due to the delayed start of Niagara West MTS work.

General Plant: The overspend of $209k in this investment portfolio was primarily associated with the purchase of a new hybrid vehicle for daily use as well as the acquisition of a new 40' bucket truck which replaced the existing 2003 bucket truck.

2020 Variance Analysis

As shown in the figure below, System Access, System Renewal, System Service and General Plant had significant variances between plan and actual.

Table 35 – Plan vs Actual for 2020

CATEGORY	2020		
	Plan	Actual	Var
	$ '000		%
System Access	839	740	-11.9%
System Renewal	1,067	661	-38.1%
System Service	428	286	-33.1%
General Plant	177	278	56.9%
TOTAL EXPENDITURE	2,511	1,965	-21.8%
Capital Contributions	- 482	- 462	-4.3%
Net Capital Expenditures	2,029	1,503	-25.9%
System O&M	1,922	1,584	-17.6%

System Access: The underspend of $99k in this investment portfolio was primarily associated with residential subdivision development which slowed down due to Covid-19.

System Renewal: The underspend of $406k in this investment portfolio was primarily associated with:

- Reduced work execution capacity due to Covid-19, which impacted progress of most system renewal programs and projects including defective pole replacements, and Gang Operated Load Break Switch replacement programs.
- Deferral of Casablanca project due to ongoing coordination delays with the Region associated with completion of the road widening layout.

System Service: The underspend variance in this investment portfolio was primarily associated with the deferral of the planned work for adding 3rd feeder from NW MTS. This deferral was due to design changes required to satisfy requirements of both GPI and NPEI. This project is on track for completion in 2021 and actuals in 2021 will be impacted accordingly.

General Plant: The overspend of $101k in this investment portfolio was primarily associated with the purchase of a new forklift that was required to accommodate the installation of larger transformers introduced by GPI to optimize system efficiency and align with industry best practices.

The table below highlights the changes in the percentage a given investment category is of the total investment over the forecast period relative to actual spending over the historical period:

Table 36 – Investment Category Historical Vs Forecast Comparison

CATEGORY	Historical Period Average (Actual)	Forecast Period Average (Plan)	Var
	$ '000		%
System Access	774	672	-13.1%
System Renewal	542	1,360	150.7%
System Service	253	484	91.6%
General Plant	413	298	-27.8%

System renewal spending is proposed to significantly increase in the forecast period as more resources are focused on replacement of end-of-life assets. Specifically, GPI will be ramping up the Defective Poles Replacement program, Rear Lot Conversions, Niagara West MTS relay change outs, and CNR Pole Line Relocation.

GPI will be suspending the Primary Cable Silicon Injection program until new cable testing findings identify cost effective opportunities for primary cable silicon injection in the distribution system. GPI will also be suspending the Meter Replacement program until meter testing findings reveal the need for any future replacements. The majority of the remaining programs will maintain a similar pace to the historical period.

The level of System Renewal expenditures in each of the 2022 to 2026 forecast period will be increased to support the proposed ramp ups. The forecast years will vary from $891k to $1,871k as shown in Table 28 with an average of $1,360k annually.

These projects and programs are needed to support the drive for improved reliability, replacement of assets that are obsolete or past useful life, and reducing O&M costs where possible associated with feeder patrols, tree trimming, and system response efforts.

System Service is another category that significantly increased during the forecast period, and this is primarily associated with addition of new feeders to support forecasted demand load requirements, as well as reinforcement of existing overhead and underground conductors, and installation of reclosers.

GPI invested in purchasing of new trucks during the historical period which in turn allowed GPI to reduce the General Plant expenditures during the forecast period relative to the actuals during the historical period. Forecast spending on General Plant over the 2022-2026 period of the DSP will be focused mostly on building upgrades (i.e. HVAC system, parking lot, new bathroom in TS, etc..) and SCADA system improvements.

5.4.3 Justifying capital expenditures

The following sections provide a list of material capital projects and their costs, actual and planned, for the historic and forecast period respectively.

5.4.3.1 Overall Plan

5.4.3.1a Comparative expenditures by category 2016 – 2021

Table 27 provides the comparative expenditures by category of GPI's capital expenditures over the historical period of this DSP

System Access

GPI's System Access investments are driven by others. GPI is obligated to connect new load and new renewable generation. GPI uses an economic evaluation methodology prescribed in the DSC to determine the level, if any, of capital contributions for each project with such levels incorporated into the annual capital budget. The scheduling of investments needs is usually coordinated to meet the needs of third parties.

GPI is required to install metering equipment and provide access to poles for 3rd party attachments as per its mandated service obligation. GPI is also required to respond to the road authorities by obligations under the Public Service Works on Highways Act. The Act prescribes a formula for the apportionment of costs that allows for the road authority to contribute 50% of the "cost of labour and labour-saving devices" towards the relocation costs. This formula was used to apportion costs for road authority projects requiring the relocation of GPI plant.

The level of System Access expenditures in each of 2016 to 2021 historical years has varied between $477k and $1,287k with an average of $755k annually.

- 2016 actuals were $600k.
- 2017 actuals were $1,287k. The increase from 2016 of $687k was primarily due to significant increases in the value of residential expansion and subdivision developments.
- 2018 actuals were $762k. The decrease from 2017 of $525k was primarily due to significant decreases in the value of residential expansion and subdivision developments.
- 2019 actuals were $478k. The decrease from 2018 of $284k was primarily due to decreases in residential expansion.
- 2020 actuals were $740k. The increase from 2019 of $262k was primarily due to increases in residential expansion.

- 2021 actuals are forecast to be $662k. The decrease from 2020 of $78k was primarily due to decreases in residential expansion.

Detailed breakdown of comparative expenditures for System Access projects and programs is shown in Table 37 below:

Table 37. System Access Projects Historical and Bridge Year

Projects	2016	2017	2018	2019	2020	2021 Bridge Year
System Access						
Residential Expansion	449,288	1,069,380	623,006	274,825	627,134	498,127
Project - New Customer Connections	62,147	25,395	74,406	76,580	65,127	77,947
Project - Residential Subdivision Development	50,438	101,452	24,861	43,717	7,064	74,738
Program - Modifications to Existing Customer Connections	9,784	18,602	12,283	82,504	40,458	10,881
Program - Transformer Station - Modifications to Support Renewable Generation		64,871				
Program - Replace >50kW form Meters with Smart INTRVL	28,400		27,905			
Project - Load Transfer Elimination and Pole Line Relocation/Reconfiguration		7,718				
Sub-Total	**600,057**	**1,287,418**	**762,461**	**477,626**	**739,783**	**661,693**

System Renewal

System renewal is a mix of non-mandatory (planned end of life replacement) and mandatory (emergency replacement) investments. Non-mandatory investments are identified, prioritized and scheduled in alignment with the Asset Management Process.

The level of system renewal expenditures in each of 2016 to 2021 historical years has varied between $208k and $1,010k with an average of $542k annually.

- 2016 actuals were $209k.
- 2017 actuals were $208k. Similar spend to 2016.
- 2018 actuals were $565k. The increase from 2017 of $357k was primarily due to the execution of a voltage conversion project, as well as ramp up in defective pole replacements and replacement of pad mounted transformers.
- 2019 actuals were $1069k. The increase from 2018 of $504k was primarily due to additional ramp up on programs such as defective pole replacements and pad mounted transformers, as well as completing 2 voltage conversion projects.
- 2020 actuals were $661k. The decrease from 2019 of $408k is primarily due to the lack of voltage conversion projects. However, GPI reallocated resources to completing work associated with secondary bus refurbishments.

- 2021 actuals are forecast to be $1,021k. The increase from 2019 of $360k is primarily due to an increase in spend for the rear lot conversion program and the CNR pole line relocation project.

Detailed breakdown of comparative expenditures for System Renewal projects and programs is shown in Table 38 below:

Table 38. System Renewal Projects Historical and Bridge Year

Projects	2016	2017	2018	2019	2020	2021 Bridge Year
System Renewal						
Program - Replace Defective Poles	67,972	81,748	119,410	258,744	251,174	286,591
Program - Secondary Bus Refurbishments		8,498			175,417	66,333
Program - Replace Sectionalizing Terminal	10,188	10,888	10,732	13,917	31,695	38,039
Program - Replace Gang Operated Load Break Switch	26,241		30,449	44,438		30,228
Program - Primary Cable Testing	69,822			125,739		
Program - Replace Pad Mounted Transformers	32,807	78,218	114,166	168,694	56,740	79,624
Program - Primary Cable Silicon Injection		15,833	4,440		38,815	
Program - Meter Replacements	2,016	13,136				
Program - Rear Lot Conversion					12,760	258,550
Program - Niagara West MTS			51,370	33,398	11,705	50,000
Program - Voltage Conversion			206,035	424,387	62,182	
Project - CNR Pole Line (18M4 Feeder) Relocation / Rerouting			28,017		20,557	212,517
Sub-Total	**209,047**	**208,320**	**564,621**	**1,069,317**	**661,046**	**1,021,882**

System Service

System Service investments are investments aimed to provide consistent service delivery and to meet operational objectives. These investments are required to support the expansion, operation and reliability of the distribution system.

The level of system service expenditures in each of 2016 to 2021 historical years has varied between $53k and $683k with an average of $253k annually.

- 2016 actuals were $53k.
- 2017 actuals were $371k. The increase from 2016 of $318k was primarily due to automation projects to enhance the reliability of the distribution system.
- 2018 actuals were $71k. The decrease from 2017 of $30k was primarily due to the shift in spend for the voltage conversion program as well as the program to convert radial feeder customers to loop supply.

- 2019 actuals were $482k. The increase from 2018 of $411k was primarily due to the execution of the pole line upgrade project, as well as spend on a project to increase capacity to the GPI system by adding a 3rd feeder from NW MTS.
- 2020 actuals were $286k. The decrease from 2019 of $196k was primarily due to reallocation of resource capacity and spend to support Residential Expansion under System Access, combined with the impact of the pandemic on overall resource capacity and productivity.
- 2021 actuals are forecast to be $683k. The increase of $397k is primarily due to increased spend on the addition of a 3rd feeder from NW MTS.

Detailed breakdown of comparative expenditures for System Service projects and programs is shown in Table 39 below:

Table 39. System Service Projects Historical and Bridge Year

Projects	2016	2017	2018	2019	2020	2021 Bridge Year
System Service						
Program - Primary OH Conductor and UG Cable Reinforcements					166,954	84,098
Program - Convert Radial Feeder Customers to Loop		544	70,613			
Project - Third Feeder from NW-MTS				99,969	36,927	599,015
Project - NWTS Automation & Improvements	53,323	173,785		45,770	82,271	
Project - Automate Primary 3 Phase Switches - Install Reclosures		38,625				
Project - Replace Manually Operated Pad Swgr with Automated PVI		157,717		103,447		
Project - Pole Line Upgrade				233,275		
Sub-Total	**53,323**	**370,672**	**70,613**	**482,460**	**286,152**	**683,114**

General Plant

General Plant investments are not part of the distribution system (e.g. fleet, tools, land, etc.). Investments in this category are driven by operational and business needs to achieve a safe workplace, enhance employee work environments and satisfaction, increase efficiencies and productivity, and enhance customer service and value.

The level of general plant expenditures in each of 2016 to 2021 historical years has varied between $216k and $570k with an average of $380k annually.

- 2016 actuals were $570k.
- 2017 actuals were $326k. The decrease from 2016 of $244k was primarily due to the lack of a major vehicle acquisition and building upgrades. Spend was reallocated to investments in SCADA system improvements.

- 2018 actuals were $507k. The increase from 2017 of $181k was primarily due to the addition of a major vehicle acquisition that year.
- 2019 actuals were $382k. The decrease from 2018 of $125k was primarily due to reduced spend in major vehicle acquisition.
- 2020 actuals were $278k. The decrease from 2019 of $104k was primarily due to reduced spend in SCADA system improvements, vehicle acquisition, and tool replacements.
- 2021 actuals are forecasted to be at $216k. The reduction of $62k is due to reduced spend on vehicles, software, and workstations.

Detailed breakdown of comparative expenditures for System Service projects and programs is shown in Table 40 below:

Table 40. General Plant Projects Historical and Bridge Year

Projects	2016	2017	2018	2019	2020	2021 Bridge Year
General Plant						
Program - Computer Workstations	8,804	13,758	3,695	14,380	23,428	9,000
Program - Server/Network Hardware Upgrades due to Cyber Security				36,301	22,796	10,000
Software	36,259	28,702	24,245		39,370	15,000
Project - SCADA System and Improvements		194,995	63,985	65,044	26,636	21,040
Vehicle - Trucks & Forklift	359,940	49,063	373,868	198,425	123,960	87,000
Building Upgrades	142,411	27,259	21,137	10,399	17,819	15,000
Office Furniture			6,432			10,000
NWTS - Upgrades		6,468	8,256	280		
Tools - Replacement	22,561		4,121	49,998	15,009	39,000
Communication Equipment	260	5,953	1,310	3,200	6,573	10,000
Micellaneous				3,501	1,973	
Sub-Total	**570,234**	**326,199**	**507,048**	**381,528**	**277,564**	**216,040**

5.4.3.1b Impact of system investment on O&M costs 2021 – 2026

GPI's operations and maintenance strategy is to minimize reactive and emergency-type work through efficient operations and an effective planned maintenance program including predictive and preventative actions. GPI's customer responsiveness and system reliability are monitored continually to ensure that its maintenance strategy is effective.

This effort is coordinated with GPI's capital program so that where maintenance programs have identified matters which require capital investments, GPI would adjust (if needed) its capital spending priorities to address those matters.

- **Predictive Maintenance** - Predictive maintenance activities involve the testing of elements of the distribution system. These activities include infrared thermography testing, transformer oil analysis, planned visual inspections and pole testing. These evaluation tools are all administered using a grid system with appropriate frequency levels. Any identified deficiencies are prioritized and addressed within a suitable time frame.

- **Preventative Maintenance** - Preventative maintenance activities include inspection, servicing and repair of network components (i.e. overhead and pad-mounted switch maintenance). Also included are regular inspection and repair of substation components and ancillary equipment. The work is performed using a combination of time and condition-based methodologies.

- **Emergency Maintenance** - This item includes unexpected system repairs to the electrical system that must be addressed immediately. The costs include those related to repairs caused by storm damage, emergency tree trimming and on-call premiums. GPI constantly evaluates its maintenance data to adjust predictive and preventative actions. The ultimate objective is to reduce this emergency maintenance.

- **Service Work** - The majority of costs related to this work pertain to service upgrades requested by customers, and requests to provide safety coverage for work (overhead line cover ups). This includes service disconnections and reconnections by GPI for all service classes; assisting pre-approved contractors; the making of final connections after Electrical Safety Authority ("ESA") inspection for service upgrades; and changes of service locations.

- **Network Control Operations** – GPI maintains a Supervisory Control and Data Acquisition ("SCADA") system.

- **Metering** - The metering department is responsible for the installation, testing, and commissioning of new and existing simple and complex metering installations. Testing of complex metering installations ensures the accuracy of the installation and verifies meter multipliers for billing purposes. Revenue Protection is another key activity performed by Metering, by proactively investigating potential diversion and theft of power.

- **Station Service** - Station service activities address the maintenance of all equipment at GPI's Niagara West transformer station. This includes both labour costs and non-capital material spending to support both scheduled and emergency maintenance events. As with the maintenance activities, station maintenance strategy focuses on minimizing, to the extent possible, emergency-type work by improving the effectiveness of GPI's planned maintenance program (including predictive and preventative actions) for its station.

- **Operations Area** - The Operations area coordinates drafting and design services for capital projects and provides distribution system asset information to many departments within GPI. Engineering costs are allocated to operations, maintenance, capital, and third-party receivable accounts based on total labour, truck and material costs.

- **Stores/Warehouse** - The Stores area is accountable for managing the procurement, control, and movement of materials within GPI's service centre. This includes monitoring inventory levels, issuing material receipts, material issues, and material returns as required. The cost of the stores department is allocated to all departmental, capital and third-party receivable accounts as an overhead cost based on direct material costs.

- **Garage/Transportation Fleet** - The Garage and Transportation Fleet area has as one of its objectives keeping maintenance schedules to ensure vehicle reliability and safety, and the minimization of vehicle down time. Vehicle costs are allocated to operations, maintenance, capital and third-party receivable accounts based on number of hours used.

Typically, system investments will result in:

- The addition of incremental plant (e.g. new poles, switchgear, transformers, etc.)
- The relocation/replacement of existing plant (e.g. road widening)
- The replacement of end of life plant with new plant (e.g. cables, poles, transformers, etc.)
- New/replacement system support expenditures (e.g. fleet, software, etc.)

Relocation/replacement of existing plant normally results in an asset being replaced with a similar one, so there would be little or no change to resources for ongoing O&M purposes (i.e. inspections still need to be carried out on a periodic basis as required per the Distribution System Code). Depending on the age of certain asset types such as cables, some advantages may be realized associated with O&M repair related charges (i.e. cable faults), and GPI will be tracking those costs during the forecast period to determine impact on O&M costs. However, considering that the majority of assets being replaced are not the assets that would normally be repaired (i.e. poles), GPI anticipates that the planned system investments in this category are expected to put neutral pressure on O&M cost.

Replacement of end of life plant with new plant will still require the allocation of resources for ongoing O&M purposes. Repair would be the most significant O&M activity impacted by new plant. Certain assets, such as poles offer few opportunities for repair related activities and generally require replacement when deemed at end of normal life or critically damaged.

Other assets such as direct buried cable offer opportunities for repair related activities (e.g. splices) up to a point where further repairs are not warranted due to end of life conditions. In a few areas cable faults will not be repaired due to cable end of life. When faulted, the faulted cable section will be replaced, normally a section between two distribution transformers. For planned cable replacement in a subdivision, new primary cable installed in duct replaces direct buried primary cable and is expected to provide higher reliability and life. This will shift response activity for a cable failure from repair (O&M) to replacement (Capital).

If assets approaching end of life are replaced at a rate that maintains equipment class average condition, then one would expect little or no change to O&M costs under no growth scenarios but would still see upward O&M cost pressure on positive growth scenarios (more cumulative assets to maintain each year). Replacement rates that improve equipment class average condition could result in lowering certain maintenance activities costs (e.g. pole testing, reactive repairs, etc.). Overall, this is expected to put downward pressure on O&M repair related costs.

Locate expenditures have increased significantly due to recent legislative requirements for expanded need for locates and significant local third-party attachment work.

System support expenditures (e.g. GIS, CIS, etc.) are expected to provide a better overall understanding of GPI's assets that will lead to more efficient and optimized design, maintenance and investment activities going forward. Inspection, maintenance and testing data will be input into the GIS as attribute information for each piece of plan. Improved asset information will allow existing resources to partially compensate for growth related increases in O&M activities. Fleet replacement expenditures will result in reduced O&M for new units however this will be offset by increasing O&M of remaining units as they get older.

In summary, the system investments will result in some upward growth related and support related O&M pressures, and downward repair related O&M pressures. Overall, the system investments are not expected to have a significant impact on total O&M costs in the forecast period. As shown in Tables 27 and 28, O&M costs fluctuated throughout the historical period at an average increase of 4% annually between 2016 and 2021. During the forecast period O&M are expected to remain flat with slight increase in alignment with inflation rate, but GPI will be closely monitoring O&M costs associated with emergency response in order to quantify savings realized during the forecast period.

Table 41 below provides a qualitative overview of forecasted impact of system investment on system O&M costs:

Table 41 – O&M impacts for significant assets

Item	Impact on O&M			
	Addition of Incremental Plant	Relocation/Replacement of Existing Plan	Replacement of End-Of-Life Plant	New/Replacement of System Support
Poles	increase	neutral	neutral	increase
Cables	increase	N/A	decrease (repairs only)	neutral
UG Transformers	increase	N/A	neutral	neutral
UG Switchgear	increase	N/A	neutral	neutral
OH Transformers	increase	neutral	neutral	neutral
MTS Transformers	increase	N/A	decrease (repairs only)	decrease
MTS Circuit Breakers	increase	N/A	decrease (repairs only)	decrease
Meters	increase	N/A	neutral	increase
Fleet	increase	N/A	neutral	neutral

5.4.3.1c Investment drivers

GPI has three sets of drivers for its capital investment plan:

- **External Drivers** - include inputs such as regulatory requirements, Regional planning requirements, municipal requirements, customer requirements, and Renewable Energy Generation (REG).

- **Strategic Investment Drivers** – include Customer Satisfaction objectives, Facilities Optimization objectives, Public Policy requirements, Safety and Wellness aims and Corporate Leadership.

- **Internal Drivers** - include Asset Condition Assessment, Fleet Assessment, IT Assessment, Reliability Assessment, Asset Capacity Utilization Assessment and Automation Assessment.

These drivers influence the investments within the four categories of investment as follows:

Table 42 – Existing Investment Drivers

	Category			
Driver	System Access	System Renewal	System Service	General Plant
Regulatory Requirements	√	√	√	√
Regional Planning Requirements	√		√	
Municipal Requirements	√	√	√	√
Customer Requirements	√	√	√	√
Renewable Energy Generation	√		√	
Customer Satisfaction objectives	√	√	√	√
Facilities Optimization objectives	√	√	√	√
Public Policy requirements	√	√	√	√
Safety and Wellness aims	√	√	√	√
Corporate Leadership	√	√	√	
Asset Condition Assessment	□	√	√	√
Reliability Assessment	√	√	√	
Asset Capacity Utilization Assessment	√	√	√	
Fleet Assessment	□	□	□	√
IT Assessment	□	□	□	√
Automation Assessment	√	√	√	√

Each of these drivers had strong influence over GPI's capital investments over the historical period.

For the Forecast period, Table 36 presents the expected evolution of each driver. The first column states the drivers of GPI's capital forecast. The second column presents how GPI sees the trend for change of the influence of each driver over the forecast period. The final column gives the rational for why GPI views each driver's influence changing that way.

Table 43 – Forecast Investment Drivers

Driver	Expected Change over Forecast Period	Rational
Regulatory Requirements	Increasing	More governmental and regulatory requirements
Regional Planning Requirements	Same	
Municipal Requirements	Same	
Customer Requirements	Increasing	Greater customer expectations
Renewable Energy Generation	Same	
Customer Satisfaction objectives	Increasing	Greater customer expectations
Facilities Optimization objectives	Increasing	Greater pressure to optimize infrastructure
Public Policy requirements	Increasing	More governmental requirements
Safety and Wellness aims	Same	
Corporate Leadership	Same	
Reliability Assessment	Increasing	Greater customer expectations
Asset Capacity Utilization Assessment	Increasing	Greater pressure to optimize infrastructure
Automation Assessment	Increasing	Pace of new technology development
Fleet Assessment	Same	
IT Assessment	Increasing	Pace of new technology development
Automation Assessment	Increasing	Pace of new technology development
Asset Condition Assessment	Increasing	Greater pressure to optimize infrastructure

5.4.3.1d GPI capability assessment

GPI forecasts no challenges to its capability to incorporate additional Renewable Energy Generation over the forecast period, if it develops.

5.4.3.2 Material Investment

This section lists material projects and programs by year and investment category through the forecast period. Chapter 2 of the Filing Requirements for Electricity Distribution Rate Applications issued by the Board dated July 12, 2018 states the relevant default materiality threshold as "$50,000 for a distributor with a distribution revenue requirement less than or equal to $10 million".

The 2021 GPI Distribution revenue requirement is less than $10 million, and as such the materiality threshold is calculated as being $50,000. GPI follows the OEB's default materiality threshold and provides justification for capital expenditures of $50,000 or higher.

All material projects have the following information provided:

A. General Information on the project/activity
B. Evaluation criteria for each project/activity
C. Category-specific information and analysis for each project/activity

A. General Information on the Project/Activity

1. Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
2. Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement (CCRA).
3. Related customer attachments and load, as applicable
4. Start date, in-service date and expenditure timing over the planning horizon (2022 – 2026)
5. The risks to the completion of the project or activity as planned and the manner in which such risks will be mitigated
6. Comparative information on expenditures for equivalent projects/activities over the historical period, where available
7. Information on total capital and O&M costs associated with REG investment, if any, included in a project/activity; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities

B. Evaluation criteria for each project/activity

Material investments are evaluated based on key regulatory outcomes as indicated below:

1. Efficiency, customer value and reliability
2. Safety
3. Cyber-security, privacy

4. Co-ordination, interoperability
5. Environmental benefits
6. Conservation and Demand Management

C. Category-specific information and analysis for each project/activity

1. System Access
2. System Renewal
3. System Service
4. General Plant

Table 44 below provides a summary of all the material project sheets that have been included in this section:

Table 44 – Summary of Material Projects (projects of $50,000 and above)

SUMMARY OF MATERIAL PROJECTS								
Project ID	**Project Name**	**Inv Category**	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
SA-001	Residential Expansions	System Access	660,249	483,278	479,430	519,457	527,203	**2,776,235**
SA-002	Pole Line Relocation (Casablanca Blvd & Livingston Ave)	System Access	134,000	87,750	0	0	0	**221,750**
SA-003	Main Street Widening	System Access	0	60,000	0	0	0	**60,000**
SR-001	Replace Pad Mounted Transformers	Service Renewal	56,521	60,047	61,248	62,473	63,722	**304,011**
SR-002	Replace Defective Poles	Service Renewal	521,019	558,190	569,353	580,741	592,355	**2,821,658**
SR-003	Niagara West MTS	Service Renewal	100,000	102,000	104,040	106,121	0	**412,161**
SR-004	CNR Pole Line Replacement and Relocation	Service Renewal	435,000	0	395,000	70,000	0	**900,000**
SR-005	Rear lot supply relocation	Service Renewal	598,550	0	0	298,000	315,000	**1,211,550**
SR-006	Secondary Bus Refurbishments	Service Renewal	65,676	68,072	69,433	70,822	72,238	**346,241**
SR-007	Voltage Conversion Projects	Service Renewal	0	0	0	0	290,000	**290,000**
SS-001	Additional Feeder From NW MTS (2508-M7)	System Service	0	887,300	397,600	0	0	**1,284,900**
SS-002	Automate Primary 3-Phase Switches (Install Reclosers)	System Service	0	165,008	126,231	42,918	43,777	**377,934**
SS-003	Monitoring & Control – FCI Installation and SCADA Integratior	System Service	0	0	0	85,600	96,300	**181,900**
SS-004	Adding Two (2) Phases of UG Cable at Bal Harbour	System Service	0	0	0	144,000	0	**144,000**
SS-005	Primary OH and UG Reinforcements	System Service	81,541	85,757	87,472	89,222	91,006	**434,998**
GP-001	Building Upgrades - Elevator / Wheelchair lifting device	General Plant	0	300,000	0	0	0	**300,000**
GP-002	Building Upgrades - New Insulation in truck and store bays	General Plant	80,000	0	0	0	0	**80,000**
GP-003	Building Upgrades - Replace existing HVAC System	General Plant	0	0	0	0	385,000	**385,000**
GP-004	Parking Lots	General Plant	0	0	75,000	100,000	0	**175,000**
GP-005	SCADA System and Improvements	General Plant	1,063	80,000	81,040	216,040	0	**628,143**
GP-006	JOMAR ERP Software System Upgrades	General Plant	0	0	30,000	70,000	0	**200,000**
Total			**2,733,619**	**2,937,402**	**2,475,847**	**2,455,394**	**2,476,601**	**13,535,481**

2022 – 2026 Material System Access Projects

A. General Information					
Project ID	SA-001	Project/Activity Name	Residential Expansions		
Investment Category		System Access			
Project Description					
Developer is installing new serviced residential lots or townhouses sites. This activity covered by this project includes primary electrical servicing and transformers for the development. In an underground serviced subdivision or townhome development, this would not include the secondary connection costs.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Gross Capital	660,249	483,278	479,430	519,457	527,203
Contributed Capital					
Net Capital	660,249	483,278	479,430	519,457	527,203
Customer Attachments and Load (5.4.3.2 A2)					
Subdivisions	1	2	3	4	5
Legacy	5	-	-	-	-
Mariner Estates	8	-	-	-	-
3 & 84 Slessor Blvd.	24	-	-	-	-
27 John St.	40	-	-	-	-
8 Lake St.	6	-	-	-	-
314 Main St. E.	-	55	-	-	-
709-721 Winston Rd.	35	-	-	-	-
240-248 Main St. E.	-	15	-	-	-
10 Windward Dr.	-	27	-	-	-
362-398 North Service Rd.	-	-	24	24	-
4 Windward Dr.	-	-	9	-	-
7 Park Rd. S.	-	-	6	-	-
Infills (Estimated)	25	25	25	25	90
Total Lots Serviced	143	122	64	49	90
Each serviced lot has a 200A service available for the dwelling.					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q1-25%, Q2-25%, Q3-25%, Q4-25%			
Risks and Mitigation (5.4.3.2 A4)					
Developers and Builders could defer their project(s). When this happens, work is deferred from quarter to quarter and possibly from year to year. Work schedules are modified to substitute other planned investments when this occurs.					
Comparative Information (5.4.3.2 A5)					
These are ongoing annual expenditures. See historical comparative information in Section 5.4.3.2.a above.					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SA-001	Project/Activity Name	Residential Expansions
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is customer service requests. The Developer/Builder is building a new subdivision or townhouse complex requiring the installation of service. Infills have also been included as part of the 'Residential Expansions' project.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Customer Satisfactionand Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Developers provide information to the Town and other utilities on the number of lots they are forecasting to develop and service each year.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Regulatory requirement and mandatory project, driven by development. Schedule coordinated with customer requirements.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
New equipment will be built to GPI approved equipment specifications and construction will be to meet GPI approved design and construction standards. This means GPI's future requirement to maintain the system can be done efficiently with exsiting standard materials and methods. Ensures compliance with Section 28 of the Electricity Act and customer satisfaction. The costs associated with this project are partially funded by the customer based upon calculated estimates.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
The primary benefit for the customer is access to the distribution system thereby meeting customers' power needs.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
There is no direct impact on current reliability performance.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
An alternative to underground servicing is overhead servicing. Overhead servicing is lower cost however, developer and Town preferences are for underground servicing.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
There are no secondary drivers for this project. Not Applicable			
Safety (5.4.3.2 B2)			
Connection constructed according to Reg 22/04 standards			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SA-001	Project/Activity Name	Residential Expansions
System Access - Timing and Priority of Investment (5.4.3.2 Ca.1)			
Mandatory; project timing coordinated with customer schedule for connection			
System Access - Customer Preferences and Third Parties (5.4.3.2 Ca.2)			
All new development areas are designed and built as underground serviced at the request of the developer and as per Town of Grimsby policies. Project completion date subject to customer schedule.			
System Access - Final Cost (5.4.3.2 Ca.3)			
Servicing costs dependent on project scope, land area, number of lots and expected size of the services to the lots, etc.. These factors influence the number and type of transformers used, amount and type of cable used, complexity of the underground infrastructure and the transformer utilization factor. Final cost is based upon actual number of residential services to be connected in 2022 through 2026.			
System Access - Minimizing Controllable Costs (5.4.3.2 Ca.4)			
Connection work coordinated with customer schedule; final connection costs to be based on standardized materials, unit rate construction contracts, and appropriate equipment sizing.			
System Access - Other Planning Objectives (5.4.3.2 Ca.5)			
No other planning objectives have been considered. Not Applicable.			
System Access - Technical Feasible Design/Implementation Options (5.4.3.2 Ca.6)			
Town By-Laws require that all new developer built residential subdivisions be serviced via underground supply.			
System Access - Project Decision Support Tools and Options (5.4.3.2 Ca.7)			
System Access - Project Decision Support Tools and Options - Least Cost Option (5.4.3.2 Ca.7.a)			
Not Applicable			
System Access - Project Decision Support Tools and Options - Cost Efficient Option (5.4.3.2 Ca.7.b)			
Not Applicable			
System Access - Results of the Final Economic Evaluation (5.4.3.2 Ca.8)			
New subdivisions/developments subject to economic evaluation. A subdivision/development will have a capital contribution from the developer that considers 25 years of operating revenue.			
System Access - Nature and Magnitued of System Impacts (e.g. REG investments) (5.4.3.2 Ca.9)			
Not Applicable			

A. General Information					
Project ID	SA-002	Project/Activity Name	Pole Line Relocation Due to Road Widening at Casablanca Blvd & Livingston Ave.		
Investment Category		System Access			
Project Description					
The Region of Niagara is reconstructing/widening Casablanca Blvd. from North Service Road to Main St. due to a Metrolinx new GO train station project taking place at the south-west corner of the intersection of Casablanca Blvd. and South Service Road. The existing poleline will be relocated to accomodate the road widening.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Gross Capital	233,333	146,250			
Contributed Capital	99,333	58,500			
Net Capital	134,000	87,750			
Region provides capital contribution amounts as per Public Service Works on Highways Act.					
Customer Attachments and Load (5.4.3.2 A2)					
Not Applicable					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q1-25%, Q2-25%, Q3-25%, Q4-25%			
Risks and Mitigation (5.4.3.2 A4)					
The Region of Niagara could defer their project. When this happens, work is deferred from quarter to quarter and possibly from year to year. Work schedules are modified to substitute other planned investments when this occurs.					
Comparative Information (5.4.3.2 A5)					
The anticipated work is based on the Region schedule for the road widening.					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SA-002	Project/Activity Name	Pole Line Relocation Due to Road Widening at Casablanca Blvd & Livingston Ave.
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to accommodate the Region's road widening plans			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Customer Satisfactionand Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
This work will be coordinated with Region schedules and plans.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Regulatory requirement and mandatory project, driven by third party needs. Plant relocation coordinated with Niagara Region.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Complies with mandated service requirements of DSC. Region provides capital contribution amounts as per Public Service Works on Highways Act. Region also pays for incremental non "like-for-like" enhancements if applicable.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Relocated plant built to current standards and in new condition.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
There is no direct impact on current reliability performance.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
An alternative would be to undereground the poleline along the new right of way. This is considered cost prohibitive and not considered further.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
There are no secondary drivers for this project. Not Applicable			
Safety (5.4.3.2 B2)			
Relocated line constructed according to CSA and Reg 22/04 standards			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SA-002	Project/Activity Name	Pole Line Relocation Due to Road Widening at Casablanca Blvd & Livingston Ave.
System Access - Timing and Priority of Investment (5.4.3.2 Ca.1)			
Mandatory; project timing coordinated with Region schedule.			
System Access - Customer Preferences and Third Parties (5.4.3.2 Ca.2)			
Pole relocation details subject to Region consultation and approvals for new pole locations on road right of way.			
System Access - Final Cost (5.4.3.2 Ca.3)			
Project cost determined by Region road design issues affecting pole relocation and construction grade required to accommodate safe and reliable installation.			
System Access - Minimizing Controllable Costs (5.4.3.2 Ca.4)			
Design to meet current CSA standards and to incorporate sufficient load carrying strength to minimize guying needs and property acquisition. Construction work coordinated with Region schedule; Region to provide capital contribution amounts as per Public Service Works on Highways Act. Region to pay incremental cost for non like-for-like relocation conditions(ie. decorative concrete vs standard wood pole) if applicable.			
System Access - Other Planning Objectives (5.4.3.2 Ca.5)			
Not Applicable			
System Access - Technical Feasible Design/Implementation Options (5.4.3.2 Ca.6)			
Not Applicable			
System Access - Project Decision Support Tools and Options (5.4.3.2 Ca.7)			
System Access - Project Decision Support Tools and Options - Least Cost Option (5.4.3.2 Ca.7.a)			
Not Applicable			
System Access - Project Decision Support Tools and Options - Cost Efficient Option (5.4.3.2 Ca.7.b)			
Not Applicable			
System Access - Results of the Final Economic Evaluation (5.4.3.2 Ca.8)			
Not Applicable			
System Access - Nature and Magnitued of System Impacts (e.g. REG investments) (5.4.3.2 Ca.9)			
Not Applicable			

<table>
<tr><th colspan="7">A. General Information</th></tr>
<tr><td>Project ID</td><td>SA-003</td><td>Project/Activity Name</td><td colspan="4" rowspan="2">Main Street Widening</td></tr>
<tr><td colspan="2">Investment Category</td><td>System Access</td></tr>
<tr><td colspan="7">Project Description</td></tr>
<tr><td colspan="7">The Region of Niagara is reconstructing/widening Main Street from Casablanca to Oakes Road North. Portions of the existing pole line will require relocation to accommodate road widening</td></tr>
<tr><td colspan="7">Total Capital and O$M Costs (5.4.3.2 A1)</td></tr>
<tr><td colspan="2">Item</td><td>2022</td><td>2023</td><td>2024</td><td>2025</td><td>2026</td></tr>
<tr><td colspan="2">Gross Capital</td><td></td><td>100,000</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Contributed Capital</td><td></td><td>40,000</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Net Capital</td><td></td><td>60,000</td><td></td><td></td><td></td></tr>
<tr><td colspan="7">Region provides capital contribution amounts as per Public Service Works on Highways Act.</td></tr>
<tr><td colspan="7">Customer Attachments and Load (5.4.3.2 A2)</td></tr>
<tr><td colspan="7">Not Applicable</td></tr>
<tr><td colspan="2">Project Start Date: (5.4.3.2 A3)</td><td>Mar. 1</td><td colspan="3">Project in Service Date: (5.4.3.2 A3)</td><td>31-Aug</td></tr>
<tr><td colspan="3">Expenditure Timing (5.4.3.2 A3)</td><td colspan="4">Q2-50%, Q3-50%</td></tr>
<tr><td colspan="7">Risks and Mitigation (5.4.3.2 A4)</td></tr>
<tr><td colspan="7">The Region of Niagara could defer their project. When this happens, work is deferred from quarter to quarter and possibly from year to year. Work schedules are modified to substitute other planned investments when this occurs.</td></tr>
<tr><td colspan="7">Comparative Information (5.4.3.2 A5)</td></tr>
<tr><td colspan="7">The anticipated work is based on the Region schedule for the road widening.</td></tr>
<tr><td colspan="4">Capital and OM&A Associated with REG (5.4.3.2 A6)</td><td colspan="3">Not Applicable</td></tr>
<tr><td colspan="4">Leave to Construct (5.4.3.2 A7)</td><td colspan="3">Not Applicable</td></tr>
</table>

B. Evaluation Criteria and Information Requirements			
Project ID	SA-003	Project/Activity Name	Main Street Widening
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to accommodate the Region's road widening plans			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Customer Satisfactionand Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
This work will be coordinated with Region schedules and plans.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Regulatory requirement and mandatory project, driven by third party needs. Plant relocation coordinated with Niagara Region.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Complies with mandated service requirements of DSC. Region provides capital contribution amounts as per Public Service Works on Highways Act. Region also pays for incremental non "like-for-like" enhancements if applicable.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Relocated plant built to current standards and in new condition.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
There is no direct impact on current reliability performance.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
An alternative would be to undereground the poleline along the new right of way. This is considered cost prohibitive and not considered further.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
There are no secondary drivers for this project. Not Applicable			
Safety (5.4.3.2 B2)			
Relocated line constructed according to CSA and Reg 22/04 standards			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Region of Niagara			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SA-003	Project/Activity Name	Main Street Widening
System Access - Timing and Priority of Investment (5.4.3.2 Ca.1)			
Mandatory; project timing coordinated with Region schedule.			
System Access - Customer Preferences and Third Parties (5.4.3.2 Ca.2)			
Pole relocation details subject to Region consultation and approvals for new pole locations on road right of way.			
System Access - Final Cost (5.4.3.2 Ca.3)			
Project cost determined by Region road design issues affecting pole relocation and construction grade required to accommodate safe and reliable installation.			
System Access - Minimizing Controllable Costs (5.4.3.2 Ca.4)			
Design to meet current CSA standards and to incorporate sufficient load carrying strength to minimize guying needs and property acquisition. Construction work coordinated with Region schedule; Region to provide capital contribution amounts as per Public Service Works on Highways Act. Region to pay incremental cost for non like-for-like relocation conditions(ie. decorative concrete vs standard wood pole) if applicable.			
System Access - Other Planning Objectives (5.4.3.2 Ca.5)			
Not Applicable			
System Access - Technical Feasible Design/Implementation Options (5.4.3.2 Ca.6)			
Not Applicable			
System Access - Project Decision Support Tools and Options (5.4.3.2 Ca.7)			
System Access - Project Decision Support Tools and Options - Least Cost Option (5.4.3.2 Ca.7.a)			
Not Applicable			
System Access - Project Decision Support Tools and Options - Cost Efficient Option (5.4.3.2 Ca.7.b)			
Not Applicable			
System Access - Results of the Final Economic Evaluation (5.4.3.2 Ca.8)			
Not Applicable			
System Access - Nature and Magnitued of System Impacts (e.g. REG investments) (5.4.3.2 Ca.9)			
Not Applicable			

2022 – 2026 Material System Renewal Projects

A. General Information					
Project ID	SR-001	Project/Activity Name	Replace Pad Mounted Transformers		
Investment Category		System Renewal			
Project Description					
This program is for the proactive replacement of pad mounted transformers, both single and three phase, identified either as defective through regular inspections or as nearing end of useful life. This is an annually recurring activity.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	56,521	60,047	61,248	62,473	63,722
Contributed Capital					
Net Capital	56,521	60,047	61,248	62,473	63,722
Customer Attachments and Load (5.4.3.2 A2)					
GPI is planning to replace 5 single-phase and 1 three-phase pad mounted transformers per year over the forecasted period. Typically, approximately 10-14 customers are supplied from either a 75kVA or 100kVA single phase pad mounted transformer, however, it could be the case that for replacing one of these units, some other adjacent units will need also to be isolated, therefore impacting more customers than the ones that are estrictly supplied from the unit to be replaced.					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2-33%, Q3-33%, Q4-34%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.					
Comparative Information (5.4.3.2 A5)					
These are ongoing annual expenditures. See historical comparative information in Chapter 2 Appendix 2-AA					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SR-001	Project/Activity Name	Replace Pad Mounted Transformers
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is assets either nearing their end-of-life or that have already reached their end-of-life, or have been identified as defective through regular inspections. Pad mounted transformers are replaced on a like for like basis.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Reliability and Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Annual asset inspections are completed every 3rd year in urban areas and every 6th year in rural areas. GPI usually inspects and average of 600 pad mounted transformers per year and all pad mounted transformes over a 6 year cycle.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process. This is proactive asset replacement work required to maintain reliable service to GPI's existing customers.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Planned replacement of pad mounted transformers rather than replacement at time of catastrophic failure can usually be organized as part of regular work and therefore not subject to overtime premiums.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Benefits for the customers include continued, reliable, safe delivery of electricity.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Planned replacement avoids unscheduled outages and extended impacts to customers.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The asset has been assessed as having a very high risk score. With the transformer class of asset, the consequence of failure could impact public safety, could pose a threat to the environment due to an insulating oil leak or spill; or could decrease reliability to the connected customer(s).			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
Planned replacement avoids the risk of catastrophic failure which could result in an increased safety risk to the public.			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SR-001	Project/Activity Name	Replace Pad Mounted Transformers
System Renewal - Asset Characteristics, Performance Deterioration/Failure (5.4.3.2 Cb.1)			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Performance Targets and Lifecycle Optimization Policies and Practices (5.4.3.2 Cb.1.a)			
GPI replaces pad mounted transformers each year based on the previous year's inspection reports. Pad mounted transformers are inspected on a 3 year cycle in urban areas and 6 year cycle in rural areas and are only identified for replacement when they are rated poor on the assessment scale. They could also have a notable defect which is affecting public safety.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Asset Condition Relative to Lifecycle and Performance record (5.4.3.2 Cb.1.b)			
Pad mounted transformers have an expected life of 40 years. GPI performs an asset inspection of each asset at least once every six years. The assets identified in this program have reached end-of life-status.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - No. Of Customers Potentially Affected (5.4.3.2 Cb.1.c)			
The numer of customers affected depends on the affected transformer and the area the transformer services. It could range from one to 16 customers.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Quantitative Customer Impacts (frequency or duration of interruptions) (5.4.3.2 Cb.1.d)			
Customer impact depends on the location of the transformer and the customers connected. In a residential area, the number of customers impacted might be as many as 16. If the transformer services a commercial, institutional or industrial customer, there may be only one customer impacted but that customer is without the ability to carry on their business activity while the transformer is out of service.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Qualitative Customer Impacts (customer satisfaction/migration) (5.4.3.2 Cb.1.e)			
Customer will be without power while the transformer is replaced. As the replacement of the transformer will be a planned event, GPI can coordinate with the customer(s) to identify an outage time that has the least impact to the customer(s) and their facility. If GPI were to run to failure, as it is the case for Pole Mounted transformers, the outage is unplanned and will likely have a greater impact to the customer(s) and their facility.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Value of Customer Impact (high/medium/low) (5.4.3.2 Cb.1.f)			
Low impact to residential and some GS<50kW customers. Medium impact to some GS<50kW and to most GS>50kW customers.			
System Renewal - Factors Affecting Timing (5.4.3.2 Cb.2)			
GPI has the resources and materials in order to ensure project completion on time. Other planned work having a higher priority, such as mandatory customer connections, will influence the work schedule to complete all of the year's planned transformer replacement.			
System Renewal - Impact on System O&M costs (5.4.3.2 Cb.3)			
Operate to failure will increase the unpredictability of the work, increase the likelihood overtime premiums will be paid and increase the likelihood of collateral damage to public or private property. By contrast, proactive replacement allows GPI to schedule the work during normal business hours; reduce the risk of damage to public or private property and to consult with the customer(s) regarding a convenient time for a scheduled outage.			
System Renewal - Reliability and/or Safety Factors (5.4.3.2 Cb.4)			
The customer(s) will experience a planned outage but the customer will have input into the timing of that outage. Proactive replacement will mitigate the exposure of the public (safety) to a potential tranformer failure in their vicinity.			
System Renewal -Analysis of Project Benefits and Costs (5.4.3.2 Cb.5)			
Rate of expenditure balances rate mitigation needs with decreasing asset reliability. Decreasing rate of expenditure will result in higher frequency risk of outages to customers as asset replacement is delayed.			
System Renewal - "Like for Like" Renewal (5.4.3.2 Cb.6)			
This project will replace like for like and no additional fucntionality has been added to address other objectives. The replacement transformer will meet the current GPI design specifications.			

<table>
<tr><th colspan="6">A. General Information</th></tr>
<tr><td>Project ID</td><td>SR-002</td><td>Project/Activity Name</td><td colspan="3" rowspan="2">Replace Defective Poles</td></tr>
<tr><td colspan="2">Investment Category</td><td>System Renewal</td></tr>
<tr><td colspan="6">Project Description</td></tr>
<tr><td colspan="6">This is an annual program that covers the planned replacement of individual poles when it has been determined that they have reached end-of-life. End-of-life is determined through various inspection processes and GPI’s asset management program. Delaying any single year's group of poles to be replaced would result in assets being statistically closer to their point of failure.</td></tr>
<tr><td colspan="6">Total Capital and O$M Costs (5.4.3.2 A1)</td></tr>
<tr><td colspan="2">Item</td><td>2022</td><td>2023</td><td>2024</td><td>2025</td><td>2026</td></tr>
<tr><td colspan="2">Capital</td><td>521,019</td><td>558,190</td><td>569,353</td><td>580,741</td><td>592,355</td></tr>
<tr><td colspan="2">Contributed Capital</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Net Capital</td><td>521,019</td><td>558,190</td><td>569,353</td><td>580,741</td><td>592,355</td></tr>
<tr><td colspan="7">There is no contributed capital from customers associated with this project.</td></tr>
<tr><td colspan="7">Customer Attachments and Load (5.4.3.2 A2)</td></tr>
<tr><td colspan="7">On average, GPI estimates to replace approximately 109 poles per year over the forecast period. Depending upon an individual pole's location, impacted load can range from that of a whole single feeder with thousands of customers connected to it (10 - 18 MW) to that of a single customer (<50kW)</td></tr>
<tr><td colspan="2">Project Start Date: (5.4.3.2 A3)</td><td>01-Jan</td><td colspan="3">Project in Service Date: (5.4.3.2 A3)</td><td>31-Dec</td></tr>
<tr><td colspan="3">Expenditure Timing (5.4.3.2 A3)</td><td colspan="4">25% Quarterly</td></tr>
<tr><td colspan="7">Risks and Mitigation (5.4.3.2 A4)</td></tr>
<tr><td colspan="7">Risks are minimal. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.</td></tr>
<tr><td colspan="7">Comparative Information (5.4.3.2 A5)</td></tr>
<tr><td colspan="7">These are ongoing annual expenditures. See historical comparative information in Chapter 2 Appendix 2-AA</td></tr>
<tr><td colspan="4">Capital and OM&A Associated with REG (5.4.3.2 A6)</td><td colspan="3">Not Applicable</td></tr>
<tr><td colspan="4">Leave to Construct (5.4.3.2 A7)</td><td colspan="3">Not Applicable</td></tr>
</table>

B. Evaluation Criteria and Information Requirements			
Project ID	SR-002	Project/Activity Name	Defective Pole Replacements
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is the risk of failure as poles are either nearing their end-of-life (EOL) or have already reached and even passed their end-of-life, or because have been identified as defective through regular inspections and non-destructive testing (NDT). These poles present a high risk of failure impacting reliability and public/worker safety. Poles are replaced on a like for like basis.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Reliability and Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Annual asset inspections and annual asset NDT. Both visual inspections and NDT inspections are completed every 3rd year in urban areas and every 6th year in rural areas. GPI usually tests an average of 800 poles per year and all poles over a 6 year cycle. Poles are identified for replacement if they have less than 60% remaining strength. As well, poles requiring immediate attention are replaced. In the past 5 years, GPI has replaced approximately 20 poles, or 0.5%, of the total number of poles per year and it is targeting to increase that number to 75 poles, or 2.0%, of the total number of poles per year as per Asset Condition Assessment completed in Jan. 2019			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
This is proactive asset replacement work required to maintain reliable service to GPI's existing customers. Pole selection managed through the GPI asset management process priority determined through GPI asset management program.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Planned replacement of poles rather than replacement at the time of catastrophic failure can usually be organized as part of regular work and therefore not subject to overtime premiums. In addition, GPI will coordinate pole replacement with other work in the area such as the relocation of distribution infrastructure to accommodate Town, Region or MTO requirements for road widening or replacement of other utility infrastructure. Plant is replaced like-for-like or upgraded to accommodate future plans for the area.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Benefits for the customers include continued, reliable, safe delivery of electricity.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Typically, pole replacement is planned to avoid disruption to customers and minimize outage time.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The alternatives are run to failure or defer. The NDT has already identified specific poles as having less than 60% remaining strength and possibly of being in danger of imminent failure. Failure puts the worker/public at risk of personal injury or property damage and puts customers at risk of unplanned outage. Choices related to the type of poles are considered. Choices are wood vs. concrete. Wood poles are less expensive and are therefore used throughout the vast majority of GPI's service area. Concrete poles usually require 3rd party assistance and often result in an outage. Replacements are on a like-for-like basis.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
There are no secondary drivers for this project.			
Safety (5.4.3.2 B2)			
Planned replacement avoids the risk of catastrophic failure leading to a collapse of the pole and a 'wire down' situation. The work is required in order to maintain safety to workers, customers and public in general. Replacement of EOL plant restores the system to safe structural and operating condition. Replacement plant to be installed in accordance with CSA construction standards and in compliance with ESA Reg. 22/04			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SR-002	Project/Activity Name	Defective Pole Replacements
System Renewal - Asset Characteristics, Performance Deterioration/Failure (5.4.3.2 Cb.1)			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Performance Targets and Lifecycle Optimization Policies and Practices (5.4.3.2 Cb.1.a)			
Poles are inspected on a 3 year cycle in urban areas and a 6 year cycle in rural areas, and poles are only identified for replacement when the tested strength reamining is less than 60% or poles require immediate attention. This is done to prevent catastrophic failure of a pole that could create a risk to public safety and possible damage to public or private property.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Asset Condition Relative to Lifecycle and Performance record (5.4.3.2 Cb.1.b)			
The average ages are 29 and 36, for wood and concrete poles respectively. GPI has identified approximately 614 poles as in 'Very Poor' and another 356 poles as in "Poor" conditions which are being targeted to be replaced in the next 10 years. GPI has not experienced a failure of a pole due to age or deterioration during the historic period likely due to following a proactive replacement practice. Refer to Appendix D for Asset Condition Assessment			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - No. Of Customers Potentially Affected (5.4.3.2 Cb.1.c)			
Depending upon an individual pole's location, impacted load can range from that of a whole single feeder with thousands of customers connected to it (10 - 18 MW) to that of a single customer (<50kW)			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Quantitative Customer Impacts (frequency or duration of interruptions) (5.4.3.2 Cb.1.d)			
Depending upon the location of the actual pole that fails, as many as 6,000+ customers may be impacted with an unplanned interruption due to a single pole failure. As noted in Cb.1.b above, GPI has not recorded a failure of a pole due to age or deterioration during the historic period. With the GPI's targeted proactive replacement strategy, it is expected that the risk level remains small.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Qualitative Customer Impacts (customer satisfaction/migration) (5.4.3.2 Cb.1.e)			
Customer satisfaction is affected by reliability. This project is required in order to maintain system reliability by minimizing the risk of pole failure.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Value of Customer Impact (high/medium/low) (5.4.3.2 Cb.1.f)			
Failure of a pole is unplanned and will usually create an outage; either due to 'lines down' or a forced outage due to a condition that creates an unsafe situation for the public. Outages are disruptive to all customers classes. Generally, residential customers find outages annoying and these are of low impact but some residential customers rely on electricity for important medical devices in the home. GS<50kW customers will experience medium impacts on their ability to carry out their business and GS>50kW customers will experience medium to high impact to their business.			
System Renewal - Factors Affecting Timing (5.4.3.2 Cb.2)			
Weather is the most notable factor. Planned pole replacement does not begin until frost is out of the ground and usually stopped as the frost begins to settle in the ground. Typically, only emergency construction work and construction work related to the connection of new serices would take priority over proactive pole replacement.			
System Renewal - Impact on System O&M costs (5.4.3.2 Cb.3)			
Running to failure will increase O&M costs. At the time of the failure, mitigating the immediate effect of the outage on the customers will be an Operations expense. This may occur outside of normal business hours and require unplanned overtime.			
System Renewal - Reliability and/or Safety Factors (5.4.3.2 Cb.4)			
Operate to failure will increase the risk of harm to workers/public and/or damage to public or private property should the failed pole collapse. There is a threat to public safety should there be an outage as a result of the failure of a pole. Operate to failure will decrease reliability of the distribution system.			
System Renewal -Analysis of Project Benefits and Costs (5.4.3.2 Cb.5)			
Rate of expenditure balances rate mitigation needs with decreasing asset reliability. Decreasing rate of expenditure will result in higher frequency risk of outages to customers as asset replacement is delayed.			
System Renewal - "Like for Like" Renewal (5.4.3.2 Cb.6)			
Pole class and loading design may be upgraded to coincide with plans for the area.			

A. General Information					
Project ID	SR-003	Project/Activity Name	Niagara West MTS		
Investment Category		System Renewal			
Project Description					
Niagara West MTS – D20/Relay Changeout - The Transfer Trip scheme and overall relay logic have been independently reviewed and determined to need optimization. This work is in conjunction with issues arising from the tripping of the HAF Wind site that initiated the review of the current scheme. This will allow for proper coordination of customer protection needs and minimize any future outages that may arise from current configuration of the logic.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	100,000	102,000	104,040	106,121	0
Contributed Capital					
Net Capital	100,000	102,000	104,040	106,121	0
There is no contributed capital from customers associated with this project.					
Project Start Date: (5.4.3.2 A3)	01-Jan	Project in Service Date: (5.4.3.2 A3)			31-Dec
Expenditure Timing (5.4.3.2 A3)		25% Quarterly			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.					
Comparative Information (5.4.3.2 A5)					
These are ongoing annual expenditures. See historical comparative information in Chapter 2 Appendix 2-AA					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SR-003	Project/Activity Name	Niagara West MTS
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The replacement of the D20 RTUs are required at NWTS as the current model is no longer manufactured or supported with spare inventory. A comprehensive study of the current configuration, compatible replacement options, replacement schedule, and station impact will be needed. This will enable the proper direction to effectively transition from the D20 RTU.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Reliability and Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
The station battery banks were subjected to overall inspection and capacity load testing. A number of cells were found to require replacement. These batteries will require replacement and need to be addressed in order to maintain consistent service expectations.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
This is proactive asset replacement work required to maintain reliable service to GPI's existing customers. Replacement selection managed through the GPI asset management process priority determined through GPI asset management program.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Benefits for the customers include continued, reliable, safe delivery of electricity.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Replacements are planned to avoid disruption to customers and minimize outage time.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
There are no secondary drivers for this project.			
Safety (5.4.3.2 B2)			
Not Applicable			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SR-003	Project/Activity Name	Niagara West MTS
System Renewal - Asset Characteristics, Performance Deterioration/Failure (5.4.3.2 Cb.1)			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Performance Targets and Lifecycle Optimization Policies and Practices (5.4.3.2 Cb.1.a)			
Failure of the RTU will negatively impact reliability			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Asset Condition Relative to Lifecycle and Performance record (5.4.3.2 Cb.1.b)			
Assets are near end of life and the current model is no longer manufactured or supported with spare inventory			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - No. Of Customers Potentially Affected (5.4.3.2 Cb.1.c)			
Failure of the RTU will result in feeder outages which could impact thousands of customers			
System Renewal - Factors Affecting Timing (5.4.3.2 Cb.2)			
The replacement of the D20 RTUs are required at NWTS as the current model is no longer manufactured or supported with spare inventory.			
System Renewal - Impact on System O&M costs (5.4.3.2 Cb.3)			
Running to failure will increase O&M costs. At the time of the failure, mitigating the immediate effect of the outage on the customers will be an Operations expense. This may occur outside of normal business hours and require unplanned overtime.			
System Renewal -Analysis of Project Benefits and Costs (5.4.3.2 Cb.5)			
Replacing the units proactively will mitigate long term sustained outages due to difficulty of finding like-for-like replacement as the units are no longer supported or provided by the manufacturer.			

A. General Information					
Project ID	SR-004	Project/Activity Name	CNR Pole Line Replacement and Relocation		
Investment Category		System Renewal			
Project Description					
The project scope is a rebuild of the 18M4 feeder, which is fed from Beamsville TS. This circuit runs along in between a railroad right-of-way on the south and a transmission line on the north, and streches accross GPI's entire service territory from east to west. The circuit was constructed in 1949 and is one of the GPI's oldest existing lines in the distribution system and is at end-of-life. The line cannot be upgraded where currently is installed due to clearance conflicts with adjacent transmission line on the north side, therefore GPI will have to relocate the circuit. Primary conductor size will also be upgraded.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	435,000		395,000	70,000	
There is no contributed capital from customers associated with this project.					
Customer Attachments and Load (5.4.3.2 A2)					
There are more than 2300 customers currently supplied from the 18M4 feeder for a peak demand of 11.9kW (August, 2019).					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2-33%, Q3-33%, Q4-34%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.					
Comparative Information (5.4.3.2 A5)					
Not Applicable					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SR-004	Project/Activity Name	CNR Pole Line Replacement and Relocation
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
This project is driven by the need to replace assets that have reached End-Of-Life status and present a high risk of failure impacting system reliability and safety.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Reliability and Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Overall asset condition indicates that short-term failure is likely, and safety, environmental, reliability and/or cost impacts of unplanned failure are considered unacceptable.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
This is proactive asset replacement work required to maintain reliable service to GPI's existing customers.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
By relocating (re-routing) the 18M4 feeder off the CNR Right-of-Way (existing location), GPI will: 1) Reduce costs associated with annual fee payable to the Canadian National Railway as the new pole line is planned to be installed in public municipal right-of-way. 2) Reduce time of response when outages occur as many sections of the feeder are currently very difficult to access by GPI crews.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Benefits for the customers include continued, reliable, safe delivery of electricity.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Avoid disruption to customers and minimize outage time due to failures.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
Upgrades cannot be made at the existing location as the pole line is already encroaching on the minimum clearance required by the transmiter (Hydro One Networks Inc.) from their transmission line that travels along the 18M4 feeder on the north side. The pole line cannot be relocated further south either as CNR rail tracks (Canadian National Railway) impede it so. The only alternative is to relocate the feeder.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
There are no secondary drivers for this project.			
Safety (5.4.3.2 B2)			
There are safety concerns due to equipment deterioration and asset age. Replacement plant to be installed in accordance with CSA construction standards and in compliance with ESA Reg. 22/04			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SR-004	Project/Activity Name	CNR Pole Line Replacement and Relocation
System Renewal - Asset Characteristics, Performance Deterioration/Failure (5.4.3.2 Cb.1)			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Performance Targets and Lifecycle Optimization Policies and Practices (5.4.3.2 Cb.1.a)			
Asset have reached the end of their life cycle. Future satisfactory performance (reliability of supply) in doubt.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Asset Condition Relative to Lifecycle and Performance record (5.4.3.2 Cb.1.b)			
The 18M4 feeder was constructed in 1949 and assets have reached end-of-life. There have been outages over the years due to broken poles and other equipment failure (e.g. switches), which have been replaced on an emergency basis with like for like plant.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - No. Of Customers Potentially Affected (5.4.3.2 Cb.1.c)			
There are more than 2300 customers currently supplied from the 18M4 feeder			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Quantitative Customer Impacts (frequency or duration of interruptions) (5.4.3.2 Cb.1.d)			
Pole failure (multiple) could result in major interruption of 12-18 hours			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Qualitative Customer Impacts (customer satisfaction/migration) (5.4.3.2 Cb.1.e)			
Reduced risk of major outages will maintain customer satisfaction			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Value of Customer Impact (high/medium/low) (5.4.3.2 Cb.1.f)			
Failure on the poleline will impact a significant number of customers. Outages are disruptive to all customers classes. Generally, residential customers find outages annoying and these are of low impact but some residential customers rely on electricity for important medical devices in the home. GS<50kW customers will experience medium impacts on their ability to carry out their business and GS>50kW customers will experience medium to high impact to their business.			
System Renewal - Factors Affecting Timing (5.4.3.2 Cb.2)			
Weather is the most notable factor. Planned poleline replacement does not begin until frost is out of the ground and usually stopped as the frost begins to settle in the ground. GPI has the resources and materials in order to ensure project completion on time. Locates required from others.			
System Renewal - Impact on System O&M costs (5.4.3.2 Cb.3)			
Running to failure will increase O&M costs. At the time of the failure, mitigating the immediate effect of the outage on the customers will be an Operations expense. This may occur outside of normal business hours and require unplanned overtime.			
System Renewal - Reliability and/or Safety Factors (5.4.3.2 Cb.4)			
Operate to failure will increase the risk of harm to workers/public and/or damage to public or private property should the failed pole collapse. There is a threat to public safety should there be an outage as a result of the failure of a pole. Operate to failure will decrease reliability of the distribution system.New poles will be installed per CSA and 22/04 standards.			
System Renewal -Analysis of Project Benefits and Costs (5.4.3.2 Cb.5)			
Rate of expenditure balances rate mitigation needs with decreasing asset reliability. Decreasing rate of expenditure will result in higher frequency risk of outages to customers as asset replacement is delayed.			
System Renewal - "Like for Like" Renewal (5.4.3.2 Cb.6)			
New pole line to be built to current standards. The relocated feeder will also share several sections, on another existing pole line that currently carries only one feeder (circuit). GPI will upgrade the existing single circuit configuration with a new double circuit configuration in all those sections.			

A. General Information					
Project ID	SR-005	Project/Activity Name	Rear lot supply relocation		
Investment Category		System Renewal			
Project Description					
This project involves the relocation of existing electrical plant located in customer's backyards to frontyard supply. Existing rear lot plant is difficult to access for GPI staff to perform maintenance or power restoration when outages occur, and in some cases, the plant poses a potential safety risk due to insufficient clearances. Over the forecast period, GPI will install replacement underground plant on the front side of the houses.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Gross Capital	598,550	0	0	298,000	315,000
There is no contributed capital from customers associated with this project. The project does not add to O&M cost in the test year					
Customer Attachments and Load (5.4.3.2 A2)					
Rear lot relocation projects are as follows:					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2-50%, Q3-50%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.					
Comparative Information (5.4.3.2 A5)					
No equivalent projects/programs over the historical period.					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SR-005	Project/Activity Name	Rear lot supply relocation
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to relocate rear lot assets to front yard locations such that they no longer pose operational, reliability and safety concerns for GPI and the customers.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Operations, Reliaibility, Safety			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
GPI has a number of pockets of customers supplied by rear lot (backyard)construction. In general, these areas are older neighbourhoods and the electrical supply systems were installed between 1950 and 1970. As a result, the electrical components are ageing and the assets are deteriorating. Rear lot supply systems pose reliability, operations, safety, and customer service issues for GPI. These concerns are either from a subdivision (many customers), or an individual customer requesting an underground service in a rear lot supply area.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Plant relocation will eliminate safety hazard and reliability issues of rear lot overhead plant. Outage duration and frequency for these speciifc customers is expected to decrease with underground front yard supply. Operational costs (trouble calls, rear lot line clearing, plant replacement) are also expected to decrease with undergound front yard supply.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Benefits for the customers are improved reliabilty of supply and mitigation of safety clearance isseu with current supply set up.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Reduced unscheduled outages and extended power outages to customers especially those due to severe weather situations.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
Alternative is to rebuild/maintain plant in rear lot postion. No improvement to operational, reliability or safety issues.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
Relocation will mitigate safety clearance hazards.			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SR-005	Project/Activity Name	Rear lot supply relocation
System Renewal - Asset Characteristics, Performance Deterioration/Failure (5.4.3.2 Cb.1)			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Performance Targets and Lifecycle Optimization Policies and Practices (5.4.3.2 Cb.1.a)			
Existing rear lot supply installations impact negatively on reliability and public safety performance measures.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Asset Condition Relative to Lifecycle and Performance record (5.4.3.2 Cb.1.b)			
The rear lot supply installations are aging and deteriorating. Asset condition poses many safety, reliaibility and operational concerns.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - No. Of Customers Potentially Affected (5.4.3.2 Cb.1.c)			
Number of customers affected dependent on specific rear lot supply configuration			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Quantitative Customer Impacts (frequency or duration of interruptions) (5.4.3.2 Cb.1.d)			
Rear lot supplies are at higher risk of disruption due to severe weather and vegetation intrusion. Outages have long restoration times due to difficult access for GPI crews. Rear lot customers wait longer for crews to restore power during an outage and if due to severe weather will generally be the last class of customer restored due to the intensive nature of the restoration process.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Qualitative Customer Impacts (customer satisfaction/migration) (5.4.3.2 Cb.1.e)			
Reduced outage frequency and duration will improve customer satisfaction levels			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Value of Customer Impact (high/medium/low) (5.4.3.2 Cb.1.f)			
Generally, residential customers find outages annoying and these are of low impact but some residential customers rely on electricity for important medical devices in the home. Rear lot outages would be expected to have a medium to high impact on residential customers.			
System Renewal - Factors Affecting Timing (5.4.3.2 Cb.2)			
GPI has the resources and materials in order to ensure annual program expenditures are completed in a timely manner.			
System Renewal - Impact on System O&M costs (5.4.3.2 Cb.3)			
Continues servicing (repairs, vegetation management, etc.) of rear lot supplies will increase O&M costs. This may occur outside of normal business hours and require unplanned overtime and premium contractor costs.			
System Renewal - Reliability and/or Safety Factors (5.4.3.2 Cb.4)			
New undergrounf supply will be installed per CSA and Reg 22/04 standards.			
System Renewal -Analysis of Project Benefits and Costs (5.4.3.2 Cb.5)			
Rate of expenditure balances rate mitigation needs with asset vulnerability. Decreasing rate of expenditure will result in higher frequency risk of safety and reliabiltiy impacts.			
System Renewal - "Like for Like" Renewal (5.4.3.2 Cb.6)			
Not Applicable			

A. General Information					
Project ID	SR-006	Project/Activity Name	Secondary Bus Refurbishments		
Investment Category		System Renewal			
Project Description					
GPI has identified locations where secondary wires, buses and services, are hanging low and need to be raised as in several occasions they have been hit and pulled down by vehicles (trucks). GPI is planning to eliminate the clearance issue by increasing the pole heights and installing new secondary wires at heights that meet current CSA and Reg 22/04 standards.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Gross Capital	65,676	68,072	69,433	70,822	72,238
There is no contributed capital from customers associated with this project. The project does not add to O&M cost in the test year					
Customer Attachments and Load (5.4.3.2 A2)					
Not Applicable					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		25% Quarterly			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.					
Comparative Information (5.4.3.2 A5)					
No equivalent projects/programs over the historical period.					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SR-006	Project/Activity Name	Secondary Bus Refurbishments
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to relocate assets to new locations such that they no longer pose a safety concern for vehicular traffic and the public.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Safety			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
GPI has identified locations where secondary wires, buses and services, are hanging low and on several occasions they have been hit and pulled down by vehicles (trucks).			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Project priority determined through the GPI capital prioritization process			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Plant relocation will eliminate safety hazard and reliability issues of overhead secondary plant being pulled down by vehicles			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Benefits for the customers are continued, reliable, safe delivery of electricity.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Avoiding unscheduled outages and extended power outages to customers.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
Alternative is to underground the road crossings. Cost for underrgrounding is prohibitive and not considered further.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
Relocation will mitigate safety hazard to vehicles and the public.			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SR-006	Project/Activity Name	Secondary Bus Refurbishments
System Renewal - Asset Characteristics, Performance Deterioration/Failure (5.4.3.2 Cb.1)			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Performance Targets and Lifecycle Optimization Policies and Practices (5.4.3.2 Cb.1.a)			
Existing secondary bus installations impact negatively on public safety performance measures			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Asset Condition Relative to Lifecycle and Performance record (5.4.3.2 Cb.1.b)			
Secondary bus is not built to current CSA and Reg 22/04 standards. All installations are considered grandfathered but do need to be addressed in a reasonable timeframe.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - No. Of Customers Potentially Affected (5.4.3.2 Cb.1.c)			
Low number of customers affected if secondary bus pulled down.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Quantitative Customer Impacts (frequency or duration of interruptions) (5.4.3.2 Cb.1.d)			
There have been several conductor pull downs over the historical period. Customers experience outage until conductor is replaced.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Qualitative Customer Impacts (customer satisfaction/migration) (5.4.3.2 Cb.1.e)			
Reduced outage frequency will improve customer satisfaction levels			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Value of Customer Impact (high/medium/low) (5.4.3.2 Cb.1.f)			
Generally, residential customers find outages annoying and these are of low impact but some residential customers rely on electricity for important medical devices in the home.			
System Renewal - Factors Affecting Timing (5.4.3.2 Cb.2)			
GPI has the resources and materials in order to ensure annual program expenditures are completed in a timely manner.			
System Renewal - Impact on System O&M costs (5.4.3.2 Cb.3)			
Conductor repairs will increase O&M costs. This may occur outside of normal business hours and require unplanned overtime and premium contractor costs.			
System Renewal - Reliability and/or Safety Factors (5.4.3.2 Cb.4)			
New secondary bus cable will be installed per CSA and Reg 22/04 standards			
System Renewal -Analysis of Project Benefits and Costs (5.4.3.2 Cb.5)			
Rate of expenditure balances rate mitigation needs with asset vulnerability. Decreasing rate of expenditure will result in higher frequency risk of conductor pull downs and associated safety impacts.			
System Renewal - "Like for Like" Renewal (5.4.3.2 Cb.6)			
Not Applicable			

<table>
<tr><td colspan="6">A. General Information</td></tr>
<tr><td>Project ID</td><td>SR-007</td><td>Project/Activity Name</td><td colspan="3" rowspan="2">Voltage Conversion Projects</td></tr>
<tr><td colspan="2">Investment Category</td><td>System Service</td></tr>
<tr><td colspan="6">Project Description</td></tr>
<tr><td colspan="6">GPI has a number of voltage conversion projects planned for the bridge and test year targeting improvement of system reliability, loss reduction and capacity. A number of 4.8kV supplied areas are at considered to be at or near end-of-life status and will be rebuilt and converted to 16kV supply. After completing these projects, GPI's distribution system will operate entirely at a primary voltage of 16.0/27.6kV to better accommodate future higher density load growth in different areas of the Town of Grimsby.</td></tr>
<tr><td colspan="6">Total Capital and O$M Costs (5.4.3.2 A1)</td></tr>
<tr><td>Item</td><td>2022</td><td>2023</td><td>2024</td><td>2025</td><td>2026</td></tr>
<tr><td>Capital</td><td></td><td></td><td></td><td></td><td>290,000</td></tr>
<tr><td colspan="6">There is no contributed capital from customers associated with this project.
The project does not add to O&M cost in the test year</td></tr>
<tr><td colspan="6">Customer Attachments and Load (5.4.3.2 A2)</td></tr>
<tr><td colspan="6">Woodeden Rd & Birchpark Dr. - This project will eliminate two step-down transformers. 1000 meters of primary underground cable will be replaced. Also, a total of 10 pad mounted transformers will be replaced. These assets were installed in 1979 and the majority have reached their end of useful life. 125 residential customers are currently supplied from the existing 4.8kV system in the Woodeden Rd. & Birchpark Dr. urban area.</td></tr>
<tr><td>Project Start Date: (5.4.3.2 A3)</td><td>Jan. 1</td><td colspan="3">Project in Service Date: (5.4.3.2 A3)</td><td>Dec. 31</td></tr>
<tr><td colspan="2">Expenditure Timing (5.4.3.2 A3)</td><td colspan="4">Q2-50%, Q3-50%</td></tr>
<tr><td colspan="6">Risks and Mitigation (5.4.3.2 A4)</td></tr>
<tr><td colspan="6">Risks are minimal. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.</td></tr>
<tr><td colspan="6">Comparative Information (5.4.3.2 A5)</td></tr>
<tr><td colspan="6">Similar installations were completed in 2018-2019</td></tr>
<tr><td colspan="3">Capital and OM&A Associated with REG (5.4.3.2 A6)</td><td colspan="3">Not Applicable</td></tr>
<tr><td colspan="3">Leave to Construct (5.4.3.2 A7)</td><td colspan="3">Not Applicable</td></tr>
</table>

B. Evaluation Criteria and Information Requirements			
Project ID	SR-007	Project/Activity Name	Voltage Conversion Projects
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to maintian acceptable levels of service reliability through the replacement and upgrading of assets that are approaching or have already reached their end of useful life. Secondary drivers are to improve system capacity, operating efficiency and loss reduction.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Reliability, Customer Satisfaction			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Assets are at or near end-of-life (40+ years old). Future growth potential in these areas support the complementary benefit of increased feeder supply capacity through the conversion to 16kV distribution voltage.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Removal of step-down transformer installations will reduce the number of potential future failure points. This together with operations at 16kV will reduce system losses.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Benefits for the customers include continued, reliable, safe delivery of electricity.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Reliability performance of these 4.8kV areas will deteriorate if asset aging issues are not addressed. It is expected that investments will result in reduced customer outages and emergency repair activity.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
Not applicable			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Replacing 4.8kV assets with 16kV assets will achieve secondary driver objectives.			
Safety (5.4.3.2 B2)			
New assets will be compliant with current ESA/CSA standards			
Cyber-security, Privacy (5.4.3.2 B3)			
Not applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Project will result in a reduction of system losses			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SR-007	Project/Activity Name	Voltage Conversion Projects
System Renewal - Asset Characteristics, Performance Deterioration/Failure (5.4.3.2 Cb.1)			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Performance Targets and Lifecycle Optimization Policies and Practices (5.4.3.2 Cb.1.a)			
Reliaibility of supply is expected to decrease if asset end-of-life status is not addressed.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Asset Condition Relative to Lifecycle and Performance record (5.4.3.2 Cb.1.b)			
Assets are at or near end-of-life status.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - No. Of Customers Potentially			
Woodeden Rd & Birchpark Dr. - 125 customers			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Quantitative Customer Impacts (frequency or duration of interruptions) (5.4.3.2			
Acceptable performance standards for outage duration and frequency are expected to be met through these projects.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Qualitative Customer Impacts (customer satisfaction/migration) (5.4.3.2 Cb.1.e)			
Customer satisfaction is affected by reliability. This project is expected to maintain current levels of system reliability for these customers.			
System Renewal - Asset Characteristics, Performance Deterioration/Failure - Value of Customer Impact (high/medium/low) (5.4.3.2 Cb.1.f)			
Majority of customers are residential and as such performance deterioration/failure of existing plant are expected to have low impact.			
System Renewal - Factors Affecting Timing (5.4.3.2 Cb.2)			
Project scale and scope are manageable within the designated period. GPI has the resources and materials in order to ensure project completion on time.			
System Renewal - Impact on System O&M costs (5.4.3.2 Cb.3)			
Running to failure will increase O&M costs. Emergency repairs may occur outside of normal business hours and require unplanned overtime.			
System Renewal - Reliability and/or Safety Factors (5.4.3.2 Cb.4)			
New plant will be installed per 22/04 standards and as such be up to date with respect to safety and reliabiility performance standards			
System Renewal -Analysis of Project Benefits and Costs (5.4.3.2 Cb.5)			
Rate of expenditure balances rate mitigation needs with decreasing asset reliability. Decreasing rate of expenditure will result in higher frequency risk of outages to customers as asset replacement is delayed.			
System Renewal - "Like for Like" Renewal (5.4.3.2 Cb.6)			
Not Applicable			

2022 – 2026 Material System Service Projects

A. General Information					
Project ID	SS-001	Project/Activity Name	Additional Feeder from NW-MTS (2508-M7)		
Investment Category		System Service			
Project Description					
GPI is serviced by four existing 28kV feeders. Two of these feeders (18M3, 18M4) egress from the existing Beamsville TS, which is owned by Hydro One and located within the Niagara Peninsula Energy Inc. (NPEI) territory. These feeders, owned by HONI up to the GPI border, supply GPI load and some NPEI load. The two other feeders (2508M3, 2508M4) egress from the existing Niagara West Municipal Transformer Station (NW-MNTS) which is owned by GPI but is located in NPEI territory. GPI is constructing a new pole line to install a third feeder (2508-M8) from the NW-MTS to supply loads in GPI's service area and increase the distribution system capacity to alleviate existing loading constraints. 2508-M7 will be constructed along the same pole line in order to provide additional capacity and redundancy to GPI distribution system.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	0	887,300	397,600	0	0
Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2-33%, Q3-33%, Q4-34%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Existing feeder cell at NW-MTS available and commissioned. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.					
Comparative Information (5.4.3.2 A5)					
No equivalent projects/programs over the historical period.�					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SS-001	Project/Activity Name	Additional Feeder from NW-MTS (2508-M7)
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is improvement in system capacity to provide for future load connections and to reduce loading on feeders to below planning limits.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Reliability, Customer Satisfaction and Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Load forecast indicate that existing NW-MTS feeders will be loaded above planned loading levels (See Capacity Planning Study). Load transfers to the other three feeders would put them in similar condition and is not a preferred alternative. The new feeder (2508M7) will alleviate the overload on the on existing NW-MTS feeders. The new feeder will pick up load from the 2508M3, 2508M4 and 2508M8 feeders thereby freeing up capacity on these feeders to pick up new load in their GPI service areas.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
New feeder will provide for additional capacity to connect new load over the forecast period. Load transfers to the new feeder from adjacent feeders will free up capacity on those feeders for future load growth over the forecast period and will improve contingency switching capabilty to address outages in the three feeder service areas.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Ability to connect new customers; improved outage contingency switching and capacity capability			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
With three feeders versus the existing two feeders, we can expect reduced number of customers impacted by a specific feeder outage. Improved feeder resiliency to outage situations.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
Alternative is to allow loading on the 2508M3 to continue to rise above planned loading levels thereby increasing risk to new connection capability and decreasing reliability of supply			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
New assets will be compliant with current ESA/CSA standards			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
There are no constraints at the transmission level requiring regional coordination (Niagara RIP dated March 2017)			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SS-001	Project/Activity Name	Additional Feeder from NW-MTS (2508-M7)
System Service - Benefits for Customer Relative to Achieving Project Objectives (5.4.3.2 Cc.1)			
New feeder will provide for additional capacity to connect new load over the forecast period. Existing customers to benefit from improved contingency switching capabilty to address outages.			
System Service - Regional Infrastructure Requirements (5.4.3.2 Cc.2)			
Not Applicable			
System Service - Advanced Technology (5.4.3.2 Cc.3)			
Not Applicable			
System Service - Reliability, Efficiency, Safety and Coordination - Benefits or Affects (5.4.3.2 Cc.4)			
● Improved reliability (feeder backup connectivity)			
System Service - Implementation Timing and Priority (5.4.3.2 Cc.5)			
Project implemented in the bridge year (2020)			
System Service - Project Benefits and Costs - Do Nothing (5.4.3.2 Cc.6.a)			
Alternative is to allow loading on the 2508M3 to continue to rise above planned loading levels thereby increasing			
System Service - Project Benefits and Costs - Technically Feasible Alternatives (5.4.3.2 Cc.6.b)			
Not Applicable			

A. General Information					
Project ID	SS-002	Project/Activity Name	Automate Primary 3-Phase Switches (Install Reclosers)		
Investment Category		System Service			
Project Description					
The objective of the project is to decrease sustained outage times on feeders; with an expected improvement to reliability Key Performance Indicators (KPI's) and reduction in O&M costs. This project will also deliver improved visibility of plant status for Operators and improved asset performance information through 24/7 monitoring and data capture (current, voltage, KW, KVAR, PF) at key points in the distribution system. It will also provide planning data for Engineering, automated fault detection and future fault restoration scheme options.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	0	165,008	126,231	42,918	43,777
Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.					
Customer Attachments and Load (5.4.3.2 A2)					
Recloser placement will sectionalize feeders in halves/quarters with the associated number of customer connections between them.					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2-33%, Q3-33%, Q4-34%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.					
Comparative Information (5.4.3.2 A5)					
Similar installations were completed in 2015-2017					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SS-002	Project/Activity Name	Automate Primary 3-Phase Switches (Install Reclosers)
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is reliability. Secondary drivers are operational efficiencies, improved system performance, maintainability, operability and continual improvement in Smart Grid capability.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Reliability, Customer Satisfaction and Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
This project will improve customer reliability. The reclosers will be installed at key points in the distribution system and will automatically sense downstream faults to isolate/sectionalize the circuit as required. Customers supplied upstream from the reclosers will not experience a sustained outage as they would have without the resclosers. In the absence of other outages issues, overall outage time to customers will be reduced. The reclosers will be connected to GPI's SCADA and will provide real time voltage, current, real and reactice power and power quality information that woul not be available otherwise. Real-time telemetry and control enhances resiliency of distribution system. The reclosers locations are determined based on feeder performance and operational needs to facilitate load transfers between feeders.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Industrial and commercial customers will save money if GPI minimizes process downtime. GPI reliability indices will improve. The recloser fault sensing capabilities will reduce the time for Operations locating a fault on the feeder. The continued investment in distribution automation will improve GPI's operations effciency by reducing outage times due to remote operator intervention, and increase cost-effectiveness by reducing on site operator visits during switching. There will be improved visibility of plant status for operators; improved asset performance information.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Minimize outage time and increase reliability to the customer. Other benefits to customers would be the utility ability to better monitor the feeders during peak loading conditions and ensure power quality is delivered.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Frequency of outages for customers upstream of a recloser will be minimized for permanent downstream faults. The use of reclosers with SCADA remote control capabilities will give GPI the ability to quickly sectionalize faulted feeder sections and transfer as much load as possible to adjacent feeders and restore power back to unaffected sections. The objective of this project is for SCADA operators to reduce outage restoration times and assist field crews with switching.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will only maintain the existing reliability level.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Automated SCADA controlled reclosers enable achievement of secondary driver objectives			
Safety (5.4.3.2 B2)			
The improvements to reliability and contingency performance due to the installation of automated reclosers that can be remote controlled through SCADA are expected to reduce the safety risks for Operations staff that may be associated with outage restoration efforts in unfavourable conditions due to weather, time of the day, or other factors. Overall reliability improvements and the ability to remotely control certain assets is expected to lead to more efficent outage response (less travel between switching devices by field crew). A reduction in these activities would reduce the overall exposure to the associated hazards.			
Cyber-security, Privacy (5.4.3.2 B3)			
Real-time data and control for automated reclose switches is monitored through GPI's SCADA system. SCADA has multiple levels of security through cyber intrusion protection using fire walls and data encryption.			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
GPI does not have a feeder configuration today that allows a full Fault Location, Isolation and Service Restoration (FLISR) implementation. The reclosers can be used in a future FLISR or other automated self-healing system as part of continuing improvement in GPI's Smart Grid capabilties.			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Reclosers as opposed to fuses are a cleaner technology. When a fuse is spent it requires a truck roll to remove and replace the spent fuse which becomes refuse and must be disposed of. When a reclose switch trips it is simply reset mechanically through an automated or remote mean.			

C. Category-specific Requirements			
Project ID	SS-002	Project/Activity Name	Automate Primary 3-Phase Switches (Install Reclosers)
System Service - Benefits for Customer Relative to Achieving Project Objectives (5.4.3.2 Cc.1)			
Minimizing feeder outages means more up time for GPI's larger customers; less production loss means cost savings to the customer.			
System Service - Regional Infrastructure Requirements (5.4.3.2 Cc.2)			
Not Applicable			
System Service - Advanced Technology (5.4.3.2 Cc.3)			
Automated reclosers sense fault current and trip accordingly. If fault is transient in nature, the reclosers will restore power automatically to the affected section of line. Eliminates fuse operation and requirement for dispatch of trouble crew to patrol and refuse affected portion of line. SCADA remote control and monitoring enabled for each recloser. This project support GPI's continuing efforts in improving its Smart Grid capabilities.			
System Service - Reliability, Efficiency, Safety and Coordination - Benefits or Affects (5.4.3.2 Cc.4)			
● Improved reliability (feeder sectionalizing) ● Improved safety with fast fault sensing from SEL relays ● Improved safety with remote operation ● Improved effciency through remote switching vs. truck roll			
System Service - Implementation Timing and Priority (5.4.3.2 Cc.5)			
Subject to annual needs over the 2021 – 2025 period.			
System Service - Project Benefits and Costs - Do Nothing (5.4.3.2 Cc.6.a)			
Doing nothing will result in no improvement to customer reliablity of supply. Customer cost of outages may rise with future impacts of climate change on the distribution system which would be mitigated through the introduction of automated reclosers.			
System Service - Project Benefits and Costs - Technically Feasible Alternatives (5.4.3.2 Cc.6.b)			
Main line fusing is limited due to fuse sizes and provides zero visibility to SCADA; requires truck rolls; provides no auxiliary data (voltage, curent, kW, kVAR). No mitigation effects on the increasing climate change impacts to distribution system supply.			

A. General Information					
Project ID	SS-003	Project/Activity Name	Monitoring & Control – FCI Installation and SCADA Integration		
Investment Category		System Service			
Project Description					
This project commenced during historical period where SCADA enabled Faulted Circuit Indicators would be installed and configured to provide enhanced monitoring abilities in the overhead system. This project was not completed in 2020 due to software communication issues by the vendor.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	0	0	0	85,600	96,300
Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.					
Customer Attachments and Load (5.4.3.2 A2)					
Not impacted					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2-50%, Q3-50%			
Risks and Mitigation (5.4.3.2 A4)					
Risks present associated with software communication issues and will be investigated properly prior to project commencement. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.					
Comparative Information (5.4.3.2 A5)					
No equivalent projects/programs over the historical period.					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SS-003	Project/Activity Name	Monitoring & Control – FCI Installation and SCADA Integration
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is reliability. Secondary drivers are operational efficiencies, improved system performance, maintainability, operability and continual improvement in Smart Grid capability.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Manage existing system assets through their normal lifecycle; optimize systems			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
This project will improve customer reliability through enhanced monitoring capabilities. The FCIs would be connected to GPI's SCADA and will provide real time system parameters that would not be available otherwise. Real-time telemetry and control enhances resiliency of distribution system.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Industrial and commercial customers will save money if GPI minimizes process downtime. GPI reliability indices will improve. The fault sensing capabilities will reduce the time for Operations locating a fault on the feeder. There will be improved visibility of plant status for operators; improved asset performance information.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Minimize outage time and increase reliability to the customer. Other benefits to customers would be the utility ability to better monitor the feeders during peak loading conditions and ensure power quality is delivered.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
The use of FCIs with SCADA monitoring capabilities will give GPI the ability to quickly sectionalize faulted feeder sections and transfer as much load as possible to adjacent feeders and restore power back to unaffected sections. The objective of this project is for SCADA operators to reduce outage restoration times and assist field crews with switching.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will only maintain the existing reliability level.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
SCADA FCIs enable achievement of secondary driver objectives			
Safety (5.4.3.2 B2)			
New assets will be compliant with current ESA/CSA standards			
Cyber-security, Privacy (5.4.3.2 B3)			
Real-time data is monitored through GPI's SCADA system. SCADA has multiple levels of security through cyber intrusion protection using fire walls and data encryption.			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
GPI does not have a feeder configuration today that allows a full Fault Location, Isolation and Service Restoration (FLISR) implementation. The FCIs can be used in a future FLISR or other automated self-healing system as part of continuing improvement in GPI's Smart Grid capabilities.			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			

C. Category-specific Requirements			
Project ID	SS-003	Project/Activity Name	Monitoring & Control – FCI Installation and SCADA Integration)
System Service - Benefits for Customer Relative to Achieving Project Objectives (5.4.3.2 Cc.1)			
Minimizing feeder outages means more up time for GPI's larger customers; less production loss means cost savings to the customer.			
System Service - Regional Infrastructure Requirements (5.4.3.2 Cc.2)			
Not Applicable			
System Service - Advanced Technology (5.4.3.2 Cc.3)			
FCIs sense fault current and reports back through SCADA. This project support GPI's continuing efforts in improving its Smart Grid capabilities.			
System Service - Reliability, Efficiency, Safety and Coordination - Benefits or Affects (5.4.3.2 Cc.4)			
● Improved reliability (feeder sectionalizing) ● Improved safety with fast fault sensing			
System Service - Implementation Timing and Priority (5.4.3.2 Cc.5)			
Subject to annual needs over the 2025 – 2026 period.			
System Service - Project Benefits and Costs - Do Nothing (5.4.3.2 Cc.6.a)			
Doing nothing will result in no improvement to customer reliability of supply. Customer cost of outages may rise with future impacts of climate change on the distribution system which would be mitigated through the introduction of SCADA FCIs			
System Service - Project Benefits and Costs - Technically Feasible Alternatives (5.4.3.2 Cc.6.b)			
Use of non-SCADA FCIs which are currently used today and requires feeder patrol to identify system faults.			

A. General Information					
Project ID	SS- 004	Project/Activity Name	Adding Two (2) Phases of UG Cable at Bal Harbour		
Investment Category		System Service			
Project Description					
The objective of the project is to convert customers currently on radial supply to loop supply to allow for backup supply connectivity and thereby increasing reliability for those customers to levels that are considered normal for all Grimsby Power customers. Backup supply allows GPI to performing circuit switching that will maintain power supply during maintenance activities and provide alternate supply restoration capability during unplanned outages. Customers in this area are fed from the Beamsville 18M3 feeder. The blue phase customers are connected in a loop configuration. The white and red phase customers are connected in a radial configuration. This project will extend the red and white phase circuits into the subdivision to provide loop supply for customers supplied from those radial circuits.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	0	0	0	144,000	0
Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2-50%, Q3-50%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Civil infrastructure for adding the two additional phases is already in place. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.					
Comparative Information (5.4.3.2 A5)					
Similar to Convert Radial Feed Customers to Loop (2022-2025)					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	SS-004	Project/Activity Name	Adding Two (2) Phases of UG Cable at Bal Harbour
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is improvement in customer reliability. Secondary drivers are operational efficiencies, improved system performance, maintainability and operability.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Reliability, Customer Satisfaction and Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
This project will improve customer reliability. Converting customers currently on radial supply to loop supply will provide backup supply connectivity and thereby increase reliability for those customers to levels that are considered normal for all Grimsby Power customers. Backup supply allows GPI to perform circuit switching in these areas that will maintain power supply during maintenance activities and provide alternate supply restoration capability during unplanned outages. Costs to extend the underground circuits are minimized as the civil infrastructure already exists to accomodate the circuit extensions.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Conversion to loop supply will improve operational efficiency in that maintenance activities can be planned and executed over greater variety of timeframes versus limited timeframes (to minimize adverse customer impact) of a radial supply. Premium labour costs avoided. Customer cost of outage reduced.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Increase reliability to the customer to levels typical of all other Grimsby Power customer. Reduced planned and unplanned outage duration and associated customer cost.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Customers in these areas will see improved reliability.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will only maintain the existing reliability level.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not applicable			
Safety (5.4.3.2 B2)			
New assets will be compliant with current ESA/CSA standards			
Cyber-security, Privacy (5.4.3.2 B3)			
Not applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SS-004	Project/Activity Name	Adding Two (2) Phases of UG Cable at Bal Harbour
System Service - Benefits for Customer Relative to Achieving Project Objectives (5.4.3.2 Cc.1)			
Customers will have their reliaibility of supply improved to levels typical of all Grimsby Power customers. Customer satisfaction will be improved and customer cost of outages reduced.			
System Service - Regional Infrastructure Requirements (5.4.3.2 Cc.2)			
Not Applicable			
System Service - Advanced Technology (5.4.3.2 Cc.3)			
Not Applicable			
System Service - Reliability, Efficiency, Safety and Coordination - Benefits or Affects (5.4.3.2 Cc.4)			
● Improved reliability (feeder backup connectivity) ● Improved efficiency through servicing in non-premium cost timeframes			
System Service - Implementation Timing and Priority (5.4.3.2 Cc.5)			
Projects wll be implemented in 2023. Sequence prioritized based on number of customer impacted, current reliaibility performance for the area and the desire to ensure smooth spending over the frecast period.			
System Service - Project Benefits and Costs - Do Nothing (5.4.3.2 Cc.6.a)			
GPI surveys indicate that the #1 driver of overall customer satisfaction with GPI, for business customers, is reliability of supply. Doing nothing will result in no improvement to customer reliablity of supply.			
System Service - Project Benefits and Costs - Technically Feasible Alternatives (5.4.3.2 Cc.6.b)			
Not Applicable			

<table>
<tr><th colspan="6">A. General Information</th></tr>
<tr><td>Project ID</td><td>SS-005</td><td>Project/Activity Name</td><td colspan="3" rowspan="2">Primary OH and UG Reinforcements</td></tr>
<tr><td colspan="2">Investment Category</td><td>System Service</td></tr>
<tr><td colspan="6">Project Description</td></tr>
<tr><td colspan="6">The objective of the project is to increase capacity on certain circuits by reconductoring or recabling. With increasing load due to new developments comes the challenge of transferring larger amount of loads between feeders during maintenance activities or outages. A number of feeder assets (poles,conductors, underground cables, etc.) were constructed when demand for electricity was not as great as it is now. The existing asset capacity is no longer suitable to support the new load levels that are expected over the 5-year forecast period. Increasing conductor sizes (reinforcements) in certain segments of feeders will ensure that main feeders are sufficient to support load growth from new developments and/or increased demand due to upgrades to existing services.</td></tr>
<tr><td colspan="6">Total Capital and O$M Costs (5.4.3.2 A1)</td></tr>
<tr><td>Item</td><td>2022</td><td>2023</td><td>2024</td><td>2025</td><td>2026</td></tr>
<tr><td>Capital</td><td>81,541</td><td>85,757</td><td>87,472</td><td>89,222</td><td>91,006</td></tr>
<tr><td colspan="6">Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.</td></tr>
<tr><td colspan="6">Customer Attachments and Load (5.4.3.2 A2)</td></tr>
<tr><td colspan="6">Not Applicable</td></tr>
<tr><td colspan="2">Project Start Date: (5.4.3.2 A3)</td><td>Jan. 1</td><td colspan="2">Project in Service Date: (5.4.3.2 A3)</td><td>Dec. 31</td></tr>
<tr><td colspan="3">Expenditure Timing (5.4.3.2 A3)</td><td colspan="3">Q2-33%, Q3-33%, Q4-34%</td></tr>
<tr><td colspan="6">Risks and Mitigation (5.4.3.2 A4)</td></tr>
<tr><td colspan="6">Risks are minimal. Material and resources will be planned, ordered and scheduled to be available. Contract labour resources are available and will be utilized if required.</td></tr>
<tr><td colspan="6">Comparative Information (5.4.3.2 A5)</td></tr>
<tr><td colspan="6">No equivalent projects/programs over the historical period.</td></tr>
<tr><td colspan="3">Capital and OM&A Associated with REG (5.4.3.2 A6)</td><td colspan="3">Not Applicable</td></tr>
<tr><td colspan="3">Leave to Construct (5.4.3.2 A7)</td><td colspan="3">Not Applicable</td></tr>
</table>

B. Evaluation Criteria and Information Requirements			
Project ID	SS-005	Project/Activity Name	Primary OH and UG Reinforcements
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is ensure that existing customer reliability in the area is maintained as load grows.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Reliability, Customer Satisfaction and Compliance with 22/04.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
This project will maintain existing customer reliability as load is added to the system. Reconductoring feeders will increase feeder capacity and maintain reliability. Increased feeder capacity will accomodate increases in load for existing customers and will add to backup supply capability to allow GPI to perform circuit switching in these areas that will maintain power supply during maintenance activities outage restoration during unplanned outages.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Increase in feeder capacity will improve connection and upgrade capability, operational efficiency in maintenance activities and response to outages.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Maintain reliability to existing customers as load growth occurs over future periods. Maintenance and outage response capability is maintained at levels acceptable to the customer.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Existing customer reliablity will be maintained.			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will result in no improvement to feeder capability to connect new load, handle load growth on existing customers and respond effectively to maintenance and outage response needs.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
New assets will be compliant with current ESA/CSA standards			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	SS-005	Project/Activity Name	Primary OH and UG Reinforcements
System Service - Benefits for Customer Relative to Achieving Project Objectives (5.4.3.2 Cc.1)			
Existing levels of customer reliaibility will be maintained over periods of load growth. Customer satisfaction maintained			
System Service - Regional Infrastructure Requirements (5.4.3.2 Cc.2)			
Not Applicable			
System Service - Advanced Technology (5.4.3.2 Cc.3)			
Not Applicable			
System Service - Reliability, Efficiency, Safety and Coordination - Benefits or Affects (5.4.3.2 Cc.4)			
●Existing reliability of supply and contingency capability maintained			
System Service - Implementation Timing and Priority (5.4.3.2 Cc.5)			
Projects wll be implemented over the 2021 – 2025 period. Sequence prioritized based on number of customer impacted, growth related impacts on capacity specific to the area and the desire to ensure smooth spending over the forecast period.			
System Service - Project Benefits and Costs - Do Nothing (5.4.3.2 Cc.6.a)			
GPI surveys indicate that the #1 driver of overall customer satisfaction with GPI, for business customers, is reliability of supply. Doing nothing will result in gradual degradation to customer reliablity of supply due to load growth and asset limitations in handling that level of growth and associated impacts on contingency response capability.			
System Service - Project Benefits and Costs - Technically Feasible Alternatives (5.4.3.2 Cc.6.b)			
Not Applicable			

2022 – 2026 Material General Plant Projects

A. General Information					
Project ID	GP-001	Project/Activity Name	Elevator / Wheelchair lifting device		
Investment Category		General Plant			
Project Description					
The purpose of this project is to retrofit the GPI Head Office with an elevator and wheel chair lifting device in order to facilitate building accessibility for disabled persons. This project is reflective of GPI's commitment to provide building accessiblity in accordance with the Accessibility for Ontarians with Disabilities Act.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	0	300,000	0	0	0
Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.					
Customer Attachments and Load (5.4.3.2 A2)					
Not Applicable					
Project Start Date: (5.4.3.2 A3)	Jan. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2 - 50%, Q3 - 50%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Contract resources to be utiltiized to perform building improvements.					
Comparative Information (5.4.3.2 A5)					
No equivalent projects/programs over the historical period.					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	GP-001	Project/Activity Name	Elevator / Wheelchair lifting device
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to improve building accessibility for disabled persons in accordance with the Accessibility for Ontarians with Disabilities Act.			
Efficiency, Customer Value, Reliability - Related Objectives and/or Perfomance Targets (5.4.3.2 B1.a)			
Performance Target - Customer Satisfaction and Compliance with Accessibility for Ontarians with Disabilities Act.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
In 2005, the Ontario Government passed the Accessibility for Ontarians with Disabilities Act to make Ontario accessible by 2025. GPI is considered as a "small private organization" under the regulations. Service providers are required to identify and remove barriers for individuals with disabilities with respect to goods, services, facilities, accommodation, employment, buildings, structures, premises and other matters prescribed by regulation and standards.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
This project will mitigate GPI head office access barriers to individuals with disabilities.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Compliance with the intent of the Accessibility for Ontarians with Disabilities Act (AODA).			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Not Applicable			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will result in no improvement to facility accessibility.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
Improvement to public safety for those with disabilities.			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	GP-001	Project/Activity Name	Elevator / Wheelchair lifting device
General Plant - Project Analysis - Value Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Value is aligned with corporate objectives and government regulations as described in the AODA.			
General Plant - Project Analysis - Risk Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
GPI is considered a small private organization under the AODA. Minor reputational risk to deferral of project.			
General Plant - Project Analysis - Do nothing alternative (5.4.3.2 Cd.1)			
The 'do nothing' alternative will result in no improvement to facility accessibility.			

A. General Information					
Project ID	GP-002	Project/Activity Name	New Insulation in truck and store bays		
Investment Category		General Plant			
Project Description					
The purpose of this project is to retrofit the existing indoor truck bays with new insulation to provide better climate control for vehicle storage, outfitting and maintenance.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	80,000	0	0	0	0
Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.					
Customer Attachments and Load (5.4.3.2 A2)					
Not Applicable					
Project Start Date: (5.4.3.2 A3)	Apr. 1	Project in Service Date: (5.4.3.2 A3)			30-Jul
Expenditure Timing (5.4.3.2 A3)		Q2-100%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Contract resources to be utiltiized to perform leasehold improvements.					
Comparative Information (5.4.3.2 A5)					
No equivalent projects/programs over the historical period.					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	GP-002	Project/Activity Name	New Insulation in truck and store bays
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to improve the climate conditions for the storage of equipment and work effectiveness.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Existing insulation in the truck bays is ineffective at mitigating the impacts of climate conditions (hot humid summer days; freezing winter days) on day to day work in the truck bays. Improving insulation in the bays will improve storage for equipment and work conditions for staff.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Effects on Operation Efficiency and Cost-effectiveness (5.4.3.2 B1.d.i)			
Improvement in climate condition will aid in equipment preparation for daily work and trouble response, Reduced work downtime during extreme weather days.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
A more climate-friendly environment helps with vehicle preparation for daily work and trouble response			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Minor improvement in outage response			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will result in no improvement to existing climate conditions in the truck bay.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
Minor improvement in worker safety due to a more effective climate working environment			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not applicable			
Conservation and Demand Management			
Not applicable			

C. Category-specific Requirements			
Project ID	GP-002	Project/Activity Name	New Insulation in truck and store bays
General Plant - Project Analysis - Value Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Value is aligned with corporate objectives and complements efforts to provide an efficient and safe work environment			
General Plant - Project Analysis - Risk Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Limited risk consequence of deferral			
General Plant - Project Analysis - Do nothing alternative (5.4.3.2 Cd.1)			
No change to existing working conditions in the truck or store bay			
General Service - High cost material projects business case details (>$250k) (5.4.3.2 Cd.2)			
Not Applicable			

<table>
<tr><th colspan="7">A. General Information</th></tr>
<tr><td>Project ID</td><td>GP-003</td><td colspan="2">Project/Activity Name</td><td colspan="3" rowspan="2">Replace existing HVAC System</td></tr>
<tr><td colspan="2">Investment Category</td><td colspan="2">General Plant</td></tr>
<tr><td colspan="7">Project Description</td></tr>
<tr><td colspan="7">The purpose of this project is to replace the existing GPI Head Office HVAC system with a new system.</td></tr>
<tr><td colspan="7">Total Capital and O$M Costs (5.4.3.2 A1)</td></tr>
<tr><td colspan="2">Item</td><td>2022</td><td>2023</td><td>2024</td><td>2025</td><td>2026</td></tr>
<tr><td colspan="2">Capital</td><td>0</td><td>0</td><td>0</td><td>0</td><td>385,000</td></tr>
<tr><td colspan="2">O&M</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td colspan="7">Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.</td></tr>
<tr><td colspan="7">Customer Attachments and Load (5.4.3.2 A2)</td></tr>
<tr><td colspan="7">Not Applicable</td></tr>
<tr><td colspan="2">Project Start Date: (5.4.3.2 A3)</td><td>Apr. 1</td><td colspan="3">Project in Service Date: (5.4.3.2 A3)</td><td>01-Aug</td></tr>
<tr><td colspan="3">Expenditure Timing (5.4.3.2 A3)</td><td colspan="4">Q2-50%, Q3-50%</td></tr>
<tr><td colspan="7">Risks and Mitigation (5.4.3.2 A4)</td></tr>
<tr><td colspan="7">Risks are minimal. Contract resources to be utiltiized to perform leasehold improvements.</td></tr>
<tr><td colspan="7">Comparative Information (5.4.3.2 A5)</td></tr>
<tr><td colspan="7">No equivalent projects/programs over the historical period.</td></tr>
<tr><td colspan="4">Capital and OM&A Associated with REG (5.4.3.2 A6)</td><td colspan="3">Not Applicable</td></tr>
<tr><td colspan="4">Leave to Construct (5.4.3.2 A7)</td><td colspan="3">Not Applicable</td></tr>
</table>

B. Evaluation Criteria and Information Requirements			
Project ID	GP-003	Project/Activity Name	Replace existing HVAC System
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to replace HVAC assets that are at end of life. New HVAC system will be more energy efficient, reducing annual energy operating costs as compared to the existing HVAC system.			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
The existing HVAC system is considered as apporaching end-of-life. Annual maintenance and repair needs are increasing. A new system will be more energy efficient, reducing annual energy costs, maintenance coasts and repair costs.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Benefits Accruing to Customers (5.4.3.2 B1.d.ii)			
Reduced operating expenses for GPI that in turn benefit the customer.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Not Applicable			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will result in no improvement/savings to HVAC operations. Future performance of existing HVACa system likely to deteriorate requiring more frequent and extensive repairs.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
Not Applicable			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not Applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not Applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
The new HVAC system will be more efficient and less costly to run thereby reducing the contribution of this component to OM&A expenses			
Conservation and Demand Management			
New HVAC system can be integrated into a automatic demand management scheme if so desired, Current systemis manual control with no CDM functionality.			

C. Category-specific Requirements			
Project ID	GP-003	Project/Activity Name	Replace existing HVAC System
General Plant - Project Analysis - Value Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Value is aligned with corporate objectives and complements efforts to reduce OM&A expenses.			
General Plant - Project Analysis - Risk Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Limited risk consequence of deferral			
General Plant - Project Analysis - Do nothing alternative (5.4.3.2 Cd.1)			
No improvement to existing HVAC performance.			
General Service - High cost material projects business case details (>$250k) (5.4.3.2 Cd.2)			
See attached business case.			

A. General Information					
Project ID	GP-004	Project/Activity Name		Parking Lots	
Investment Category	General Plant				
Project Description					
The purpose of this project is to build 2 new parking lots. 1 parking lot at GPI headoffice in 2024, and 1 parking lot at NW-MTS in 2025					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	0	0	75,000	100,000	0
Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.					
Customer Attachments and Load (5.4.3.2 A2)					
Not Applicable					
Project Start Date: (5.4.3.2 A3)	April. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2-50%, Q3-50%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Contract resources to be utiltiized.					
Comparative Information (5.4.3.2 A5)					
No equivalent projects/programs over the historical period.?					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	GP-004	Project/Activity Name	Parking Lots
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to provide adequate means of parking at headoffice and NW-MTS			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Currently staff have expressed issues with parking trucks at NW-MTS. Customer also expressed concerns in the past associated with parking their vehicles when entering GPI facility.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Not Applicable			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will result in continued issues and concerens associatd with parking at GPI headoffice and NW-MTS			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
Not Applicable			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			

C. Category-specific Requirements			
Project ID	GP-004	Project/Activity Name	Parking Lots
General Plant - Project Analysis - Value Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Value is aligned with corporate objectives and complements efforts to reduce OM&A expenses.			
General Plant - Project Analysis - Risk Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Limited risk consequence of deferral			
General Plant - Project Analysis - Do nothing alternative (5.4.3.2 Cd.1)			
Not applicable			
General Service - High cost material projects business case details (>$250k) (5.4.3.2 Cd.2)			
Not applicable			

A. General Information					
Project ID	GP-005	Project/Activity Name	SCADA Systems and Improvements		
Investment Category		General Plant			
Project Description					
The purpose of this project is to implement an Outage Management System (OMS) that, integrated with other systems (CIS, SCADA, GIS), would facilitate and streamline the communications and the information that is shared with customers, especially when outages occur. GPI's SCADA system is based on CPP Survalent software. Acquisition of the Survalent OMS module is required to enable the SCADA Outage Management System (OMS)capabilities.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	1,063	80,000	81,040	216,040	0
Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.					
Customer Attachments and Load (5.4.3.2 A2)					
Not Applicable					
Project Start Date: (5.4.3.2 A3)	April. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		Q2-50%, Q3-50%			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Contract resources to be utiltiized.					
Comparative Information (5.4.3.2 A5)					
No equivalent projects/programs over the historical period.�					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	GP-005	Project/Activity Name	SCADA Systems and Improvements
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to improve the effectiveness of GPI's outage response activities that provide information to the customer that is of value to them			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Improved field operations due to quicker response and more accurate dispatch of crews. More information available to customer affected by the outage. Minor field financial savings.			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Increased reliablity associated with enhanced visibility, monitoring and control of distribution system			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will result in no improvement to existing outage management capabilities and information to the customer.			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
Not Applicable			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not Applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not Applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not Applicable			
Conservation and Demand Management			
Not Applicable			

C. Category-specific Requirements			
Project ID	GP-005	Project/Activity Name	SCADA Systems and Improvements
General Plant - Project Analysis - Value Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Value is aligned with corporate objectives and complements efforts to reduce OM&A expenses.			
General Plant - Project Analysis - Risk Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Limited risk consequence of deferral			
General Plant - Project Analysis - Do nothing alternative (5.4.3.2 Cd.1)			
Not applicable			
General Service - High cost material projects business case details (>$250k) (5.4.3.2 Cd.2)			
Not applicable			

A. General Information					
Project ID	GP-006	Project/Activity Name	JOMAR ERP Software System Upgrades		
Investment Category		General Plant			
Project Description					
JOMAR is Grimsby Power’s ERP system which manages billing and execution activities for the organization. Enhancements in the JOMAR product has yielded an opportunity to expand the current functionality and provide full-scale support to the variety of functions at Grimsby Power.					
Total Capital and O$M Costs (5.4.3.2 A1)					
Item	2022	2023	2024	2025	2026
Capital	0	0	30,000	70,000	0
Capital costs are the gross capital costs. GPI does not require any contributed capital from specific customers for this project. This project does not add to O&M cost in the test year.					
Customer Attachments and Load (5.4.3.2 A2)					
Not Applicable					
Project Start Date: (5.4.3.2 A3)	April. 1	Project in Service Date: (5.4.3.2 A3)			Dec. 31
Expenditure Timing (5.4.3.2 A3)		25% quarterly			
Risks and Mitigation (5.4.3.2 A4)					
Risks are minimal. Contract resources to be utiltiized.					
Comparative Information (5.4.3.2 A5)					
No equivalent projects/programs over the historical period.�					
Capital and OM&A Associated with REG (5.4.3.2 A6)			Not Applicable		
Leave to Construct (5.4.3.2 A7)			Not Applicable		

B. Evaluation Criteria and Information Requirements			
Project ID	GP-006	Project/Activity Name	JOMAR ERP Software System Upgrades
Efficiency, Customer Value, Reliability - Main and Secondary Drivers (Trigger) (5.4.3.2 B1.a)			
The main driver for this project is to improve productivity and streamline function between various business units within GPI			
Efficiency, Customer Value, Reliability - Source and Nature of Information for Justification (5.4.3.2 B1.b)			
Improved project exeuction and financial tracking			
Efficiency, Customer Value, Reliability - Priority of the Investment Relative to Other (5.4.3.2 B1.c)			
Non-Mandatory project priority determined through the GPI capital prioritization process.			
Efficiency, Customer Value, Reliability - Impact on Reliability Performance (5.4.3.2 B1.d.iii)			
Not Applicable			
Efficiency, Customer Value, Reliability - Alternatives (5.4.3.2 B1.d.iv)			
The 'do nothing' alternative will result in no improvement to existing ERP system			
Efficiency, Customer Value, Reliability - Project Configuration to Meet Secondary Drivers (5.4.3.2 B1.d.v)			
Not Applicable			
Safety (5.4.3.2 B2)			
Not Applicable			
Cyber-security, Privacy (5.4.3.2 B3)			
Not Applicable			
Co-ordination, Interoperability - Regional Planning (5.4.3.2 B4.a)			
Not Applicable			
Co-ordination, Interoperability - Future Technological Functionality (5.4.3.2 B4.b)			
Not Applicable			
Environmental Benefits - Clean Technology, Conservation, Efficiency (5.4.3.2 B5)			
Not Applicable			
Conservation and Demand Management			
Not Applicable			

C. Category-specific Requirements			
Project ID	GP-006	Project/Activity Name	JOMAR ERP Software System Upgrades
General Plant - Project Analysis - Value Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Value is aligned with corporate objectives and complements efforts to reduce OM&A expenses.			
General Plant - Project Analysis - Risk Assessment -include monetary benefit, if applicables (5.4.3.2 Cd.1)			
Limited risk consequence of deferral			
General Plant - Project Analysis - Do nothing alternative (5.4.3.2 Cd.1)			
Not applicable			
General Service - High cost material projects business case details (>$250k) (5.4.3.2 Cd.2)			
Not applicable			

APPENDIX A

Glossary of Terms

GLOSSARY OF TERMS

Where applicable, definitions set out in the Distribution System Code (DSC) apply to terms used in this Distribution System Plan (DSP).

Where applicable, definitions set out in the Filing Requirements for Electricity Transmission and Distribution Applications, Chapter 5 - Consolidate Distribution System Plan, Filing Requirements apply to terms used in this DSP.

Distribution System Plan Duration - the duration of a distributor's Distribution System Plan, which is a minimum of 10 years in total and comprised of a historical period and a forecast period.

Forecast Period - the last 5 years of the DSP duration, consisting of 5 forecast years, beginning with the Test year.

Historical Period - is the first 5 years of the DSP duration, consisting of 5 historical years, ending with the Bridge year.

System Access Investments - modifications (including asset relocation) to a distributor's distribution system that a Local Distribution Company (LDC) is obligated to perform to provide a customer (including generator customer) or group of customers with access to electricity services via the distribution system.

System Renewal Investments - routine operations and maintenance activities carried out to sustain required distribution system performance to the end of the subject asset's service life.

System Service Investments - modifications to a distributor's distribution system to ensure the distribution system continues to meet operational objectives while addressing anticipated future customer electricity service requirements.

General Plant Investments - modifications, replacements or additions to a distributor's assets that are not part of its distribution system; including land and buildings, tools and equipment, rolling stock and electronic devices and software used to support day to day business and operations activities.

REG Investments - investments that accommodate the connection of renewable energy generation (REG), including connection assets, expansions and/or renewable enabling improvements, the costs of which are the responsibility of the distributor as set out in the DSC. REG investments can be stand-alone or integrated into a project/program/activity, and are to be categorized for the purposes of section 5.4 in the same way as any other investment category.

Regional Infrastructure Plan - document issued by the transmitter leading a Regional Planning Process that identifies forecast regional electricity service requirements, and describes and justifies the optimal infrastructure investments planned to meet those requirements.

Regional Planning Process - a consultation involving distributors, transmitters, and the Independent Electricity System Operator convened for the purpose of exchanging information related to the system planning, coordinating the modification of regional electricity transmission system, and preparing and issuing a Regional Infrastructure Plan.

System O&M - routine operation and maintenance activities carried out to sustain required distribution system performance to the end of the subject asset's service life.

Complex Load - customer with self-generation and/or storage capabilities.

Supervisory Control and Data Acquisition - a system for remote monitoring and control. Usually abbreviated to SCADA.

Remote Terminal Unit - a remote station for monitoring and control in a SCADA system. Usually abbreviated to RTU.

APPENDIX B

GPI SERVICE TERRITORY

GPI SERVICE TERRITORY

APPENDIX C

2019 Benchmarking Update
Report to the Ontario Energy Board

By: Pacific Economics Group (PEG)

Empirical Research in Support of Incentive Rate-Setting: 2019 Benchmarking Update

Report to the Ontario Energy Board

August 2020

Pacific Economics Group Research, LLC

Empirical Research in Support of Incentive Rate-Setting: 2019 Benchmarking Update

Report to the Ontario Energy Board

August 2020

Dave Hovde, M.S.
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1. Introduction

In 2013, the Ontario Energy Board (OEB) issued a report titled "Rate Setting Parameters and Benchmarking under the Renewed Regulatory Framework for Ontario's Electricity Distributors"[1] (Board Report) in which it set forth the framework for setting rate adjustment formulas for local distribution companies (LDCs or "distributors"). The Board Report provides the OEB's final determination on its policies and approaches to the distributor rate adjustment parameters and the benchmarking of electricity distributor total cost performance. This 2019 Benchmarking Update determines the 2020 stretch factor assignments for distributors in relation to the 2021 rate year.

According to the Board Report, rates will be indexed by a formula "which is used to adjust the distribution rates to reflect expected growth in the distributors' input prices (the inflation factor) less allowance for appropriate rates of productivity and efficiency gains (the X-factor)."[2] The productivity part of the X-Factor is the same for all LDCs. The efficiency gains part of the X-Factor is called the stretch factor and can vary by company. This stretch factor reflects the potential for incremental productivity gains by a given LDC under incentive regulation (i.e., incentive rate mechanism or IRM) which in turn depends on an individual distributor's level of cost efficiency.

These stretch factor assignments are based on the results of a statistical cost benchmarking study designed to make inferences on individual distributors' cost efficiency. An econometric model is used to predict the level of cost associated with each distributor's operating conditions. Distributors that had actual cost that was lower than that predicted by the model were assigned lower stretch factors than those that did not. The October 18, 2013 report by Pacific Economics Group (PEG) titled "Productivity and Benchmarking Research in Support of Incentive Rate Setting in Ontario" describes the model used to produce the benchmarking results. The work was subsequently updated to include 2013 data in July of 2014[3] and has been updated

[1] Issued on November 21, 2013 and corrected on December 4, 2013.

[2] Board Report, page 5.

[3] "Empirical work in Support of Incentive Rate Setting: 2013 Benchmarking Update".

each year since. This report presents updated benchmarking results that incorporates 2019 data to update the stretch factors.

Section 2 of this report discusses the methodology used for the 2019 update. Section 3 discusses the data used. Section 4 presents the benchmarking results and updated stretch factors. Section 5 discusses additional resources available to distributors to validate the results contained in this report.

2. Benchmarking Methodology

The model used to determine the cost efficiency of distributors is based on econometrics. Distributor cost in this model is estimated as a function of business conditions faced by each distributor. These business conditions include the number of customers served and the price of inputs such as labor and capital. The parameters of this model establish the relationship between each business condition and distributor cost. These parameters were estimated using Ontario LDC data from 2002-2012.

The model can make a prediction of each distributor's cost given its business conditions by multiplying the company's business condition variables by the model parameters and summing the results[4]. The distributor's actual cost is then compared to that predicted by the model. The percentage difference between actual and predicted cost is the measure of cost performance. Companies with larger negative differences between actual and predicted costs are considered to be better cost performers and therefore eligible for lower stretch factors. A

[4] The table of parameters published in the PEG report was for the full sample. When making predictions of cost for each company, the econometric program estimated the model without including the subject of benchmarking in the sample. Therefore, there exist 59 different sets of parameters which are very similar to each other. For ease of presentation, the PEG report did not present the parameters specific to each distributor. These company-specific parameters are necessary for the 2013 calculations and are contained within the working papers associated with this report.

detailed description of the econometric model including estimation technique and other technical details are contained in sections 6 and A2.1 of the PEG report.

The econometric model used to obtain the updated stretch factors is identical to the model described in the PEG report. The OEB intentionally decided not to update the parameters of the econometric model to include future data. The goal was to establish a fixed benchmark that would allow companies a fair opportunity to demonstrate continuous improvement of cost performance and earn a lower stretch factor. The parameters from the previous model were combined with each company's data – including 2013-2019 data - to produce 2019 predicted cost. The rationale for this decision is discussed in the Board Report and in a memorandum by PEG that also makes some corrections to the 2012 results.[5] The PEG memorandum contains the corrected final results of the 2010-2012 benchmarking model used in this update.

To apply the 2019 values to the model parameters, the data must be transformed to be consistent with how the data were specified for the estimated econometric model. One example of a transformation is that many of the explanatory variables were expressed as logarithms prior to the model being estimated. The PEG report describes the details of the estimation process in section A2.1. The spreadsheet model and associated documentation discussed in section 5 contain the calculations leading to the cost benchmarking results.

The purpose of the benchmarking work is to evaluate the total cost incurred by each distributor. Table 1 shows the formulas used to calculate the measure of total cost used in PEG's benchmarking analysis. As described in the PEG benchmarking report, adjustments were undertaken with the purpose of standardizing cost to facilitate more accurate cost comparisons among distributors. These adjustments included the treatment of high voltage and low voltage costs.

The variables used to explain total cost are the same as in the previous PEG report. They include outputs such as customers, kWh deliveries, and capacity. Prices for capital and OM&A along with other business conditions such as customer growth and average length of lines are also included. A complete discussion of the explanatory variables can be found in section 6 of the PEG report and the documents discussed in section 5. The explanatory variables are used to

[5] Available on the OEB website in the file "PEG_Memorandum_OEB on_corrections_20131220.pdf"

explain the level of cost incurred by each LDC. Cost that is not explained by the variables is deemed to be due to management performance.

3. Benchmarking Data

The source of the cost and output data used in the calculations is from the distributors as reported in the reporting and record-keeping requirements (RRR) filings. The study assumes that the data as reported by the distributors conforms to accounting policies and procedures described in the Accounting Procedures Handbook for Electricity Distributors that includes the Uniform System of Accounts and other instructions contained within the RRR filing system. It is also assumed that the LDCs have taken ownership of the data provided to the OEB and significant revisions are not anticipated.[6]

Data sources apart from the RRR are related to input prices. OEB-approved rates of return were obtained from OEB Staff. The source for other input price data was Statistics Canada. The input price indexes used were the same as those used in PEG's original study with one exception. Statistics Canada no longer calculates the Electric Utility Construction Price Index (EUCPI). The growth in the GDPIPI (FDD) was used to escalate the EUCPI values used the calculations.[7]

The update was done in the same manner as the original work with a few exceptions. The first is that the OEB has improved the quality of the guidance given to distributors related to capital additions data. As a result, improved data are available for 2013-2019. PEG has accordingly relied upon these newly-available capital additions data instead of inferring these

[6] The Ontario Energy Board (OEB) released the Report of the Board on Scorecard (EB-2010-0379) on March 5, 2014 (the "Scorecard Report") states that: '*While the Board will create consistent Scorecard reports for distributors, ownership of the data and Scorecard resides with the distributor.*'

[7] GDPIPI (FDD) is the Gross Domestic Product Implicit Price Index for Final Domestic Demand.

data from changes in gross plant[8]. The second exception is related to the treatment of deferred smart meter OM&A expenses. In the original PEG report, an adjustment was made for the estimated amount of amortization that was included in the reported OM&A expenses as a result of clearing amounts from account 1556. In 2014, OEB staff had advised that due to improved reporting requirements, this adjustment is no longer necessary.

The calculations have also been adjusted for amalgamations that have taken place since the original study was done. The historical cost performance of the combined entity was calculated from the historical results of the predecessor distributors that were amalgamated or acquired.[9] The most recent amalgamations are the integration of Guelph Hydro into Alectra, Thunder Bay and Kenora Hydro into Synergy North, Erie Thames and West Coast Huron into ERTH, and Veridian and Whitby Hydro into Elexicon. The net effect of these amalgamations reduces the number of distributors benchmarked to 59 from 63 in the previous benchmarking update.

This report also addresses the impact of data revisions by LDCs for informational purposes only. The OEB requires distributors to be accountable for the integrity of their reported data. As part of its procedures to improve data quality, the OEB invited distributors to submit corrections to previously provided data. However, a key determination is that already established and published benchmarking results for prior years would not be modified as a result of the new data. This includes any year that comprised the three-year average used to determine the current year's stretch factor. As stretch factors are used directly to set the distribution rates of distributors, they are not subsequently adjusted to avoid retroactive rate setting (i.e., rates are

[8] This improvement in data quality also extends to the collection of smart meter capital additions. The previous study estimated capital additions for distribution capital exclusive of meters for the period 2006-2012 in order to be able to isolate the accounting treatment of smart meters. The capital expenditures on smart meters were gathered for each company via a supplemental data request. These capital expenditures were then used as a proxy for capital additions and added to the total. A survey of the composition of the reported gross capital additions has revealed that some distributors have included amounts cleared from account 1555. The capital additions data for these companies has been adjusted to remove the cleared smart meter capital additions to avoid double counting.

[9] The method used to calculation the hypothetical historical cost performance of the combined entity is to sum the actual costs, sum the costs predicted by the model, and calculate the percentage difference. This method is essentially a cost-weighted average of the historical cost performances of the amalgamated distributors.

final once set unless approved on an interim basis). Consequently, the three years of data used to derive the three-year average for any year's stretch factors are locked-in such that the underlying data used do not change due to any subsequent data revisions. [10]

However, to show the impacts of data changes on the stretch factors, revised data have been incorporated into the benchmarking databases and model to allow previous results to be recalculated. The revised 2018 and 2017 results are presented only for the purposes of showing the impact of the data changes but were not used as discussed above to calculate the new 2017-2019 average cost performance used to determine the 2020 stretch factors assignments.

Several tables are included at the end of this report. Table 1 describes the calculation of total cost. Table 2 shows each distributor's growth in total cost from 2018 to 2019. Table 3 (A) presents the 2019 benchmarking results and a comparison to prior years' results. Table 3 (B) summarizes data revision impacts on cost performance although they have no bearing on the derivation of the current stretch factors. Table 4 presents average cost performance and associated stretch factors. Table 5 presents the companies assigned to each cohort according to their updated stretch factors. Changes from the previous year's assignments are shown in bold.

The goal of the benchmarking work is to evaluate levels of distributor cost. Table 2 presents the actual OM&A, Capital, and Total cost for each distributor for 2018 and 2019. As can be seen, industry total cost increased by 3.09% on average from 2018-2019. Whereas OM&A cost grew on average by 1.53%, capital cost increased on average by 4.29%.

The econometric model estimates LDCs' costs as a function of distributor output, input price growth, and other business condition variables beyond management control. It will also produce a prediction of the level of cost consistent with these business conditions and thus "explain" some of the observed cost level. As described in the PEG benchmarking report, changes not accounted for by these factors are deemed to be due to management performance. The parameter estimates measure the cost impact of the different business conditions and are

[10] The previous results were "locked-in" by pasting the values of previous cost performance into the 2019 part of the calculations. This means that these values are will not be affected by subsequent data revisions. This allows for the calculation of a new three-year average of the new 2019 result consistent with the previously published 2017-2019 results while still allowing the calculation of revised results for previous years, if applicable, to show the impact of any data revision.

presented on Table 16 of the PEG benchmarking report. The discussion below provides some details about the parameters and their associated impacts established for the 2002 to 2012 period.

The first of the cost drivers is output quantity. The model uses three measures for the quantity of distributor output. The first is the number of customers served and the second is kWh delivered. The third is a proxy for the capacity of the distribution system. The capacity variable is described in the PEG report and is equal to the largest peak load experienced as of the current year of data. For example, the 2012 value for the capacity variable is equal to largest reported system summer or winter kW in all the years 2002-2012. Therefore, for 2013, this capacity variable only increased if the distributor's kW demand in that year exceeded kW demand in every year between 2002 and 2012. Of the three output variables, the model estimates that the number of customers has the largest impact on cost, followed by the system capacity variable. The kWh delivered was the least important of the output variables. For the average company, the number of customers was found to be a more important cost driver than the other two combined. For each 1% change in number of customers, cost was estimated to change by 0.44%.

The second group of cost drivers were the input prices for capital and OM&A. For the average company, the cost impact of changes in the capital price was found to be almost twice as important as that for OM&A. For every 1% change in capital price, the impact on total cost was about 0.63%. The corresponding impact for changes in the OM&A price was 0.37%. The relevant indexes were updated to include 2019 data. For the OM&A price, the growth in average weekly earnings and that for the GDP implicit price index for final domestic demand ("GDPIPI (FDD)") were calculated. The 2019 growth in the OM&A price index is calculated as 70% times average weekly earnings growth plus 30% times GDPIPI (FDD) growth. The 2018 values for the OM&A price index from the previous report were escalated by the growth that occurred in 2019.

The capital price calculation is based upon an asset price index, an economic depreciation rate, and a rate of return. The asset price index was the Electric Utility Construction Price Index as calculated by Statistics Canada. As this index is no longer available, the previous values are escalated by an alternate index. The index chosen was the GDPIPI (FDD) which is the same index used to represent all non-labour price inflation in the Board-approved inflation measure formula[11]. The depreciation rate is fixed at 4.59% consistent with the previous work. The rate of return is a weighted average of the rates for return on equity, long-term debt, and short-term debt as approved by the OEB. The capital price used to calculate total cost is also used as an explanatory variable. Therefore, any changes in the rate of return or asset price index that affect the cost calculation will also affect the price calculation which will in turn "explain" the observed changes in cost.

The last group of cost drivers consists of other business condition variables. The first was the percentage of customers added over the last ten years. The second was the average km of distribution line. For each 1% change in line length, total cost was estimated to increase by 0.29%. The model also contains a time trend that accounts for changes in cost over time that are not accounted for by the other cost drivers. This variable estimates that cost should rise by 1.7% per year for reasons not identified by other variables in the model. All of these business condition variables were updated to include 2019 data.

4. Benchmarking Results and Updated Stretch Factors

Table 3 (A) presents a summary of the current benchmarking results for each distributor from 2017-2019. The updated average cost performance is based on a three-year rolling average calculated from the 2017-2019 values and is used to assign updated stretch factors to distributors. The last column presents the difference between the updated average cost performance and the previous one (2016-2018).[12] The electricity distributor sector has shown consistent year-over-year cost performance improvements. The average level of cost performance in 2019 for the 59 distributors is 7.8% lower than forecast (or predicted) cost that builds upon cost performance improvement in previous years. Previous years also have shown lower levels of performance

[11] The weight given to the non-labour index in the inflation formula includes capital cost.

[12] Changes in average cost performance are due to not only the addition of 2019 results, but the removal of 2016 results. It is therefore possible to simultaneously have improved 2019 cost performance and deteriorating average performance.

improvements for the currently benchmarked distributors but not as good compared to 2019 (i.e., lower than forecast cost of 6.2% in 2018, 4.9% in 2017 and 3.4% in 2016).

As discussed above, the OEB requires distributors to be accountable for the integrity of their reported data and sets out reporting procedures to improve data quality. OEB Staff reviewed and approved distributors' data corrections requests to previously filed data when reasonable justification is provided. The revised data were incorporated into the benchmarking databases and the 2017 and 2018 results were recalculated to demonstrate the impact on the previously published 2016-2018 average cost performance. Table 3 (B) shows the impact of LDC data revisions on 2017 and 2018 cost performance for those companies that had approved changes since the previous update[13]. No revisions would have changed previously determined cohort placement.

Updated stretch factors are assigned based on a three-year average of actual less predicted cost over the 2017-2019 period. As discussed in the Board Report, distributors that averaged 25% or more below cost received the lowest stretch factor of 0%. Those that averaged in excess of 10% and up to 25% below cost received a stretch factor of 0.15%. Those within 10% of predicted cost received a stretch factor of 0.30%. Those distributors that had cost in excess of 10% and up to 25% of that predicted received a stretch factor of 0.45%. Any distributors that had cost in excess of 25% more than predicted were assigned the highest stretch factor of 0.60%.

Table 4 presents a summary of the current and previous years' cost performance results and corresponding stretch factors. The assigned stretch factor for most companies was not affected by the 2019 update. A total of seven companies have been assigned different stretch factors and all six of the seven now have lower stretch factors. Table 5 presents the updated stretch factor assignments in the format of Appendix D of the Board report.

5. Validation and Other Supporting Documents

As part of their reporting requirements, distributors are asked to validate the numbers contained in their scorecard. The Spreadsheet Model as updated produces the updated

[13] There were no accepted revisions to 2016 data since the previous update.

benchmarking results contained in this report. It builds on the previous version by adding additional worksheets related to the 2019 calculations.

The format of the additional worksheets used in the update are similar to those provided earlier and the User's Guide will be applicable to the new worksheets. The guide is intended to serve as a tool for distributors to better understand these calculations and their cost performance. The spreadsheet model and users guide are available in the Total cost benchmarking – updates section of Performance Assessment page on the OEB's website.

Table 1

Calculation of 2019 Total Cost

Variable		Reference	Formula	Source
Total Cost			= OM&A + Capital Cost	Formula
OM&A			= A+B+C+D+E+F+G-I+J	Formula
2019	Operation	A		RRR
2019	Maintenance	B		RRR
2019	Billing and Collection	C		RRR
2019	Community Relations	D		RRR
2019	Administrative and General Expenses	E		RRR
2019	Insurance Expense	F		RRR
2019	Advertising Expenses	G		RRR
Adjustments to OM&A				
2019	HV Adjustment	I		RRR
2019	LV Adjustment	J		Hydro One Networks
Capital				
2018	Asset Price Index	K		Previous Year Calculations
2018	Capital Price	L		Previous Year Calculations
2018	Capital Quantity	M		Previous Year Calculations
2018	Capital cost	N		Previous Year Calculations
2019	Asset Price Index	O	=K x (GDPPI-FDD 2016 / GDPPI-FDD 2015)	Formula, Statistics Canada
2019	Capital Additions	P		RRR
2019	HV Capital Additions	Q		RRR
2019	Quantity of Capital Additions	R	=(P-Q) / O	Formula
	Depreciation Rate	S	Fixed at 4.59% for All Years	PEG Report
2019	Capital Quantity	T	= M - S x M + R	Formula
2019	Rate of Return	U		OEB Staff
2019	Capital Price	V	=U x K + S x O	Formula
2019	Capital Cost	W	= V x T	Formula

Table 2

Total Cost by Distributor: 2018 vs. 2019

	OM&A Cost			Capital Cost			Total Cost		
	2018	2019	Percent Change	2018	2019	Percent Change	2018	2019	Percent Change
Alectra Utilities Corporation	243,197,452	257,552,392	5.73%	469,515,340	497,115,696	5.71%	712,712,792	754,668,089	5.72%
Algoma Power Inc.	11,930,620	11,990,934	0.50%	13,643,491	14,233,881	4.24%	25,574,112	26,224,815	2.51%
Atikokan Hydro Inc.	1,087,097	1,083,377	-0.34%	588,363	602,858	2.43%	1,675,460	1,686,235	0.64%
Bluewater Power Distribution Corporation	13,754,074	13,313,535	-3.26%	13,013,655	13,641,782	4.71%	26,767,729	26,955,317	0.70%
Brantford Power Inc.	9,964,565	10,071,915	1.07%	11,058,211	11,698,662	5.63%	21,022,776	21,770,577	3.50%
Burlington Hydro Inc.	18,025,935	19,043,936	5.49%	24,594,385	26,038,314	5.71%	42,620,320	45,082,250	5.62%
Canadian Niagara Power Inc.	10,228,808	10,005,216	-2.21%	15,124,610	16,301,129	7.49%	25,353,418	26,306,344	3.69%
Centre Wellington Hydro Ltd.	2,464,520	2,602,317	5.44%	2,521,655	2,628,436	4.15%	4,986,175	5,230,753	4.79%
Chapleau Public Utilities Corporation	744,872	819,048	9.49%	230,567	236,825	2.68%	975,438	1,055,873	7.92%
Cooperative Hydro Embrun Inc.	689,126	691,107	0.29%	510,711	516,778	1.18%	1,199,837	1,207,886	0.67%
Elexicon Energy Inc.	38,584,591	40,136,684	3.94%	64,138,025	68,419,347	6.46%	102,722,616	108,556,031	5.52%
E.L.K. Energy Inc.	2,605,463	2,787,808	6.76%	2,383,382	2,428,307	1.87%	4,988,845	5,216,115	4.45%
Energy+ Inc.	17,677,971	18,361,849	3.80%	25,642,530	26,671,125	3.93%	43,320,501	45,032,974	3.88%
Entegrus Powerlines Inc.	13,576,025	13,298,368	-2.07%	19,719,965	20,560,306	4.17%	33,295,990	33,858,674	1.68%
EnWin Utilities Ltd.	25,555,586	24,432,745	-4.49%	38,208,169	39,064,214	2.22%	63,763,755	63,496,959	-0.42%
EPCOR Electricity Distribution Ontario Inc.	4,816,102	6,529,883	30.44%	4,507,376	4,953,086	9.43%	9,323,478	11,482,969	20.83%
ERTH Power Corporation	7,895,692	7,261,722	-8.37%	8,351,982	8,903,938	6.40%	16,247,674	16,165,660	-0.51%
Espanola Regional Hydro Distribution Corporation	1,482,629	1,709,667	14.25%	773,750	798,526	3.15%	2,256,379	2,508,193	10.58%
Essex Powerlines Corporation	7,545,389	7,356,413	-2.54%	9,802,132	10,269,224	4.66%	17,347,521	17,625,637	1.59%
Festival Hydro Inc.	6,168,269	5,855,853	-5.20%	7,900,687	8,034,350	1.68%	14,068,956	13,890,203	-1.28%
Fort Frances Power Corporation	1,619,179	1,629,256	0.62%	910,944	931,036	2.18%	2,530,123	2,560,292	1.19%
Greater Sudbury Hydro Inc.	14,687,809	14,566,546	-0.83%	17,287,490	17,850,661	3.21%	31,975,298	32,417,207	1.37%
Grimsby Power Incorporated	3,128,103	3,151,551	0.75%	3,619,182	3,758,286	3.77%	6,747,285	6,909,837	2.38%
Halton Hills Hydro Inc.	6,069,683	6,215,697	2.38%	11,751,841	12,189,535	3.66%	17,821,525	18,405,232	3.22%
Hearst Power Distribution Company Limited	1,135,359	1,086,335	-4.41%	360,263	368,522	2.27%	1,495,622	1,454,857	-2.76%
Hydro 2000 Inc.	546,524	506,164	-7.67%	140,259	152,566	8.41%	686,783	658,731	-4.17%
Hydro Hawkesbury Inc.	1,120,620	991,638	-12.23%	614,206	613,884	-0.05%	1,734,826	1,605,522	-7.75%
Hydro One Networks Inc.	535,524,472	538,618,195	0.58%	827,969,995	874,005,188	5.41%	1,363,494,467	1,412,623,382	3.54%
Hydro Ottawa Limited	81,806,255	78,332,371	-4.34%	153,288,862	170,827,554	10.83%	235,095,117	249,159,924	5.81%
Innpower Corporation	5,758,129	5,765,661	0.13%	9,387,602	10,012,926	6.45%	15,145,732	15,778,587	4.09%
Kingston Hydro Corporation	7,381,155	6,960,489	-5.87%	8,730,212	8,971,880	2.73%	16,111,367	15,932,369	-1.12%
Kitchener-Wilmot Hydro Inc.	17,517,341	17,521,849	0.03%	32,715,645	33,707,186	2.99%	50,232,987	51,229,035	1.96%
Lakefront Utilities Inc.	2,607,882	2,618,296	0.40%	2,590,014	2,660,380	2.68%	5,197,896	5,278,677	1.54%
Lakeland Power Distribution Ltd.	5,311,137	4,991,820	-6.20%	4,836,119	5,058,682	4.50%	10,147,256	10,050,502	-0.96%
London Hydro Inc.	37,400,594	37,864,464	1.23%	50,450,167	53,390,903	5.67%	87,850,760	91,255,367	3.80%
Milton Hydro Distribution Inc.	9,389,991	9,936,414	5.66%	17,637,631	18,354,678	3.98%	27,027,622	28,291,092	4.57%
Newmarket-Tay Power Distribution Ltd.	11,281,977	12,351,094	9.05%	17,318,142	17,444,218	0.73%	28,600,118	29,795,312	4.09%
Niagara Peninsula Energy Inc.	17,326,922	18,348,752	5.73%	24,661,333	25,695,030	4.11%	41,988,255	44,043,783	4.78%
Niagara-on-the-Lake Hydro Inc.	2,850,813	2,774,720	-2.71%	4,349,050	4,466,080	2.66%	7,199,863	7,240,800	0.57%
North Bay Hydro Distribution Limited	6,070,898	6,567,534	7.86%	10,723,875	11,154,005	3.93%	16,794,774	17,721,539	5.37%
Northern Ontario Wires Inc.	2,651,283	2,790,464	5.12%	1,450,162	1,483,588	2.28%	4,101,445	4,274,052	4.12%
Oakville Hydro Electricity Distribution Inc.	17,915,297	17,906,962	-0.05%	33,898,412	35,941,071	5.85%	51,813,709	53,848,033	3.85%
Orangeville Hydro Limited	3,204,308	3,419,294	6.49%	3,729,338	3,763,494	0.91%	6,933,646	7,182,788	3.53%
Orillia Power Distribution Corporation	4,916,240	4,906,135	-0.21%	4,474,802	4,807,450	7.17%	9,391,042	9,713,585	3.38%
Oshawa PUC Networks Inc.	13,100,434	12,607,249	-3.84%	20,306,089	22,784,128	11.51%	33,406,523	35,391,377	5.77%

Table 2

Total Cost by Distributor: 2018 vs. 2019

	OM&A Cost			Capital Cost			Total Cost		
	2018	2019	Percent Change	2018	2019	Percent Change	2018	2019	Percent Change
Ottawa River Power Corporation	2,855,216	3,337,203	15.60%	2,585,948	2,666,141	3.05%	5,441,164	6,003,344	9.83%
Peterborough Distribution Incorporated	8,748,446	8,467,413	-3.27%	13,244,855	13,382,600	1.03%	21,993,301	21,850,013	-0.65%
PUC Distribution Inc.	10,701,655	10,740,394	0.36%	12,488,359	12,709,727	1.76%	23,190,013	23,450,122	1.12%
Renfrew Hydro Inc.	1,440,446	1,355,865	-6.05%	1,226,241	1,269,531	3.47%	2,666,687	2,625,396	-1.56%
Rideau St. Lawrence Distribution Inc.	2,184,478	2,242,574	2.62%	1,181,665	1,206,954	2.12%	3,366,143	3,449,528	2.45%
Sioux Lookout Hydro Inc.	1,454,263	1,546,224	6.13%	919,053	929,922	1.18%	2,373,316	2,476,146	4.24%
Synergy North Corporation	17,752,308	16,857,004	-5.17%	20,539,891	21,435,307	4.27%	38,292,198	38,292,311	0.00%
Tillsonburg Hydro Inc.	2,854,683	2,767,763	-3.09%	2,261,637	2,565,809	12.62%	5,116,320	5,333,572	4.16%
Toronto Hydro-Electric System Limited	249,021,330	253,196,236	1.66%	618,658,249	652,375,141	5.31%	867,679,579	905,571,377	4.27%
Wasaga Distribution Inc.	3,166,523	3,432,078	8.05%	2,833,751	3,120,995	9.66%	6,000,274	6,553,073	8.81%
Waterloo North Hydro Inc.	13,837,414	13,878,886	0.30%	33,242,872	34,310,088	3.16%	47,080,286	48,188,974	2.33%
Welland Hydro-Electric System Corp.	6,608,044	6,757,918	2.24%	5,106,103	5,352,055	4.70%	11,714,147	12,109,973	3.32%
Wellington North Power Inc.	1,702,863	1,806,902	5.93%	1,408,362	1,436,725	1.99%	3,111,224	3,243,627	4.17%
Westario Power Inc.	5,431,298	5,927,808	8.75%	8,111,767	8,361,826	3.04%	13,543,065	14,289,635	5.37%
Average			1.53%			4.29%			3.09%
Median			0.50%			3.93%			3.50%

Note: The 2018 values for Alectra, ERTH, Synergy, Elexicon have been adjusted for the cost impact of their amalgamations.

Table 3 (A)

Summary of Cost Performance Results

	Cost Efficiency Assessment							
	2015	2016	2017	2018	2019	2016-2018	2017-2019	Difference from 2016-2018
Alectra Utilities Corporation	0.0%	-0.1%	4.1%	-0.8%	0.1%	1.1%	1.2%	0.1%
Algoma Power Inc.	70.6%	69.8%	68.9%	66.1%	64.3%	68.2%	66.4%	-1.8%
Atikokan Hydro Inc.	9.7%	11.9%	12.6%	9.6%	6.6%	11.3%	9.6%	-1.8%
Bluewater Power Distribution Corporation	0.8%	2.1%	4.0%	3.7%	0.3%	3.2%	2.7%	-0.6%
Brantford Power Inc.	-6.1%	-4.4%	-8.2%	-9.4%	-10.2%	-7.3%	-9.3%	-2.0%
Burlington Hydro Inc.	-10.3%	-11.1%	-11.9%	-13.9%	-11.7%	-12.3%	-12.5%	-0.2%
Canadian Niagara Power Inc.	13.0%	13.5%	11.2%	17.1%	15.6%	13.9%	14.6%	0.7%
Centre Wellington Hydro Ltd.	-1.2%	0.4%	1.0%	-0.3%	-1.1%	0.4%	-0.1%	-0.5%
Chapleau Public Utilities Corporation	23.9%	21.0%	17.0%	24.2%	25.4%	20.7%	22.2%	1.5%
Cooperative Hydro Embrun Inc.	-33.2%	-38.2%	-41.1%	-44.8%	-51.3%	-41.4%	-45.7%	-4.4%
E.L.K. Energy Inc.	-34.7%	-39.4%	-44.5%	-47.8%	-47.4%	-43.9%	-46.6%	-2.7%
Elexicon Energy Inc.	-2.7%	-1.7%	-2.8%	-5.5%	-1.0%	-3.3%	-3.1%	0.2%
Energy+ Inc.	-5.3%	-9.9%	-11.1%	-13.1%	-14.1%	-11.4%	-12.8%	-1.4%
Entegrus Powerlines Inc.	-15.4%	-13.5%	-16.8%	-16.0%	-21.0%	-15.4%	-17.9%	-2.5%
ENWIN Utilities Ltd.	9.9%	9.6%	5.3%	-2.7%	-10.1%	4.1%	-2.5%	-6.6%
EPCOR Electricity Distribution Ontario Inc.	-14.2%	-13.2%	-18.4%	-19.3%	-3.9%	-17.0%	-13.9%	3.1%
ERTH Power Corporation	11.9%	11.9%	11.2%	6.6%	1.3%	9.9%	6.4%	-3.5%
Espanola Regional Hydro Distribution Corporation	-20.4%	-20.9%	-23.1%	-24.8%	-17.2%	-22.9%	-21.7%	1.2%
Essex Powerlines Corporation	-13.5%	-14.3%	-14.1%	-12.3%	-19.2%	-13.6%	-15.2%	-1.6%
Festival Hydro Inc.	14.0%	13.4%	8.8%	10.8%	5.9%	11.0%	8.5%	-2.5%
Fort Frances Power Corporation	5.1%	6.8%	2.4%	-0.8%	-5.1%	2.8%	-1.2%	-4.0%
Greater Sudbury Hydro Inc.	8.0%	9.6%	7.1%	7.6%	5.1%	8.1%	6.6%	-1.5%
Grimsby Power Incorporated	-17.0%	-13.0%	-24.9%	-27.6%	-31.8%	-21.8%	-28.1%	-6.3%
Halton Hills Hydro Inc.	-28.2%	-27.5%	-28.4%	-29.2%	-30.3%	-28.4%	-29.3%	-0.9%
Hearst Power Distribution Company Limited	-7.4%	-21.3%	-20.1%	-21.3%	-28.7%	-20.9%	-23.4%	-2.5%
Hydro 2000 Inc.	-6.2%	-19.6%	-23.0%	-15.4%	-22.4%	-19.4%	-20.3%	-0.9%

Table 3 (A)

Summary of Cost Performance Results

	Cost Efficiency Assessment							
	2015	2016	2017	2018	2019	2016-2018	2017-2019	Difference from 2016-2018
Hydro Hawkesbury Inc.	-68.1%	-66.4%	-56.3%	-57.7%	-69.3%	-60.1%	-61.1%	-1.0%
Hydro One Networks Inc.	19.7%	15.6%	17.0%	16.0%	16.3%	16.2%	16.4%	0.3%
Hydro Ottawa Limited	15.2%	15.7%	16.5%	18.2%	20.4%	16.8%	18.4%	1.6%
Innpower Corporation	8.5%	9.1%	4.7%	-2.2%	-5.3%	3.8%	-0.9%	-4.8%
Kingston Hydro Corporation	-3.1%	-2.9%	-1.4%	1.3%	-3.8%	-1.0%	-1.3%	-0.3%
Kitchener-Wilmot Hydro Inc.	-22.3%	-20.4%	-19.9%	-19.2%	-21.1%	-19.8%	-20.1%	-0.3%
Lakefront Utilities Inc.	-22.1%	-18.8%	-23.5%	-21.0%	-24.4%	-21.1%	-23.0%	-1.9%
Lakeland Power Distribution Ltd.	-7.6%	-11.6%	-16.1%	-9.2%	-14.2%	-12.3%	-13.2%	-0.8%
London Hydro Inc.	-9.9%	-8.0%	-7.1%	-5.9%	-5.8%	-7.0%	-6.2%	0.8%
Milton Hydro Distribution Inc.	2.7%	-0.6%	-14.4%	-17.4%	-18.7%	-10.8%	-16.8%	-6.1%
Newmarket-Tay Power Distribution Ltd.	-13.7%	-11.9%	-8.6%	-10.0%	-9.8%	-10.2%	-9.5%	0.7%
Niagara Peninsula Energy Inc.	4.5%	3.5%	4.9%	1.3%	1.1%	3.2%	2.4%	-0.8%
Niagara-on-the-Lake Hydro Inc.	-6.6%	-6.4%	-9.2%	-5.2%	-9.5%	-6.9%	-8.0%	-1.0%
North Bay Hydro Distribution Limited	7.0%	3.2%	5.5%	3.3%	4.9%	4.0%	4.6%	0.6%
Northern Ontario Wires Inc.	-42.2%	-38.5%	-36.0%	-37.3%	-38.2%	-37.3%	-37.2%	0.1%
Oakville Hydro Electricity Distribution Inc.	6.9%	4.5%	2.6%	1.0%	0.3%	2.7%	1.3%	-1.4%
Orangeville Hydro Limited	-7.6%	-10.2%	-14.3%	-20.0%	-20.7%	-14.8%	-18.3%	-3.5%
Orillia Power Distribution Corporation	-8.0%	-2.5%	-3.8%	-5.7%	-7.4%	-4.0%	-5.6%	-1.6%
Oshawa PUC Networks Inc.	-14.9%	-15.4%	-16.3%	-14.4%	-12.0%	-15.4%	-14.2%	1.1%
Ottawa River Power Corporation	-9.3%	-9.8%	-10.4%	-21.9%	-18.9%	-14.0%	-17.0%	-3.0%
Peterborough Distribution Incorporated	11.0%	12.6%	8.2%	5.8%	1.5%	8.9%	5.2%	-3.7%
PUC Distribution Inc.	16.2%	14.0%	11.2%	8.2%	5.5%	11.1%	8.3%	-2.8%
Renfrew Hydro Inc.	10.6%	10.6%	7.7%	7.2%	1.1%	8.5%	5.3%	-3.1%
Rideau St. Lawrence Distribution Inc.	-4.8%	-8.1%	-4.1%	-9.4%	-11.2%	-7.2%	-8.3%	-1.0%
Sioux Lookout Hydro Inc.	-4.3%	-3.4%	-7.9%	-16.9%	-19.0%	-9.4%	-14.6%	-5.2%
Synergy North Corporation	7.3%	9.8%	9.1%	7.4%	6.2%	8.8%	7.6%	-1.2%

Table 3 (A)

Summary of Cost Performance Results

	Cost Efficiency Assessment							
	2015	2016	2017	2018	2019	2016-2018	2017-2019	Difference from 2016-2018
Tillsonburg Hydro Inc.	-0.5%	1.6%	-1.2%	3.2%	3.7%	1.2%	1.9%	0.7%
Toronto Hydro-Electric System Limited	51.5%	52.3%	52.9%	53.0%	52.8%	52.7%	52.9%	0.2%
Wasaga Distribution Inc.	-45.6%	-44.9%	-45.7%	-46.7%	-42.9%	-45.8%	-45.1%	0.7%
Waterloo North Hydro Inc.	8.2%	9.9%	9.5%	9.7%	8.1%	9.7%	9.1%	-0.6%
Welland Hydro-Electric System Corp.	-18.7%	-17.4%	-19.6%	-24.0%	-25.4%	-20.3%	-23.0%	-2.7%
Wellington North Power Inc.	11.8%	16.2%	12.7%	8.7%	6.7%	12.5%	9.4%	-3.1%
Westario Power Inc.	-6.0%	-2.7%	-1.5%	-8.5%	-7.7%	-4.2%	-5.9%	-1.7%
Average	-3.1%	-3.4%	-4.9%	-6.2%	-7.8%	-4.8%	-6.3%	-1.5%
Median	-4.3%	-2.7%	-3.8%	-5.7%	-7.4%	-4.2%	-5.9%	-1.2%
Max	70.6%	69.8%	68.9%	66.1%	64.3%	68.2%	66.4%	3.1%
Min	-68.1%	-66.4%	-56.3%	-57.7%	-69.3%	-60.1%	-61.1%	-6.6%

Table 3 (B)

Summary of the Impact of Revised Data on Cost Performance Results

LDCs with approved 2017 and/or 2018 data revisions for the 2019 data update	2017 Cost Performance			2018 Cost Performance			2016-2018 Average Cost Performance*		
	As Previously Calculated	As Revised	Difference	As Previously Calculated	As Revised	Difference	As Previously Calculated	As Revised	Difference
Bluewater Power Distribution Corporation	4.0%	4.0%	0.00%	3.7%	3.7%	0.00%	3.2%	3.2%	0.000%
Burlington Hydro Inc.	-11.9%	-10.9%	-1.00%	-13.9%	-12.9%	-1.02%	-12.3%	-11.6%	0.671%
E.L.K. Energy Inc.	-44.5%	-44.5%	0.00%	-47.8%	-47.6%	-0.19%	-43.9%	-43.8%	0.063%
Energy+ Inc.	-11.1%	-11.1%	0.00%	-13.1%	-13.5%	0.35%	-11.4%	-11.5%	-0.116%
Essex Powerlines Corporation	-14.1%	-14.1%	0.00%	-12.3%	-12.3%	0.00%	-13.6%	-13.6%	0.000%
Hydro One Networks Inc.	17.0%	17.0%	0.00%	16.0%	16.0%	-0.01%	16.2%	16.2%	0.004%
Northern Ontario Wires Inc.	-36.0%	-36.0%	0.00%	-37.3%	-37.6%	0.23%	-37.3%	-37.4%	-0.078%
Waterloo North Hydro Inc.	9.5%	9.5%	0.05%	9.7%	9.6%	0.12%	9.7%	9.6%	-0.055%

* There were no new revisions to 2016 data. Essex had approved revisions to data that are collected but not used in the current analysis. Bluewater had revisions to O&M data that reallocated expenses among accounts that did not affect the total OM&A cost used in the analysis. The impact of revisions are not cumulative with revisions from previous updates.

Table 4

Summary of Stretch Factor Assignments

	2016-2018		2017-2019		Change in Stretch Factor
	Benchmarking Performance	Stretch Factor	Benchmarking Performance	Stretch Factor	
Alectra Utilities Corporation	1.1%	0.30	1.2%	0.30	NO
Algoma Power Inc.	68.2%	0.60	66.4%	0.60	NO
Atikokan Hydro Inc.	**11.3%**	**0.45**	**9.6%**	**0.30**	**YES**
Bluewater Power Distribution Corporation	3.2%	0.30	2.7%	0.30	NO
Brantford Power Inc.	-7.3%	0.30	-9.3%	0.30	NO
Burlington Hydro Inc.	-12.3%	0.15	-12.5%	0.15	NO
Canadian Niagara Power Inc.	13.9%	0.45	14.6%	0.45	NO
Centre Wellington Hydro Ltd.	0.4%	0.30	-0.1%	0.30	NO
Chapleau Public Utilities Corporation	20.7%	0.45	22.2%	0.45	NO
Cooperative Hydro Embrun Inc.	-41.4%	0.00	-45.7%	0.00	NO
E.L.K. Energy Inc.	-43.9%	0.00	-46.6%	0.00	NO
Elexicon Energy Inc.	-3.3%	0.30	-3.1%	0.30	NO
Energy+ Inc.	-11.4%	0.15	-12.8%	0.15	NO
Entegrus Powerlines Inc.	-15.4%	0.15	-17.9%	0.15	NO
ENWIN Utilities Ltd.	4.1%	0.30	-2.5%	0.30	NO
EPCOR Electricity Distribution Ontario Inc.	-17.0%	0.15	-13.9%	0.15	NO
ERTH Power Corporation	9.9%	0.30	6.4%	0.30	NO
Espanola Regional Hydro Distribution Corporation	-22.9%	0.15	-21.7%	0.15	NO
Essex Powerlines Corporation	-13.6%	0.15	-15.2%	0.15	NO
Festival Hydro Inc.	**11.0%**	**0.45**	**8.5%**	**0.30**	**YES**
Fort Frances Power Corporation	2.8%	0.30	-1.2%	0.30	NO
Greater Sudbury Hydro Inc.	8.1%	0.30	6.6%	0.30	NO
Grimsby Power Incorporated	**-21.8%**	**0.15**	**-28.1%**	**0.00**	**YES**
Halton Hills Hydro Inc.	-28.4%	0.00	-29.3%	0.00	NO

Table 4

Summary of Stretch Factor Assignments

	2016-2018		2017-2019		Change in Stretch Factor
	Benchmarking Performance	Stretch Factor	Benchmarking Performance	Stretch Factor	
Hearst Power Distribution Company Limited	-20.9%	0.15	-23.4%	0.15	NO
Hydro 2000 Inc.	-19.4%	0.15	-20.3%	0.15	NO
Hydro Hawkesbury Inc.	-60.1%	0.00	-61.1%	0.00	NO
Hydro One Networks Inc.	16.2%	0.45	16.4%	0.45	NO
Hydro Ottawa Limited	16.8%	0.45	18.4%	0.45	NO
Innpower Corporation	3.8%	0.30	-0.9%	0.30	NO
Kingston Hydro Corporation	-1.0%	0.30	-1.3%	0.30	NO
Kitchener-Wilmot Hydro Inc.	-19.8%	0.15	-20.1%	0.15	NO
Lakefront Utilities Inc.	-21.1%	0.15	-23.0%	0.15	NO
Lakeland Power Distribution Ltd.	-12.3%	0.15	-13.2%	0.15	NO
London Hydro Inc.	-7.0%	0.30	-6.2%	0.30	NO
Milton Hydro Distribution Inc.	-10.8%	0.15	-16.8%	0.15	NO
Newmarket-Tay Power Distribution Ltd.	**-10.2%**	**0.15**	**-9.5%**	**0.30**	**YES**
Niagara Peninsula Energy Inc.	3.2%	0.30	2.4%	0.30	NO
Niagara-on-the-Lake Hydro Inc.	-6.9%	0.30	-8.0%	0.30	NO
North Bay Hydro Distribution Limited	4.0%	0.30	4.6%	0.30	NO
Northern Ontario Wires Inc.	-37.3%	0.00	-37.2%	0.00	NO
Oakville Hydro Electricity Distribution Inc.	2.7%	0.30	1.3%	0.30	NO
Orangeville Hydro Limited	-14.8%	0.15	-18.3%	0.15	NO
Orillia Power Distribution Corporation	-4.0%	0.30	-5.6%	0.30	NO
Oshawa PUC Networks Inc.	-15.4%	0.15	-14.2%	0.15	NO
Ottawa River Power Corporation	-14.0%	0.15	-17.0%	0.15	NO
Peterborough Distribution Incorporated	8.9%	0.30	5.2%	0.30	NO
PUC Distribution Inc.	**11.1%**	**0.45**	**8.3%**	**0.30**	**YES**

Table 4

Summary of Stretch Factor Assignments

	2016-2018		2017-2019		Change in Stretch Factor
	Benchmarking Performance	Stretch Factor	Benchmarking Performance	Stretch Factor	
Renfrew Hydro Inc.	8.5%	0.30	5.3%	0.30	NO
Rideau St. Lawrence Distribution Inc.	-7.2%	0.30	-8.3%	0.30	NO
Sioux Lookout Hydro Inc.	**-9.4%**	**0.30**	**-14.6%**	**0.15**	**YES**
Synergy North Corporation	8.8%	0.30	7.6%	0.30	NO
Tillsonburg Hydro Inc.	1.2%	0.30	1.9%	0.30	NO
Toronto Hydro-Electric System Limited	52.7%	0.60	52.9%	0.60	NO
Wasaga Distribution Inc.	-45.8%	0.00	-45.1%	0.00	NO
Waterloo North Hydro Inc.	9.7%	0.30	9.1%	0.30	NO
Welland Hydro-Electric System Corp.	-20.3%	0.15	-23.0%	0.15	NO
Wellington North Power Inc.	**12.5%**	**0.45**	**9.4%**	**0.30**	**YES**
Westario Power Inc.	-4.2%	0.30	-5.9%	0.30	NO

Table 5

Stretch Factor Assignments by Group

Group I (7 Distributors)	Group II (17 Distributors)		Group III (29 Distributors)		Group IV (4 Distributors)	Group V (2 Distributors)
Stretch Factor = 0%	Stretch Factor = 0.15%		Stretch Factor = 0.30%		Stretch Factor = 0.45%	Stretch Factor = 0.60%
Cooperative Hydro Embrun Inc.	Burlington Hydro Inc.	Lakefront Utilities Inc.	Alectra Utilities Corporation	Newmarket-Tay Power Distribution Ltd.	Canadian Niagara Power Inc.	Algoma Power Inc.
E.L.K. Energy Inc.	Energy+ Inc.	Lakeland Power Distribution Ltd.	Atikokan Hydro Inc.	Niagara Peninsula Energy Inc.	Chapleau Public Utilities Corporation	Toronto Hydro-Electric System Limited
Grimsby Power Incorporated	Entegrus Powerlines Inc.	Milton Hydro Distribution Inc.	Bluewater Power Distribution Corporation	Niagara-on-the-Lake Hydro Inc.	Hydro One Networks Inc.	
Halton Hills Hydro Inc.	EPCOR Electricity Distribution Ontario Inc.	Orangeville Hydro Limited	Brantford Power Inc.	North Bay Hydro Distribution Limited	Hydro Ottawa Limited	
Hydro Hawkesbury Inc.	Espanola Regional Hydro Distribution Corporation	Oshawa PUC Networks Inc.	Centre Wellington Hydro Ltd.	Oakville Hydro Electricity Distribution Inc.		
Northern Ontario Wires Inc.	Essex Powerlines Corporation	Ottawa River Power Corporation	EnWin Utilities Ltd.	Orillia Power Distribution Corporation		
Wasaga Distribution Inc.	Hearst Power Distribution Company Limited	Sioux Lookout Hydro Inc.	Elexicon Energy Inc.	Peterborough Distribution Incorporated		
	Hydro 2000 Inc.	Welland Hydro-Electric System Corp.	ERTH Power Corporation	PUC Distribution Inc.		
	Kitchener-Wilmot Hydro Inc.		Festival Hydro Inc.	Renfrew Hydro Inc.		
			Fort Frances Power Corporation	Rideau St. Lawrence Distribution Inc.		
			Greater Sudbury Hydro Inc.	Synergy North Corporation		
			Innpower Corporation	Tillsonburg Hydro Inc.		
			Kingston Hydro Corporation	Waterloo North Hydro Inc.		
			London Hydro Inc.	Wellington North Power Inc.		
				Westario Power Inc.		

APPENDIX D

Asset Condition Assessment

GRIMSBY Power Inc.
2018 ASSET CONDITION ASSESSMENT

Kinectrics Report: K-814152-RA-0001-R02

January 10, 2019

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Toronto, ON
M8Z 6C4 Canada
www.kinectrics.com

GRIMSBY POWER INC.
2018 ASSET CONDITION ASSESSMENT

Kinectrics Report: K-814152-RA-0001-R02

January 10, 2019

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Revision History

Revision Number	Date	Comments	Approved
R00	2018-11-09	Draft	
R01	2018-12-21	Draft	
R02	2019-01-10	Final	

EXECUTIVE SUMMARY

In 2018 Grimsby Power Inc. (GPI) determined a need to perform a condition assessment of its key distribution assets. GPI selected and engaged Kinectrics Inc. (Kinectrics) to assist with this work. This report presents the results of 2017 Asset Condition Assessment (ACA) study.

Asset Categories Considered

The asset groups included in the 2018 ACA are as follows, including 9 categories or 18 sub-categories:

- Station Transformers
- Station Breakers
- Poles (Wood, Concrete)
- Pole Mounted Transformers (1-Phase, 2-Phase, 3-Phase)
- OH Lines (1-Phase, 2-Phase, 3-Phase)
- OH Gang Switches (1-Phase, 3-Phase)
- Pad Mounted Transformers (1-Phase, 3-Phase)
- Pad Mounted Switchgear
- UG Cables (1-Phase, 2-Phase, 3-Phase)

For each asset category, available data was assessed, Health Index distribution was determined, and condition-based Flagged for Action plan was developed.

Some of these asset groups, such as station transformers and station breakers, require that an individual asset unit get replaced before its failure. A risk based prioritized list was developed for each of these groups, indicating the projected flagged for action year of each individual unit.

Data Collection

Before 2018 ACA study started, GPI had prepared the available data for the asset groups studied in this project. Such data collection commitment was continued and intensified during the entire process of 2018 ACA study. Working together with Kinectrics in this study, GPI took extra effort to review and update the information in existing databases while incorporating new data from other sources. The ACA study results were also used for sanity check in data acquisition process.

Overall Health Index Distribution

In general, 15 of the 18 sub-categories had over 70% of their units classified as “good” or “very good”, and 15 of them had an average Health Index score of greater than 80%.

With respect to the asset categories of concern, Poles (Wood) had the highest percentages of units in “poor” to “very poor” condition, with over 27% of units classified as “poor” or “very poor”.

Flagged for Action Plans

In general, the overwhelming majority of the sub-categories (except for Poles-Wood) had their flagged for action plans showing smooth variation throughout the next 10 years. In other words, for these asset groups GPI does not have any substantial backlog action work.

In the short term, it was determined that Poles (Wood), Poles (Concrete) and OH Lines (1-Phase) had the highest percentages of units flagged for action in first year, each exceeding 4% of population.

Furthermore, within the next 10 years, more than 20% of the Poles (Wood), Poles (Concrete), OH Lines (1-Phase), OH Switches (3-Phase) and UG Cables (1-Phase) are expected to require some action to be taken to address their condition.

The actual replacement plans might be only a subset of the Flagged for Action plans after GPI's review based on GPI's maintenance and replacement strategy.

Data Availability

The asset groups of Station Transformers had relatively complete data sets, with test, detailed inspection and loading data available.

Station Circuit Breakers had operation cycle data available. Poles (Wood) and Pad Mounted Transformers (1-Phase) had inspection data available. Pad Mounted Switchgear had inspection data through on-site visit.

All other asset groups had age information only.

Recommendations

At the moment, GPI had decent amount of data for 2018 ACA study, based on which informed decisions could be made. For the purpose of improving ACA study in the future, it is recommended that GPI enhance data collection in the following areas:

- Corrective maintenance records and inspection records at component level, for all the asset groups other than Station Transformers, Poles (Wood) or Pad Mounted Transformers (1-Phase).
- Operation cycle counts, for both the normal operation and fault interruption for Station Breakers, as well as manufacturer specification limits on contact resistance and operation cycles, for the purpose of estimating breaker degradation due to usage.
- Historic records of asset removal for all the asset groups, for the purpose of developing GPI specific asset degradation curves in the future.

- Continous tracking of Underground Cables failures by location in the outage database. Once sufficient data are available in the future, they could be incorporated in ACA study.

The results presented in this study are based solely on asset condition as determined by available data. Note that there are numerous other considerations that may influence GPI's planning process. Among these are obsolescence, system growth, corporate priorities, technological advancements, etc.

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DEFINITIONS

Terminology	Acronym	Definition
Age Limiter	AL	The final HI assigned to an individual asset may also be limited by the asset's age. The AL is generally equal to the cumulative survival probability at a given age of an asset group. If the calculated HI is less than or equal to the AL, the final HI assigned is the calculated HI. Otherwise, the final HI assigned is equal to the AL.
Asset Condition Assessment	ACA	Process of using asset information to determine the condition of assets. Condition data can include nameplate information, test results, asset inspection records, corrective maintenance records, operational experience, etc.
Condition Parameter Score	CPS	Score of an asset for a particular condition parameter. In this study, the scoring system used ranges from 0 through 4 (0 = worst; 4 = best).
Condition Parameters	CP	Asset characteristics or properties that are used to derive the HI.
Criticality		Metric used to quantify consequence of failure in this methodology.
Criticality Index	CI	Index used to determine asset Criticality. CI ranges from 0% to 100%, with 100% representing the unit with the highest possible consequence of failure.
Cumulative Distribution Function	CDF	Cumulative distribution function. Assumed in this methodology as the Weibull function representing the cumulative likelihood of removals.

Terminology	Acronym	Definition
Data Availability Indicator	DAI	A measure of the amount of condition parameter data that an asset has, as measured against the full data sets that are practically available and included in the HI formula. It is determined by the weighted ratio of the condition parameters availability of an individual unit, over the maximum condition parameters availability of an asset group.
Data Gap		A data gap is the case where none of the units in an asset group has data for a particular item as requested by "ideal" data sets. A data gap means the data is either unavailable or not in a useable format.
De-rating Multiplier	DR	Multipliers used to adjust a condition or sub-condition parameter score or calculated Health Index so as to reflect certain conditions.
Flagged for Action Plan	FFA Plan	Number of units that are expected to require attention annually.
Flagged for Action Year	FFA Year	The year that a particular unit is flagged for action.
Health Index	HI	Health Indexing quantifies equipment condition based on numerous condition parameters that are related to the factors that cumulatively lead to an asset's end of life. HI is given in terms of a percentage range of 0%-100%, with 100% representing as new condition.
Probability Density Function	PDF	Probability density function. Assumed in this methodology as the Weibull function representing the likelihood that an asset will be removed from service when its age is within a particular range.
Removal Rate		Weibull hazard function. Assumed in this methodology as the rate of removal (removals per year for given age, including failures, proactively replaced, removal for non-condition reasons).
Risk		Product of likelihood of removal and consequence of failure.
Sample Size		Subset of an asset population with enough data (i.e. age or condition data) to calculate the HI.

Terminology	Acronym	Definition
Sub-Condition Parameter Score	SCPS	Score of an asset for a particular sub condition parameter. In this study, the scoring system used ranges from 0 through 4 (0 = worst; 4 = best).
Sub-Condition Parameters	CP	Asset characteristics or properties that are used to derive the HI. Each condition parameter can be comprised of multiple sub-condition parameters.
Weibull Distribution		Continuous function used, in this methodology to model, the removal rates of assets.
Weight of Condition Parameter	WCP	In the HI formula, condition parameters are assigned a weight that is based on t he degree of contribution or relevance to asset degradation.
Weight of Sub-Condition Parameter	WSCP	In the HI formula, condition parameters are assigned a weight that is based on t he degree of contribution or relevance to asset degradation.

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I INTRODUCTION

Grimsby Power Inc. (GPI) engaged Kinectrics Inc (Kinectrics) in 2018 to perform an Asset Condition Assessment (ACA) on selected distribution assets. An assessment produces a quantifiable evaluation of asset condition and also aids in prioritizing and allocating sustainment investments. This undertaking, if done continuously over time, would allow GPI to monitor trends in the condition of its assets and to continuously improve its assessment process and asset management practices. This assessment covered GPI's asset population as of September 2018. This report presents results based on the available data. Year 0 shown in all figures is for 2018, year 1 for 2019, year 2 for 2020 etc.

I.1 Objective and Scope of Work

The categories and sub-categories of assets considered in this study are as follows:

Asset Category	
Station Transformers	-
Station Breakers	-
Poles	Wood
	Concrete
Pole Mounted Transformers	1 Phase
	2 Phase
	3 Phase
OH Lines (km)	1 Phase
	2 Phase
	3 Phase
OH Gang Switches	1 Phase
	3 Phase
Pad Mounted Transformers	1 Phase
	3 Phase
Pad Mounted Switchgear	-
UG primary Cables (km)	1 Phase
	2 Phase
	3 Phase

I.2 Deliverables

The deliverable in this study is a Report that includes the following information:

- Description of the Asset Condition Assessment methodology
- For each asset category the following were included:
    - Health Index formulation
    - Age distribution
    - Health Index distribution
    - Condition-based Flagged For Action Plan
    - Prioritized risk based list of proactively replaced asset groups
    - Assessment of data availability and a Data Gap analysis

- Prioritized risk based lists were provided for the asset groups requiring replacement of individual asset units before failure

II ASSET CONDITION ASSESSMENT METHODOLOGY

The Asset Condition Assessment (ACA) Methodology involves the process of determining asset Health Index, as well as developing a condition-based Flagged for Action Plan for each asset group. The methods used are described in the subsequent sections.

II.1 Health Index

Health Indexing quantifies equipment condition based on numerous condition parameters that are related to the degradation factors that lead to an asset's end of service life. The Health Index is an indicator of the asset's overall health and is typically given in terms of percentage, with 100% representing an asset in brand new condition. Health Indexing provides a measure of long-term degradation and thus differs from defect management, whose objective is finding defects and deficiencies that need correction or remediation in order to keep an asset operating prior to reaching its end of life.

Condition parameters are the asset characteristics or properties that are used to derive the Health Index. A condition parameter may be comprised of several sub-condition parameters. For example, a parameter called "Oil Quality" may be a composite of parameters such as "Moisture", "Acid", "Interfacial Tension", "Dielectric Strength" and "Colour".

In formulating a Health Index, condition parameters are ranked, through the assignment of *weights*, based on their contribution to asset degradation. The *condition parameter score* for a particular parameter is a numeric evaluation of an asset with respect to that parameter.

Health Index (HI), which is a function of scores and weightings, is therefore given by:

$$HI = \frac{\sum_{m=1}^{\forall m} \alpha_m (CPS_m \times WCP_m)}{\sum_{m=1}^{\forall m} \alpha_m (CPS_{m.\max} \times WCP_m)} \times DR$$

Equation 1

where

$$CPS = \frac{\sum_{n=1}^{\forall n} \beta_n (CPF_n \times WSCP_n)}{\sum_{n=1}^{\forall n} \beta_n (WSCP_n)}$$

Equation 2

CPS	Condition Parameter Score
WCP	Weight of Condition Parameter
α_m	Data availability coefficient (1 if available; 0 if not available)
CPF	Sub-Condition Parameter Score
WSCP	Weight of Sub-Condition Parameter
β_n	Data availability coefficient for sub-condition parameter (1 if available; 0 if not available)

DR De-Rating Multiplier

The scale that is used to determine an asset's score for a particular parameter is called the *condition criteria*. For this project, a condition criteria scoring system of 0 through 4 is used. A score of 0 represents the worst score while 4 represents the best score. I.e. $CPF_{max} = 4$.
De-Rating multipliers are applied to the calculated HI. These may be used to represent the impact of non-condition issues such as design or operating environment.

II.1.1 Health Index Results

As stated previously, an asset's Health Index is given as a percentage, with 100% representing "as new" condition. The Health Index is calculated only if there is sufficient condition data. The subset of the population with sufficient data is called the *sample size*. Results are generally presented in terms of number of units and as a percentage of the sample size. If the sample size is sufficiently large and the units within the sample size are sufficiently random, the results may be extrapolated for the entire population.

The Health Index distribution given for each asset group illustrates the overall condition of the asset group. Further, the results are aggregated into five categories and the categorized distribution for each asset group is given. The Health Index categories are as follows:

Very Poor	Health Index < 25%
Poor	25 ≤ Health Index < 50%
Fair	50 ≤ Health Index <70%
Good	70 ≤ Health Index <85%
Very Good	Health Index ≥ 85%

Note that for critical asset groups, such as Power Transformers, the Health Index of each individual unit is given.

II.2 **Condition Based Flagged for Action Plan**

The condition based Flagged for Action Plan outlines the number of units that are expected to require attention in the next 10 years. The numbers of units are estimated using either a *proactive* or *reactive* approach. In the proactive approach, units are considered for action prior to failure, whereas the reactive approach is based on expected failures per year.

Both approaches consider asset removal rate and probability of failure. The removal rate is estimated using the method described in the subsequent section.

II.2.1 Removal Rate and Probability of Removal

Where removal rate data is not available, a frequency of removal that grows exponentially with age provides a good model.

Depending on its application, there have been various forms derived from the original equation. Based on Kinectrics' experience in removal rate studies of multiple power system asset groups, Kinectrics has selected the Weibull equation to model the removal curves. The Weibull function has no specific characteristic shape and, as such, can model the exponentially increasing removal rate using appropriate parameters.

The Weibull removal density function is defined as:

$$f(t) = \frac{\beta t^{\beta-1}}{\alpha^{\beta}} e^{-(\frac{t}{\alpha})^{\beta}}$$

Equation 3

f	= removal rate per unit time
t	= time
α, β	= constant that control the scale and shape of the curve

Depending on its application, there have been various forms derived from the original equation. Based on Kinectrics' experience in removal rate studies of multiple power system asset groups, the following variation of the removal rate formula has been adopted:

The corresponding cumulative removal distribution is therefore:

$$Q(t) = 1 - R(t) = 1 - e^{-(\frac{t}{\alpha})^{\beta}}$$

Equation 4

Q(t)	= cumulative failure distribution
R(t)	= survival function

Finally, the removal rate function (i.e. hazard function) is then:

$$\lambda(t) = \frac{f(t)}{1 - Q(t)} = \frac{\beta t^{\beta-1}}{\alpha^{\beta}}$$

Equation 5

$\lambda(t)$	= hazard function (removals per year)

Different asset groups experience different removal rates and therefore different removal distributions. The parameters α and β are determine the shapes of these curves. For each asset group, the values of these constant parameters were selected to reflect typical useful lives for these assets.

Consider, for example, an asset class where at the ages of 40 and 75 the asset has cumulative probabilities of removal of 20% and 95% respectively. It follows that when using Equation 5, α and β are calculated as 57.503 and 4.132 respectively. The removal rate and probability of removal graphs for these parameters are as follows:

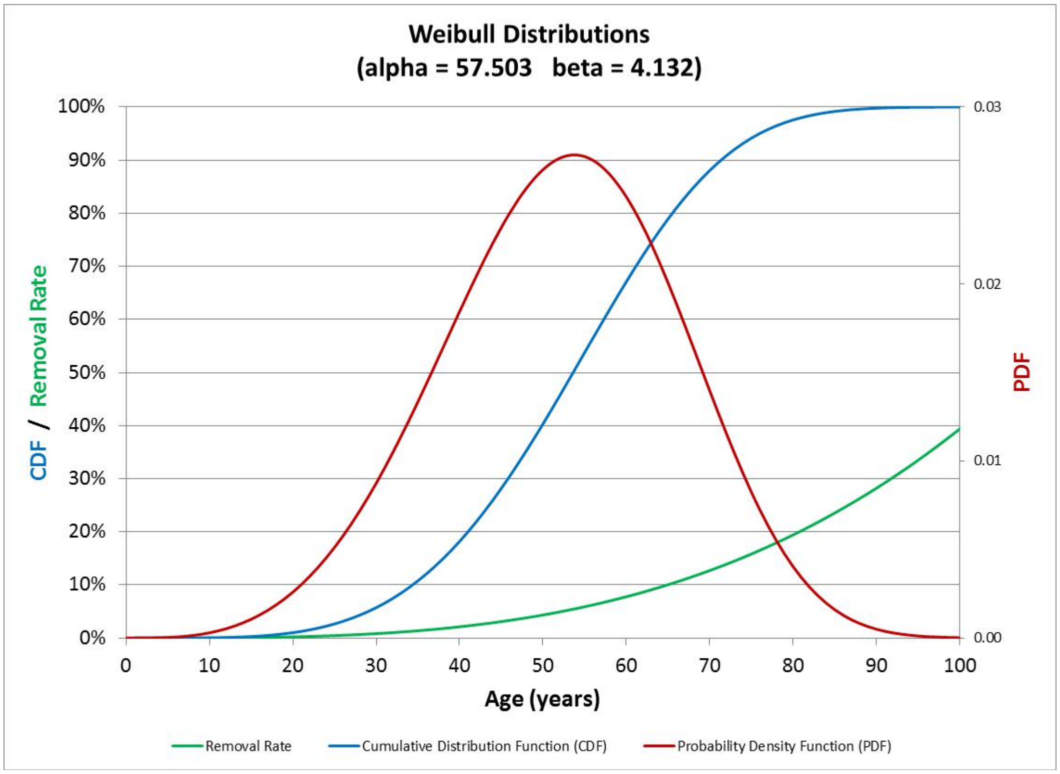

Figure 1 Removal rate vs. Age

II.2.2 Projected Flagged for Action Plan Using a Probabilistic Approach

For assets that have low consequences of failure or that are run to failure, a probabilistic approach is taken to estimate the number of units that are flagged for action in a given year.

For such asset types, the number of units expected to be replaced in a given year are determined based on the asset's removal rates. The number of failures per year is given by Equation 5.

An example of such a Flagged for Action Plan is as follows: Consider an asset distribution of 100 - 5 year old units, 20 – 10 year old units, and 50 - 20 year old units. Assume that the removal rates for 5, 10, and 20 year old units for this asset class are $\lambda_5 = 0.02$, $\lambda_{10} = 0.05$, $\lambda_{20} = 0.1$ failures / year respectively. In the current year, the total number of replacements is 100(.02) + 20(0.05) + 50(0.1) = 2 + 1 + 5 = 8.

In the following year, the expected asset distribution is, as a result, as follows: 8 – 1 year old units, 98 – 6 year old units, 19 – 11 year old units, and 45 - 21 year old units. The number of replacements in year 2 is therefore $8(\lambda_1) + 19(\lambda_6) + 45(\lambda_{11}) + 45(\lambda_{21})$.

Note that in this study the "age" used is in fact "effective age", or condition-based age if available, as opposed to the chronological age of the asset.

For the asset categories below, the probabilistic approach is used to estimate the FFA Plan. It is also important to note that the FFA gives the estimated number of assets per year that need to be addressed; the year that a specific unit needs to be addressed is not calculated.

- Poles (wood, concrete)
- Distribution transformers (pole mounted, pad mounted)
- OH switches
- OH lines
- Pad mounted switchgear
- Primary underground cables

II.2.3 Projected Flagged for Action Plan Using a Prioritized Risk Approach

For certain asset classes, costs of replacement and/or consequences of failure are more significant. As such planning for replacement requires more consideration. For these assets, a risk-based approach is taken when developing the FFA Plan. This risk-based methodology considers both the asset likelihood of removal (as related to HI) and its consequence of failure (criticality). The product of likelihood or removal and consequence of failure determines asset risk.

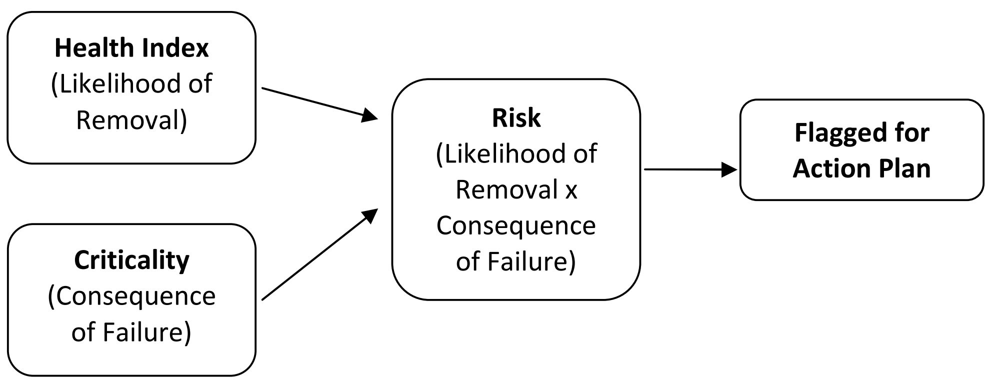

Figure 2 Risk Assessment Procedure

Relating Health Index and Probability of Removal

If there are no dominant sources, it can be assumed that the stress to which an asset is exposed is not constant and will have a somewhat normal frequency distribution. This is illustrated by the probability density curve of stress below. The vertical lines in the figure represent condition or strength (Health Index) of an asset.

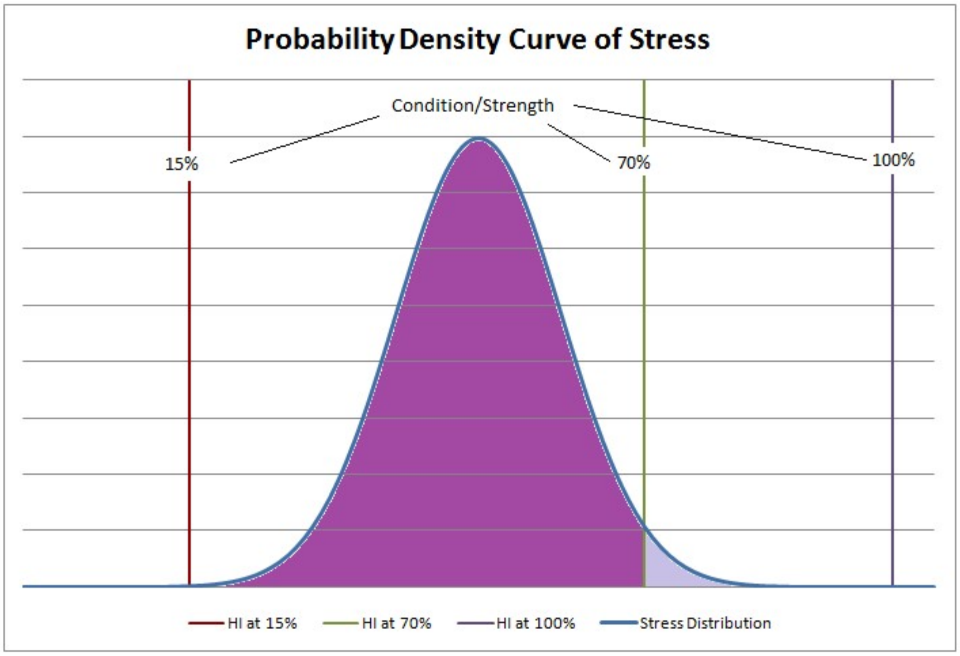

Figure 3 Stress Curve

An asset is in as-new condition (100% strength) should be able to withstand most levels of stress. As the condition of the asset deteriorates, it may be less able to withstand higher levels of stress. Consider, for example, the green vertical line that represents 70% condition/strength. The asset should be able to withstand magnitudes of stress to left of the green line. If, however, the stress is of a magnitude to the right of the green line, the asset will fail.

To create a relationship between the Health Index and likelihood of removal, assume two "points" on the stress curve that correspond to two different Health Index values. In this example, assume that an asset that has a condition/strength (Health Index) of 100% can withstand all magnitudes of stress to the left of the purple line. It then follows that probability that an asset in 100% condition will fail is the probability that the magnitude of stress is at levels to the right of the purple line. This corresponds to the area under the stress density curve to the right of the purple line. Similarly, if it assumed that an asset with a condition of 15% will fail if subjected to stress at magnitudes to the right of the red line, the probability of failure at 15% condition is the area under the stress density curve to the right of the red line.

The likelihood of removal at a particular Health Index is found from plotting the Health Index on X-axis and the area under the probability density curve to the right of the Health Index line on Y-axis, as shown on the graph of the figure below.

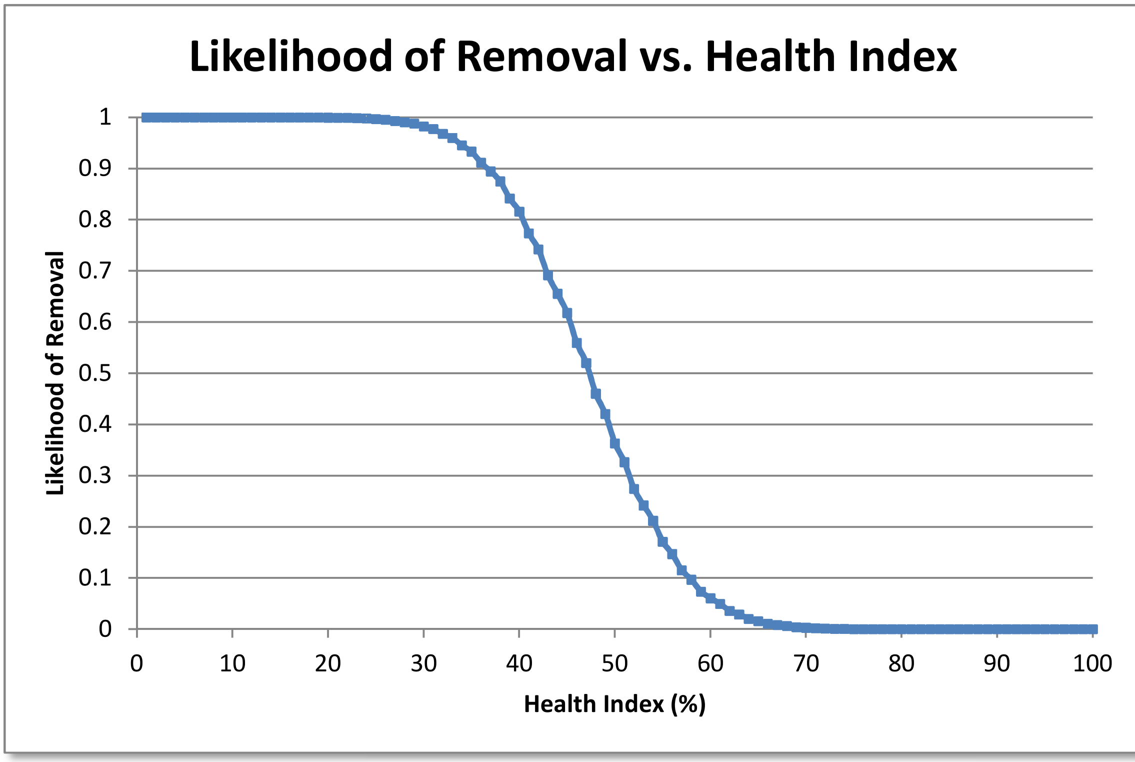

Figure 4 Likelihood of Removal vs. Health Index

Condition-Based Flagged for Action Plan

In this study, the metric used to measure consequence of failure is referred to as *Criticality*. Criticality may be determined in numerous ways, with monetary consequence or degree of risk to corporate business values being examples. The higher the criticality value assigned to a unit, the higher it's consequence of failure.

Due to the small population size for the asset groups applicable to prioritized risk based approach, in this study all the units in these asset groups were assigned of minimum criticality value.

To develop a Flagged for Action Plan, the risk of removal of each unit must be quantified. Risk is the product of a unit's likelihood of removal and its consequence of failure. An asset unit is flagged for action when the calculated risk value exceeds a pre-set threshold.

For the asset categories listed below, the risk-based approach is used to estimate the FFA Plan.

- Station transformers (main tank + LTC)
- Station circuit breakers

It is also important to note with this approach, in addition to the estimated number of assets per year that need to be addressed, the FFA Year (i.e. the years that a particular unit is flagged for action) is calculated for each asset unit.

II.3 Data Assessment

The condition data used in this study were provided by GPI and included the following:

- Test Results (e.g. Oil Quality, DGA)
- Inspection Records
- Loading
- Make, Model, and Type
- Age

There are two components that assess the availability and quality of data used in this study: data availability indicator (DAI) and data gap.

II.3.1 Data Availability Indicator (DAI)

The Data Availability Indicator (DAI) is a measure of the amount of condition parameter data that an asset has, as measured against the full data sets that are practically available and included in the HI formula. It is determined by the weighted ratio of the condition parameters availability of an individual unit, over the maximum condition parameters availability of an asset group. The formula is given by:

$$DAI = \frac{\sum_{m=1}^{\forall m} (DAI_{CPS\,m} \times WCP_m)}{\sum_{m=1}^{\forall m} (WCP_m)}$$

Equation 6

where

$$DAI_{CPSm} = \frac{\sum_{n=1}^{\forall n} \beta_n \times WCFn}{\sum_{n=1}^{\forall n} (WCPFn)}$$

Equation 7

DAI_{CPSm}	Data Availability Indicator for Condition Parameter m with n Condition Parameter Factors (CPF)
β_n	Data availability coefficient for sub-condition parameter (=1 when data available, =0 when data unavailable)
$WSCP_n$	Weight of Condition Parameter Factor n
DAI	Overall Data Availability Indicator for the m Condition Parameters
WCP_m	Weight of Condition Parameter m

For example, consider an asset with the following condition parameters and sub-condition parameters:

Condition Parameter		Condition Parameter Weight (WCP)	Sub-Condition Parameter		Sub-Condition Parameter Weight (WCF)	Data Available? (β = 1 if available; 0 if not)
m	Name		n	Name		
1	A	1	1	A_1	1	1
2	B	2	1	B_1	2	1
			2	B_2	4	1
			3	B_3	5	0
3	C	3	1	C_1	1	0

The Data Availability Indicator is calculated as follows:

$DAI_{CP1} = (1*1) / (1) = 1$
$DAI_{CP2} = (1*2 + 1*4 + 0*5) / (2 + 4 + 5) = 0.545$
$DAI_{CP3} = (0*1) / (1) = 0$

$$DAI = (DAI_{CP1}*WCP_1 + DAI_{CP2}*WCP_2 + DAI_{CP3}*WCP_3) / (WCP_1 + WCP_2 + WCP_3)$$
$$= (1*1 + 0.545*2 + 0*3) / (1 + 2 + 3)$$
$$= 35\%$$

An asset with all available condition parameter data represented will, by definition, have a DAI value of 100%. In this case, an asset will have a DAI of 100% regardless of its Health Index score. Bear in mind that a DAI of 100% does not mean there is no data gap (to be discussed in the following section). What it really indicates is that, at the time of study, an asset has information on all the condition parameters that a utility is able to provide information for.

Provided that the condition parameters used in the Health Index formula are of good quality and there are little data gaps, there will be a high degree of confidence that the Health Index score accurately reflects the asset's condition.

II.3.2 Data Gap

The Health Index formulations developed and used in this study are based only on GPI's available data. There are additional parameters or tests that GPI may not collect but that are important indicators of the deterioration and degradation of assets. While these will not be included in the HI formula, they are referred to as data gaps. I.e. A data gap is the case where none of the units in an asset group has data for a particular item as requested by "ideal" data sets. The situation where data is provided for only a sub-set of the population is not considered as a data gap.

As part of this study, the data gaps of each asset category are identified. In addition, the data items are ranked in terms of importance. There are three priority levels, the highest being most indicative of asset degradation.

Priority	Description	Symbol
High	Impactive data; most useful as an indicator of asset degradation	☆☆☆
Medium	Important data; can indicate the need for corrective maintenance or increased monitoring	☆☆
Low	Helpful data; least indicative of asset deterioration	☆

When filling up data gaps, it is generally recommended that data collection be initiated for the items marked with higher priority, because such information will result in higher quality Health Index formulas.

The more impactive and important data included in the Health Index formula of a certain asset group, and the higher the Data Availability Indicator of a particular unit in that group, the higher the confidence in the Health Index calculated for the particular unit.

If an asset group has significant data gaps and lacks good quality condition, there is less confidence that the Health Index score of a particular unit accurately reflects its condition, regardless of the value of its DAI.

To facilitate the incorporation of data gap items into improved Health Index formulas for future assessments, the data gaps items are presented in this report as sub-condition parameters. For each item, the parent condition parameter is identified. Also given are the object or component addressed by the parameter, a description of what to assess for each component or object, and the possible source of data.

The following is an example for "Tank Corrosion" on a Pad-Mounted Transformer:

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Tank Corrosion	Physical Condition	☆☆	Oil Tank	Tank surface rust or deterioration due to environmental factors	Visual Inspection

III RESULTS

This section summarizes the findings of this study.

III.1 Health Index Results

A summary of the Health Index evaluation results is shown in Table 1. For each asset category the population, sample size (number of assets with sufficient data for Health Indexing), average age, age availability and average DAI are given. The average Health Index and distribution are also shown. A summary of the Health Index distribution for all asset categories are also graphically shown in Figure 5. Note that the Health Index distribution percentages are based on the asset group's sample size.

It can be observed that out of the 18 sub-categories, 15 of them had over 70% of their units classified as "good" or "very good". Also 15 of them had an average Health Index score of greater than 80%.

The asset groups that had all the units in "very good" condition included Station Transformers, Station Circuit Breakers, Pole Mounted Transformers (2-Phase, 3-Phase), OH Switches (1-Phase) and Underground Cables (2-Phase).

It can be seen from the results that among all the asset categories, Poles (Wood) and OH Lines (1-Phase, 3-Phase) were relatively speaking the ones of major concern. More than 20% of the units in these asset groups were classified as "poor" or "very poor".

Other asset group of concern included Poles (Concrete), having over 10% of units classified as "poor" or "very poor".

Table 1 Health Index Results Summary

Asset Category		Population	Sample Size	Average Health Index	Health Index Distribution					Average Age	Average DAI	Age Availability
					Very Poor (< 25%)	Poor (25 - <50%)	Fair (50 - <70%)	Good (70 - <85%)	Very Good (>= 85%)			
Station Transformers		2	2	92%	0	0	0	0	2	15	88%	100%
Station Circuit Breakers		11	11	98%	0	0	0	0	11	12	100%	100%
Poles	Wood	3607	3603	73%	614	344	110	511	2024	29	74%	100%
	Concrete	69	69	81%	0	12	13	2	42	36	75%	100%
Pole Mounted Transformers	1 Phase	681	678	97%	0	0	4	15	659	19	Age Only	100%
	2 Phase	3	3	98%	0	0	0	0	3	22	Age Only	100%
	3 Phase	39	39	98%	0	0	0	0	39	21	Age Only	100%
OH Lines *	1 Phase	85.7	81.0	67%	13.6	17.7	7.3	1.6	40.7	33	Age Only	95%
	2 Phase	0.1	0.1	64%	0.0	0.0	0.1	0.0	0.0	45	Age Only	94%
	3 Phase	95.6	92.3	80%	16.4	5.7	0.0	0.0	70.1	29	Age Only	96%
OH Switches	1 Phase	10	3	99%	0	0	0	0	3	4	Age Only	30%
	3 Phase	137	51	88%	0	4	0	12	35	10	Age Only	37%
Pad Mounted Transformers	1 Phase	557	557	98%	0	0	8	13	536	18	98%	100%
	3 Phase	129	127	98%	0	0	0	3	124	20	93%	98%
Pad Mounted Switchgear		24	19	88%	0	0	3	5	11	11	4%	79%
Underground Cables *	1 Phase	73.5	72.5	90%	2.9	1.5	3.6	7.0	57.6	18	Age Only	99%
	2 Phase	0.04	0.04	100%	0.00	0.00	0.00	0.00	0.04	19	Age Only	100%
	3 Phase	15.4	12.2	97%	0.0	0.0	0.0	1.3	10.9	12	Age Only	79%

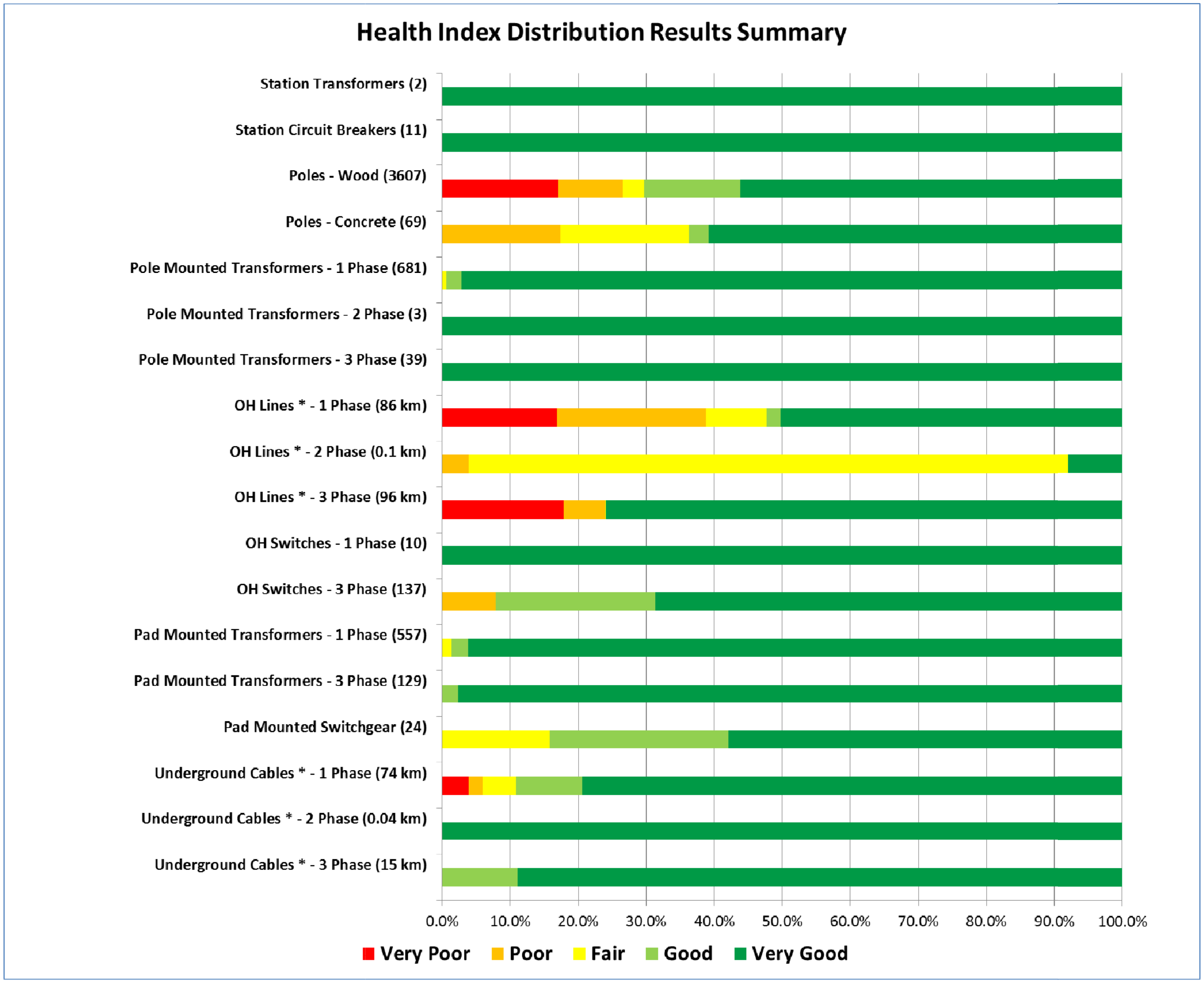

Figure 5 Health Index Results Summary

III.2 Condition-Based Flagged for Action Plan

The Flagged for Action Plan estimates the number of units expected to require attention in a given year.

Table 2 shows the Year 0 (year 2018) and 10 Year cumulative Flagged for Action Plan. Table 3 shows the 10 Year Flagged for Action Plan annually.

Table 2 Summary of Flagged for Action

Asset Category		1st Year		10 Year Replacement		Replacement Strategy
		Quantity	Percentage	Quantity	Percentage	
Station Transformers		0	0.0%	0	0.0%	Proactive
Station Circuit Breakers		0	0.0%	0	0.0%	Proactive
Poles	Wood	143	4.0%	993	27.6%	Proactive/Reactive
	Concrete	3	4.3%	20	29.0%	Proactive/Reactive
Pole Mounted Transformers	1 Phase	3	0.4%	45	6.6%	Reactive
	2 Phase	0	0.0%	0	0.0%	Reactive
	3 Phase	0	0.0%	0	0.0%	Reactive
OH Lines *	1 Phase	4	4.7%	29.1	34.0%	Reactive
	2 Phase	0	0.0%	0	0.0%	Reactive
	3 Phase	3	3.1%	21	22.0%	Reactive
OH Switches	1 Phase	0	0.0%	0	0.0%	Proactive/Reactive
	3 Phase	4	2.9%	38	27.7%	Proactive/Reactive
Pad Mounted Transformers	1 Phase	2	0.4%	14	2.5%	Reactive
	3 Phase	0	0.0%	0	0.0%	Reactive
Pad Mounted Switchgear		0	0.0%	0	0.0%	Proactive/Reactive
Underground Cables *	1 Phase	2.1	2.9%	18.1	24.6%	Reactive
	2 Phase	0	0.0%	0	0.0%	Reactive
	3 Phase	0	0.0%	0	0.0%	Reactive

* by length (km)

Table 3 Ten Year Flagged for Action Plan

Asset Category		Flagged for Action Plan by Year									
		1	2	3	4	5	6	7	8	9	10
Station Transformers		0	0	0	0	0	0	0	0	0	0
Station Circuit Breakers		0	0	0	0	0	0	0	0	0	0
Poles	Wood	143	109	109	109	109	109	109	109	43	44
	Concrete	3	3	3	2	2	2	2	1	1	1
Pole Mounted Transformers	1 Phase	3	3	4	4	4	5	5	5	6	6
	2 Phase	0	0	0	0	0	0	0	0	0	0
	3 Phase	0	0	0	0	0	0	0	0	0	0
OH Lines *	1 Phase	4	3.7	3.4	3.3	3	2.6	2.5	2.4	2.3	1.9
	2 Phase	0	0	0	0	0	0	0	0	0	0
	3 Phase	3	2.7	2.6	2.4	2.3	2	1.6	1.6	1.6	1.2
OH Switches	1 Phase	0	0	0	0	0	0	0	0	0	0
	3 Phase	4	3	4	4	4	4	4	4	4	3
Pad Mounted Transformers	1 Phase	2	2	2	2	1	1	1	1	1	1
	3 Phase	0	0	0	0	0	0	0	0	0	0
Pad Mounted Switchgear		0	0	0	0	0	0	0	0	0	0
Underground Cables *	1 Phase	2.1	1.8	1.7	1.8	1.5	1.3	2	2	1.9	2
	2 Phase	0	0	0	0	0	0	0	0	0	0
	3 Phase	0	0	0	0	0	0	0	0	0	0

* by length (km)

* Year 0 = 2018, year 1 = 2019, year 2 = 2020 … etc

It is evident from Table 3 that in general, the majority asset groups at GPI had relatively smooth flagged for action plans, indicating relatively small variation or gradual ascending/descending trend, in terms of yearly flagged for action numbers.

Only Poles (Wood) showed a noticeable proportion of backlog at present.

It is important to note that the Flagged for Action plan suggested in this study is based solely on asset condition. It uses a probabilistic, non-deterministic, approach and as such can only show expected failures or probable number of units that are expected to be candidates for replacement or other action. While this condition-based Flagged for Action Plan can be used as a guide or input to GPI's distribution system plan, it is not expected that it be followed directly or as the final deciding factor in making sustainment capital decisions. There are numerous other factors and considerations that will influence GPI's Asset Management decisions, such as obsolescence, system expansion, regulatory requirements, municipal demand and customer preferences etc.

III.3 Data Assessment Results

Data assessment determines the data availability of each asset group, as well as identifying the data gaps for each asset group. Data availability is a measure of the amount of data that an individual unit has in comparison with the set of data currently available in for its respective asset category. Data gaps are items that are indicators of asset degradation, but are currently not collected or available for any asset in an asset category. The fewer the data gaps, the higher the quality of available condition data and Health Index formulas.

Data for Station Transformers included age, loading, oil and insulation test results, and corrective maintenance counts. Data gaps were corrective maintenance counts for some components.

Data for Station Circuit Breakers included age and operation counts. Data gaps were corrective maintenance counts for operating mechanism and arc extinction, timing test results, and manufacturer specification limits on contact resistance and operating cycle.

Data for Poles included age and maintenance inspection results. Data gaps were inspection results for some pole physical condition parameters.

Data for Pole Mounted Transformers included age only. Data gaps were inspection results at component level and loading.

Data for Overhead Lines and Overhead Switches included age only. Data gaps were inspection results at component level.

Data for Pad Mounted Transformers included age and inspection results. Data gaps were loading and some additional inspection results at component level.

Data for Pad Mounted Switchgear included age and inspection results. However the inspection results were obtained from on-site visit. Data gaps were inspection results that are electronically available.

Data for Underground Cables included age only. Data gaps were fault rate and inspection results at component level.

At this study, the asset groups at GPI were of relatively young age compared with other utilities. In the future, historic removal records (i.e. age at removal) need to be collected for all the asset groups, for the purpose of developing GPI specific asset degradation curves.

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IV CONCLUSIONS

An Asset Condition Assessment was conducted for fifteen of GPI's distribution asset categories (twenty three sub-categories). For each asset category, the Health Index distribution was determined and a condition-based Flagged for Action plan was developed.

Risk based prioritized lists were developed for Station Transformers (Combined with LTC) and Station Circuit Breakers. These lists indicated the projected flagged for action year of each individual unit.

1) In general, the asset units in most of GPI's asset groups were in good condition, in the fact that 15 out of 18 sub-categories had over 70% of their units in "good" or "very good" condition, while 15 out of 18 sub-categories had an average Health Index score of greater than 80%.

2) Among all the asset groups, Station Transformers, Station Circuit Breakers, Pole Mounted Transformers (2-Phase, 3-Phase), OH Switches (1-Phase) and Underground Cables (2-Phase) were in the best condition, each having all the units classified as "very good".

3) With respect to the asset groups that were of concern, Poles (Wood) and OH Lines (1-Phase, 3-Phase) were found to be in the relatively speaking bad condition, each with more than 20% of the units classified as "poor" or "very poor".

4) Other asset groups of concern included Poles (Concrete), having over 10% of units classified as "poor" or "very poor".

5) In terms of flagged-for-action plans, GPI's asset groups had relatively smooth flagged for action plans throughout years, except for Poles (Wood), which had relatively high backlog of units to be addressed immediately.

6) For 10-year long term flagged-for-action plans, Poles (Wood, Concrete), OH Lines (1-Phase, 3-Phase), OH Switches (3-Phase) and Underground Cables (1-Phase) had the highest percentage of the population to be addressed, each with over 20% of their population being flagged for action.

7) It is important to note that the Flagged for Action plan presented in this study is based solely on asset condition and that there are numerous other considerations that may influence GPI's Asset Management Plan, such as obsolescence, system growth, regulatory requirements, municipal initiatives, etc.

With respect to data quality, GPI had prepared multiple years of historic data on operation and maintenance of its asset groups at the start of the project. Such data were screened so as to filter out the stale information before being incorporated in ACA study. GPI kept on data collection work throughout the entire process of ACA study, with ACA study results being used as feedback to calibrate and validate the data collection process. Through communication and interviews between GPI and Kinectrics, GPI was able to review and update the information in its inventory, test, operation and maintenance database while incorporating new data from other sources.

The following observations summarized the status of data collection at GPI:

i. All asset groups had age data.

ii. The asset groups that had relatively complete data sets included Station Transformers (main tank and LTC) and Poles.

iii. Station Circuit Breakers had operation cycle count data

iv. Pad Mounted Transformers had inspection records at component level.

v. Pad Mounted Switchgear has inspection data obtained during on-site visit.

vi. All other asset groups had age information only.

vii. In 2014, GPI implemented Enterprise Resource Planning (ERP) system and has been collecting historic removal information for its asset groups ever since. However given that the collected data are not sufficient to develop asset degradation trend, the age limiting curves in this study were based on industry publication and practice.

V RECOMMENDATIONS

The following recommendations were made based on the study results:

a) In the future, more historic records of asset removal need to be collected for all the asset groups, so as to improve the accuracy of asset degaradtion curves.

b) Inspection records at component level need to be collected for all the OH asset groups, Underground Cables, Pad Mounted Switchgear, so as to improve the input granularity for better assessment of component condition status.

c) Loading data need to be collected for all the distribution transformers outside substations, so as to provide information on service record assessment. In the near future, the loading data could be sampled monthly at fixed time for each transformer unit. In the long term, the monthly maximum 15 minute peak reading is to be taken with the help of smart grid techniques.

d) Operation cycle counts need to be collected for Station Breakers, for both the normal operation and fault interruption. This will help determine the degradation due to different usage.

e) Underground Cables failures need to be tracked by location. Such information could indicate historic trend in cable degradation in the future when sufficient data have been collected. Efforts would be taken to sort such data by cable segments for statistical processing before being incorporated in ACA study.

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VI APPENDIX A: RESULTS FOR EACH ASSET CATEGORY

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1 STATION TRANSFORMERS

1.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

1.1.1 Condition and Sub-Condition Parameters

Main Tank

Table 1-1 Condition Parameter and Weights – Main Tank

m	Condition Parameter	WCP_m	Sub-Condition Parameters
1	Insulation	6	Table 1-2
2	Cooling	1	Table 1-3
3	Sealing & Connection	1	Table 1-4
4	Service Record	3	Table 1-5
	Age Limiting	Overall Multiplier	Figure 1-1

Table 1-2 Insulation Sub-Condition Parameters and Weights (m=1) – Main Tank

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Oil Quality	3	Table 1-10
2	Oil DGA	5	Table 1-11
3	Winding Dissipation	5	Table 1-12
4	Furan	1	Table 1-13
5	Bushing PF	1	Table 1-12

Table 1-3 Cooling Sub-Condition Parameters and Weights (m=2) – Main Tank

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Fans	1	Table 1-14
2	Pumps	1	Table 1-14
3	Radiator Leaks	1	Table 1-14

Table 1-4 Sealing & Connection Sub-Condition Parameters and Weights (m=3) – Main Tank

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Leak	3	Table 1-14
2	Deciccant	3	Table 1-14
3	Paint	2	Table 1-14

Table 1-5 Service Record Sub-Condition Parameters and Weights (m=3) – Main Tank

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Loading	1	Table 1-15

LTC

Table 1-6 Condition Parameters and Weights – LTC

n	Condition Parameter	WCP_m	Condition Criteria Table
1	Insulation	14	Table 1-7
2	Service Record	3	Table 1-8
	Age Limiting	Overall Multiplier	Figure 1-1

Table 1-7 Insulation Sub-Condition Parameters and Weights (m=1) – LTC

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Oil Quality	3	Table 1-10
2	Oil DGA	1	Table 1-11

Table 1-8 Service Record Sub-Condition Parameters and Weights (m=3) – LTC

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Number of Operation	1	Table 1-16

The combined Health Index score is calculated as per the formula in the following table.

Table 1-9 Station Transformers Combined Health Index Formula

If (***Transformer has LTC***)	If ($HI_{Main\ Tank} < 50\%$) then $HI_{COM} = HI_{Main\ Tank}$
	ElseIf ($HI_{LTC} < 50\%$) then $HI_{COM} = HI_{LTC}$
	Else $HI_{COM} = 60\% HI_{Main\ Tank} + 40\% HI_{LTC}$
Else	$HI_{COM} = HI_{Main\ Tank}$

1.1.2 Condition Criteria

Oil Quality

The "Oil Quality" parameter is a composite of the following oil properties: moisture, dielectric strength, interfacial tension, color, and acidity.

Table 1-10 Oil Quality Test Criteria - Station Transformers

Score	Description
4	Overall Factor is less than 1.2
3	Overall Factor between 1.2 and 1.5
2	Overall Factor is between 1.5 and 2.0
1	Overall Factor is between 2.0 and 3.0
0	Overall Factor is greater than 3.0

Where the Overall factor is the weighted average of the following gas scores:

Overall Factor = $\frac{\sum Score_i \times Weight_i}{\sum Weight}$

Oil Quality Test	Voltage Class [kV]	Scores				
		1	2	3	4	Weight
Water Content (D1533) [ppm]	V ≤ 69	< 30	30-35	35-40	> 40	5
	69 < V < 230	< 20	20-25	25-30	> 35	
	V ≥ 230	< 15	15-20	20-25	> 25	
Dielectric Strength (D1816 - 2 mm gap) [kV]	V ≤ 69	> 40	35-40	30-35	< 30	4
	69 < V < 230	> 47	42-47	35-42	< 35	
	V ≥ 230	> 50	50-45	40-45	< 40	
Dielectric Strength (D877) [kV]	All	> 40	30-40	20-30	< 20	
IFT (D971) [dynes/cm]	V ≤ 69	> 25	20-25	15-20	< 15	4
	69 < V < 230	> 30	23-30	18-23	< 18	
	V ≥ 230	> 32	25-32	20-25	< 20	
Color	All	< 1.5	1.5-2.0	2.0-2.5	> 2.5	1
Acid Number (D974) [mg KOH/g]	V ≤ 69	< 0.05	0.05-0.1	0.1-0.2	> 0.2	4
	69 < V < 230	< 0.04	0.04-0.1	0.1-0.15	> 0.15	
	V ≥ 230	< 0.03	0.03-0.07	0.07-0.1	> 0.1	
Dissipation Factor (D924 - 25C)	All	< 0.5%	0.5%-1%	1-2%	> 2%	5
Dissipation Factor (D924 - 100C)	All	< 5%	5%-10%	10%-20%	> 20%	

Oil DGA

Table 1-11 DGA Criteria - Station Transformers

Score	Description
4	DGA overall factor is less than 1.2
3	DGA overall factor between 1.2 and 1.5
2	DGA overall factor is between 1.5 and 2.0
1	DGA overall factor is between 2.0 and 3.0
0	DGA overall factor is greater than 3.0

In the case of a score other than 4, check the variation rate of DGA parameters. If the maximum variation rate (among all the parameters) is greater than 30% for the latest 3 samplings or 20% for the latest 5 samplings, overall Health Index is multiplied by 0.9 for score 3, 0.85 for score 2, 0.75 for score 1 and 0.5 for score 0.

Where the DGA overall factor is the weighted average of the following gas scores:

Overall Factor = $\frac{\sum Score_i \times Weight_i}{\sum Weight}$

--- Main Tank

Transformers							
Dissolved Gas (X)	Scores						
	1	**2**	**3**	**4**	**5**	**6**	**Weight**
H2 (Hydrogen)	X ≤70	70 < X ≤ 100	100 < X ≤ 200	200 < X ≤ 400	400 < X ≤ 1000	X >1000	**4**
CH4 (Methane)	X ≤ 70	70 < X ≤ 120	120 < X ≤ 200	200 < X ≤ 400	400 < X ≤ 600	X > 600	**3**
C2H6 (Ethane)	X ≤ 75	75 < X ≤ 100	100 < X ≤ 150	150 < X ≤ 250	250 < X ≤ 500	X > 500	**3**
C2H4 (Ethylene)	X ≤ 60	60 < X ≤ 100	100 < X ≤ 150	150 < X ≤ 250	250 < X ≤ 500	X > 500	**3**
C2H2 (Acetylene)	X ≤ 3	3 < X ≤ 7	7 < X ≤ 35	35 < X ≤ 50	50 < X ≤ 100	X > 100	**5**
CO (Carbon Monoxide)	X ≤ 750	750 < X ≤ 1000	1000 < X ≤ 1300	1300 < X ≤ 1500	1500 < X ≤ 1700	X > 1700	**2***
CO2 (Carbon Dioxide)	X ≤ 7500	7500 < X ≤ 8500	8500 < X ≤ 9000	9000 < X ≤ 12000	12000 < X ≤ 15000	X > 15000	**2***
CO2/CO (Ratio)	>20	15 to 20	10 to 15	7 to 10	3 to 7	0 to 3	**4***

*If CO ≥ 500 ppm and CO2 ≥ 5000 ppm, use CO2/CO ratio (i.e. CO weight = CO2 weight = 0, CO2/CO weight = 4) Else, use CO2 and CO limits (i.e. CO weight = CO2 weight = 2, CO2/CO weight = 0)

--- LTC

Dissolved Gas (X)	**Scores**					**Weight**
	1	2	3	4	5	
X = C2H4/C2H2	X < 0.33	0.33 ≤ X < 0.67	0.67 ≤ X < 1	1 ≤ X < 1.33	X ≥ 1.33	3
X = C2H6/CH4	X < 0.20	0.2 ≤ X < 0.4	0.4 ≤ X < 0.6	0.6 ≤ X < 0.8	X ≥ 0.80	2
H2	X < 70	70 ≤ X < 500	500 ≤ X < 1000	1000 ≤ X < 1500	X ≥ 1500	1

Note: Overall Factor =1.2 when ALL the following conditions meet

- H2 (hydrogen)< 1500 ppm
- C2H4 (Ethylene) < 1000 ppm
- C2H2 (Acetylene) < 1000 ppm

A test must have been conducted within the past 5 years to be considered.

Power Dissipation Factor

Table 1-12 Power Dissipation Factor Test Criteria - Station Transformers

Score	Description
4	PF < 0.05%
3	0.05% < PF < 0.5%
2	0.5% < PF < 1%
1	1% < PF < 2%
0	PF >2%

Furan

Table 1-13 Furan Test Criteria - Station Transformers

Score	Description
4	2FAL < 250
3	250 < 2FAL < 350
2	350 < 2FAL < 500
1	500 < 2FAL < 700
0	2FAL >700

Individual Corrective Maintenance

Table 1-14 Individual Corrective Maintenance Criteria - Station Transformers

Score	"CM Count" Value
4	CM Count <1.5
3	1.5 $\leq$ CM Count < 2.5
2	2.5 $\leq$ CM Count < 3
1	3 $\leq$ CM Count < 4
0	CM Count $\geq$ 4

Where "CM Count" is calculated as below:

Year	Score		Weight
	0	1	
2018	Ok	Not OK	1
2017			0.9
2016			0.8
2015			0.7
2014			0.6
2013			0.5
2012			0.4
2011			0.3
2010			0.2
2009			0.1

CM Count = $\sum Score_i \times Weight_i$

Where *i* refers to the year the inspection was conducted

When there are multiple inspections in a year, the worst score is adopted

Loading History

Table 1-15 Loading History - Station Transformers

Data: S1, S2, S3, …, SN recorded data (average daily loading)
SB= rated MVA NA=Number of Si/SB which is lower than 0.6 NB= Number of Si/SB which is between 0.6 and 0.8 NC= Number of Si/SB which is between 0.8 and 1.0 ND= Number of Si/SB which is between 1 and 1.2 NE= Number of Si/SB which is greater than 1.2 Score = $\frac{NA \times 4 + NB \times 3 + NC \times 2 + ND \times 1}{N}$

Number of Operation

Table 1-16 Number of Operation Criteria - LTC

Score	Description
4	Number of Operation < 10000
3	10000 < Number of Operation < 20000
2	20000 < Number of Operation < 30000
1	30000 < Number of Operation < 40000
0	Number of Operation > 40000

Age Limiting Factor

In this project, age was used as a limiting factor to reflect the degradation of asset unit as time passed by.

The calculated overall HI result (after taking into account all the possible de-rating multipliers) is then compared with an age limiting factor.

$$Final\ overall\ HI = \begin{cases} HI_{calculated} & if\ HI_{calculated} <= Age\_Limiter \\ Age\_limiter & if\ HI_{calculated} > Age\_Limiter \end{cases}$$

The age derating is the Weibull survival function (1 – cumulative distribution function), assuming it could be modeled by the Weibull distribution.

$$Age\_Derating = S_f = e^{-(\frac{x}{\alpha})^{\beta}}$$

Equation 6

S_f	= survivor function
x	= age in years
α	= *constant that controls scale of function*
β	= *constant that controls shape of function*

In this project, the parameters of Station Transformers (both main tank and LTC) age limiting curve are shown in the following table, based on industry practice.

Table 1-17 Age Limiting Curve Parameters - Station Transformers

Asset Type	α	β
Main Tank / LTC	**65.5929**	**5.5258**

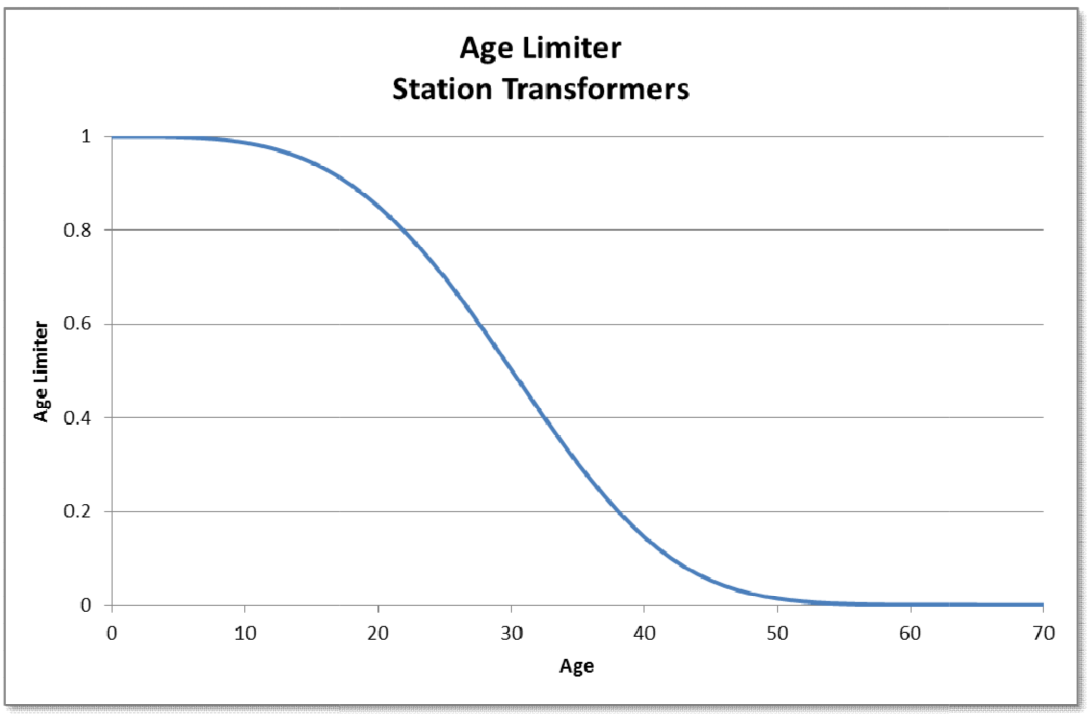

Figure 1-1 Age Limiting Factor Criteria - - Station Transformers

1.2 Age Distribution

The average age was 15, for both main tank and LTC of Station Transformers. The age distribution was as follows.

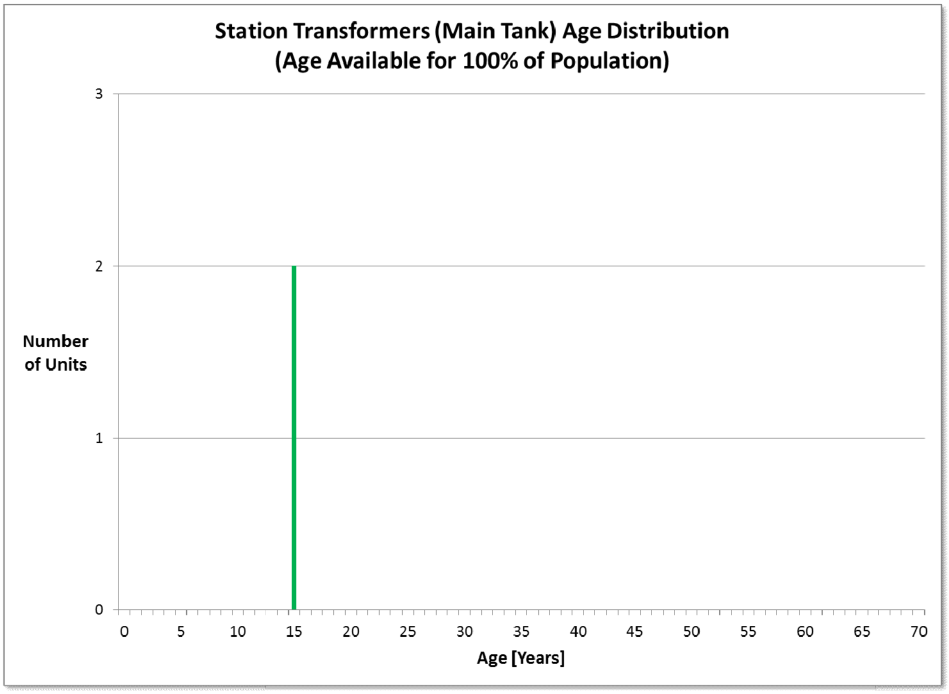

Figure 1-2 Age Distribution –Station Transformers (Main Tank)

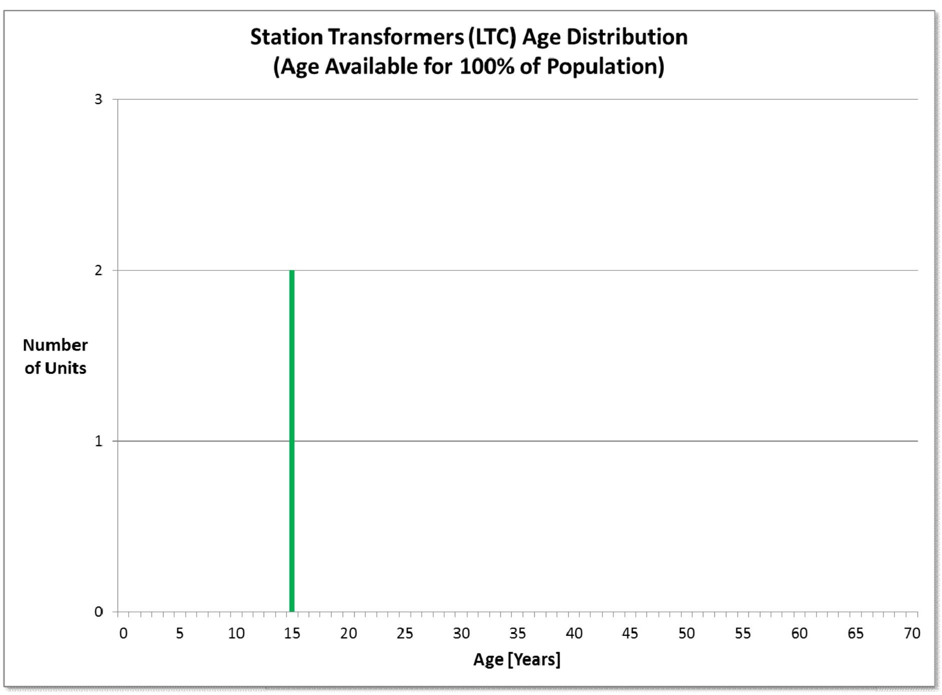

Figure 1-3 Age Distribution –Station Transformers (LTC)

1.3 Health Index Results

There were 2 units (2 main tanks) of Station Transformers at GPI, all equiped with LTC. All of them had sufficient data for a Health Indexing.

The average Health Index was 97% and 85% for main tank and LTC asset units respectively.

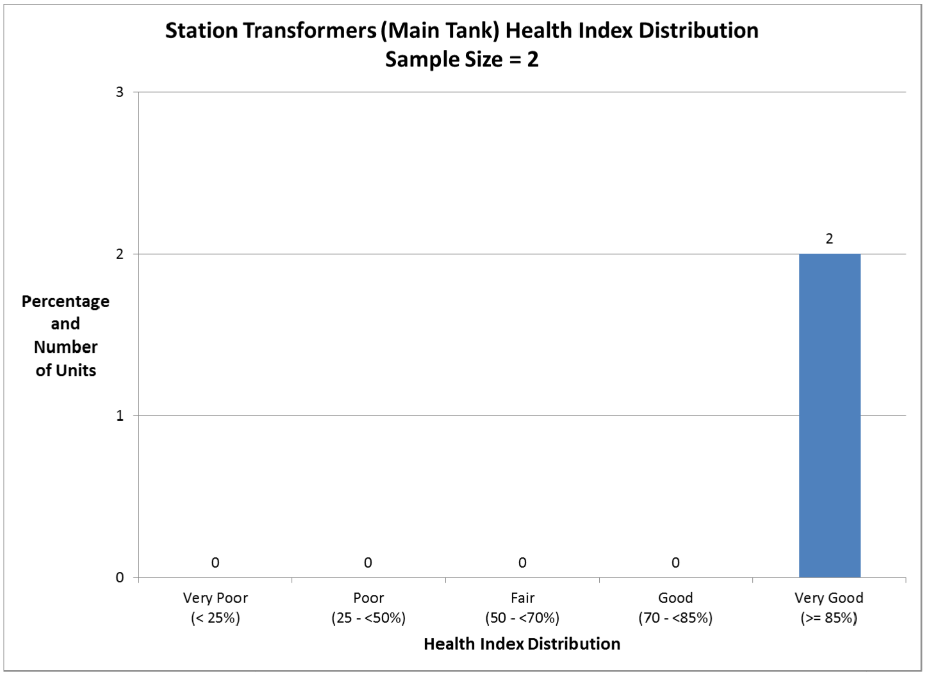

Figure 1-4 Health Index Distribution –Station Transformers (Main Tank)

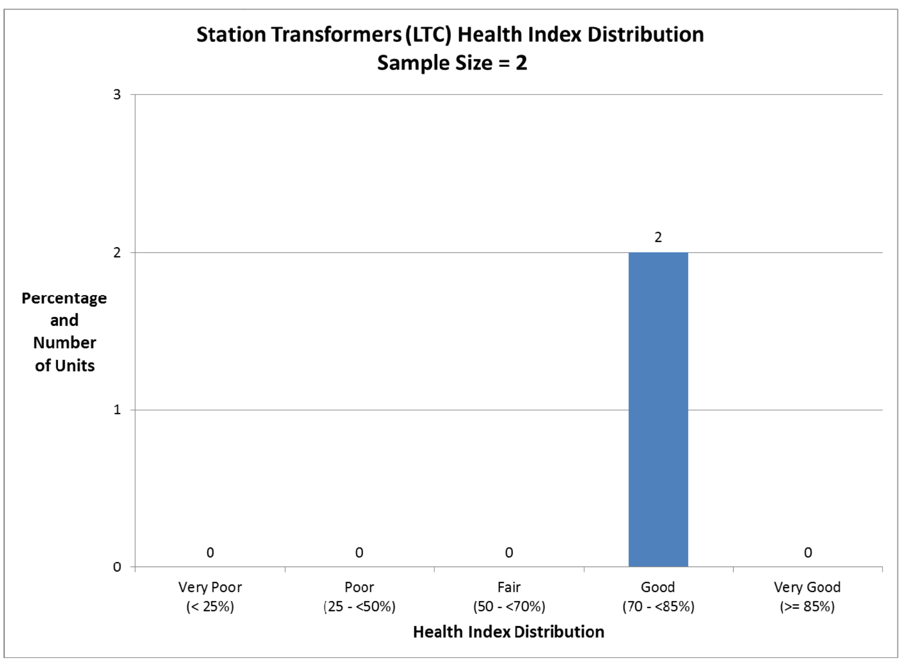

Figure 1-5 Health Index Distribution – Station Transformers (LTC)

1.4 Flagged for Action Plan

As per study, there was no asset unit flagged for action in the next 10 years, for Station Transformers.

1.5 Risk Based Prioritized List

The following table shows the risk based prioritization lists.

Table 1-18 Risk Based Prioritization List - Station Transformers (Combined)

Rank	ID	Location	Position	Age	DAI	Main Tank HI	LTC HI	HI (TX+LTC)	HI Category	Risk Index 100% = Most Risk 0% = Least Risk	FFA Year
1	2508-T1	Niagara West MTS	Q23BM	15	96%	97%	85%	**92%**	Very Good	0.0%	>20
2	2508-T2	Niagara West MTS	Q25BM	15	100%	97%	85%	**92%**	Very Good	0.0%	>20

1.6 Data Gaps

Data for Station Transformers (main tank) included age, loading, oil and insulation test results, and corrective maintenance counts.

There is no major data gap in this asset group. However the maintenance and test data are not stored in electronically extractable format. To facilitate future ACA study, this needs to be improved.

2 STATION CIRCUIT BREAKERS

2.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

2.1.1 Condition and Sub-Condition Parameters

Table 2-1 Condition Parameter and Weights – Station Circuit Breakers

m	Condition Parameter	WCP_m	Sub-Condition Parameters
1	Service Record	1	Table 2-2
	Age Limiting	Overall Multiplier	Figure 2-1

Table 2-2 Operating Counter Sub-Condition Parameters and Weights (m=1) – Station Circuit Breakers

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Operating Counter	1	Table 2-3

2.1.2 Condition Criteria

Operating Count

Cumulative operating count results of breaker are checked against the maximum allowable specification limits.

Table 2-3 Operating Count Results Criteria - Station Circuit Breakers

Score	Description (for Vacuum Breakers)
4	< 16000
3	16000 – 20000
1	20000 – 24000
0	> 24000

Age Limiting Factor

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Station Circuit Breakers age limiting curve are shown in the following table, based on industrial practice.

Table 2-4 Age Limiting Curve Parameters - Station Circuit Breakers

Asset Type	α	β
Station Circuit Breaker	**53.4875**	**2.899**

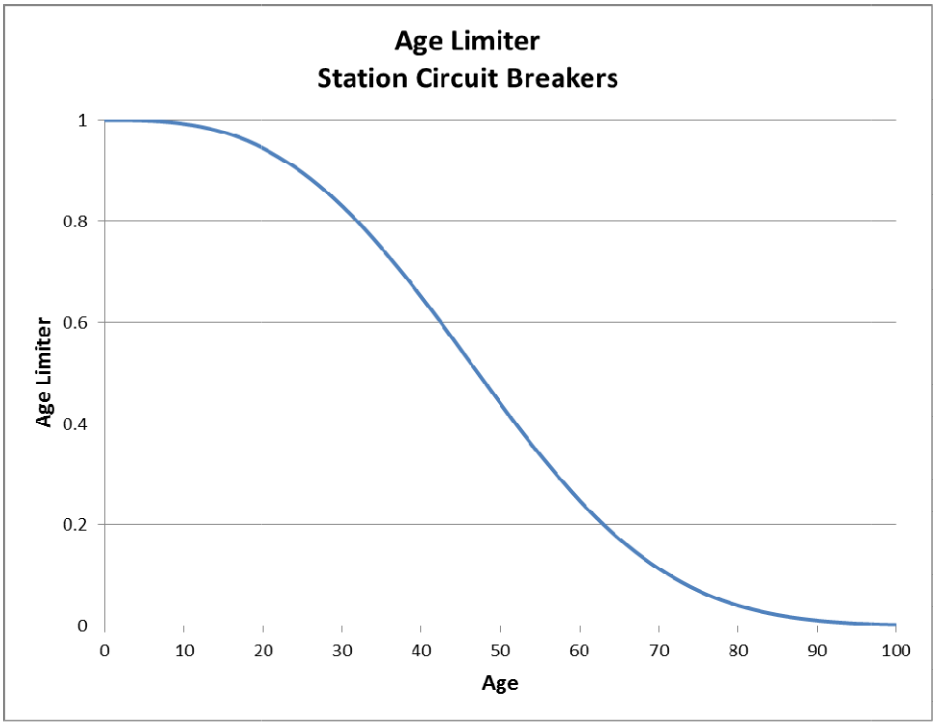

Figure 2-1 Age Limiting Factor Criteria - - Station Circuit Breakers

2.2 Age Distribution

The average age was 12. The age distribution was as follows.

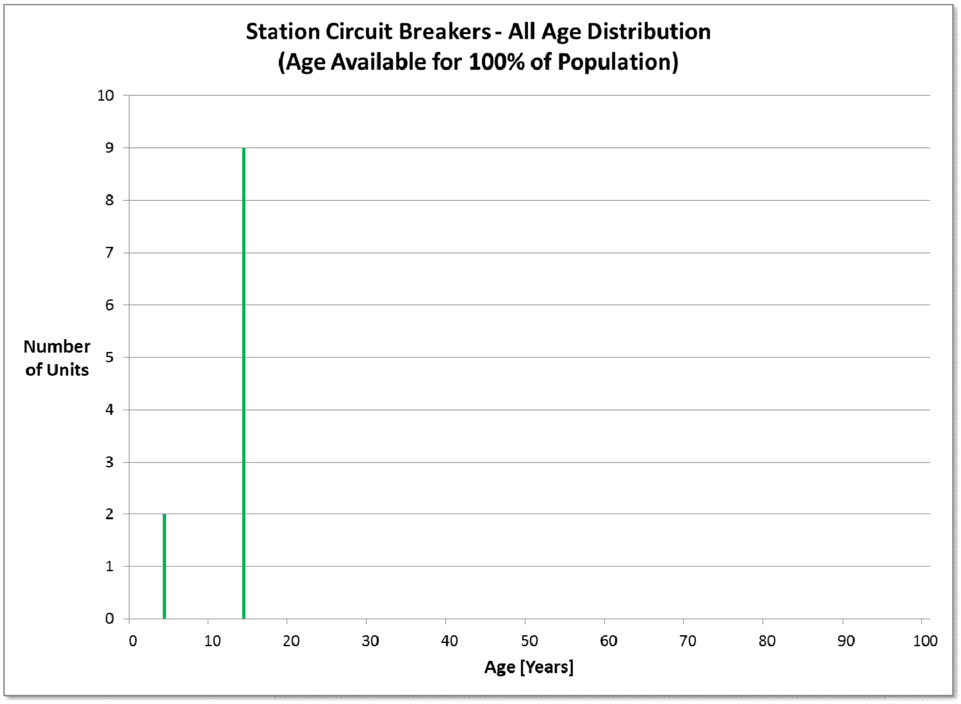

Figure 2-2 Age Distribution –Station Circuit Breakers

2.3 Health Index Results

There were 11 units of Station Circuit Breakers at GPI. All of them had data for a Health Indexing.

The average Health Index was 98%.

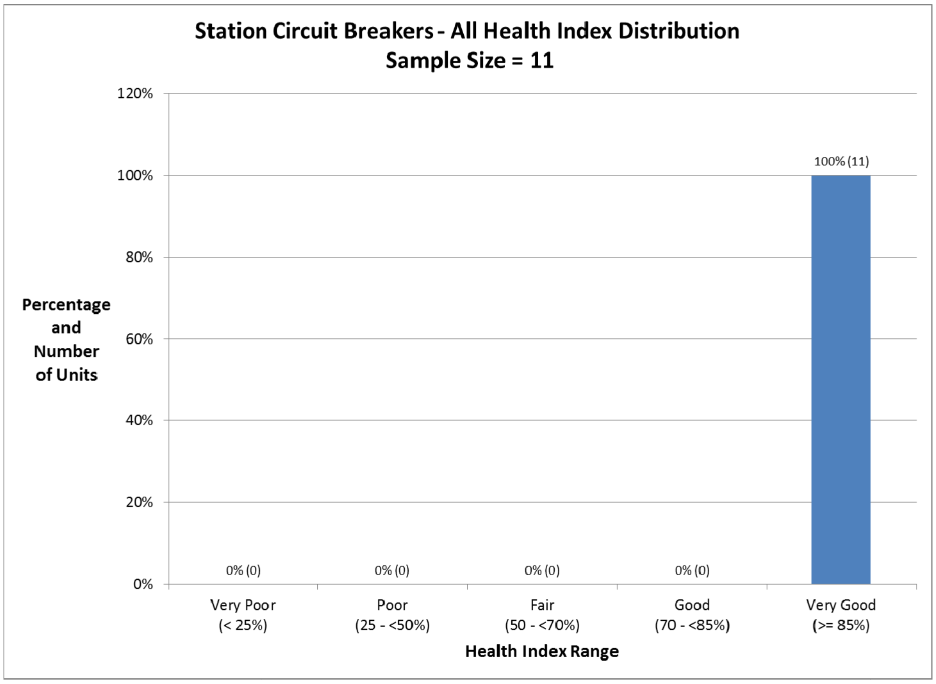

Figure 2-3 Health Index Distribution –Station Circuit Breakers

2.4 Flagged for Action Plan

As per study, there was no asset unit flagged for action in the next 10 years, for Station Circuit Breakers.

2.5 Risk Based Prioritized List

The following table shows the risk based prioritization lists.

Table 2-5 Risk Based Prioritization List - Station Circuit Breakers

Rank	ID	Busbar	Cell	Voltage (kV)	Current	Interruption Medium	Age	DAI	HI (Final)	HI Category	Risk Index 100%=Most Risk 0% = Least Risk	FFA Year
1	T1B	B	1	27.6	2000	Vacuum	14	100.0%	98.0	Very Good	0.0%	>20
2	M1	B	2	27.6	1200	Vacuum	14	100.0%	98.0	Very Good	0.0%	>20
3	M2	B	3	27.6	1200	Vacuum	14	100.0%	98.0	Very Good	0.0%	>20
4	M3	B	4	27.6	1200	Vacuum	14	100.0%	98.0	Very Good	0.0%	>20
5	BY	B	5	27.6	2000	Vacuum	14	100.0%	98.0	Very Good	0.0%	>20
6	M4	Y	7	27.6	1200	Vacuum	14	100.0%	98.0	Very Good	0.0%	>20
7	M5	Y	8	27.6	1200	Vacuum	14	100.0%	98.0	Very Good	0.0%	>20
8	M6	Y	9	27.6	1200	Vacuum	14	100.0%	98.0	Very Good	0.0%	>20
9	T2Y	Y	10	27.6	2000	Vacuum	14	100.0%	98.0	Very Good	0.0%	>20
10	M8	B	0	27.6	1200	Vacuum	4	100.0%	99.9	Very Good	0.0%	>20
11	M7	Y	11	27.6	1200	Vacuum	4	100.0%	99.9	Very Good	0.0%	>20

2.6 Data Gaps

Data for Station Circuit Breakers included age and operating counter. The following table shows the data gaps.

Table 2-6 Data Gap for Station Circuit Breakers

Data Gap (Sub-Condition Parameter)	Parent Condition Parameter	Priority	Description	Source of Data
Lubrication	Operating Mechanism	☆☆	Mechanism not properly lubricated	Inspection/ Maintenance Records
Linkage		☆☆	Mechanical operability issue	
Cabinet		☆	Control loop abnormal	
Timing Test Results	Contact Performance	☆☆☆	Close time too long	Testing
Contact Resistance		☆	Contact erosion	
Leakage	Arc Extinction	☆	Loss of vacuum	Inspection/ Maintenance Records
Power Dissipation Factor Test	Insulation	☆☆	Insulation damage	Inspection/ Maintenance Records
Operating Mechanism Type		☆☆	Spring/hydraulic/pneumatic	Inventory Database

3 POLES

3.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

3.1.1 Condition and Sub-Condition Parameters

Table 3-1 Condition Parameter and Weights – Poles

m	Condition Parameter	WCP_m	Sub-Condition Parameters
1	Pole Condition	2	Table 3-2
2	Accessory Condition	1	Table 3-3
	Age Limiting	Overall Multiplier	Figure 3-1

Table 3-2 Pole Condition Sub-Condition Parameters and Weights (m=1) – Poles

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Overall	1	Table 3-5

Table 3-3 Accessory Condition Sub-Condition Parameters and Weights (m=2) – Poles

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Guy	2	Table 3-4
2	Grounding	1	Table 3-4
3	Anchor	1	Table 3-4
4	Crossarm	3	Table 3-4

3.1.2 Condition Criteria

Individual Condition

Table 3-4 Individual Condition Criteria - Poles

Score	Condition Description
4	Satisfactory
1	Unsatisfactory

Overall Condition

Table 3-5 Overall Condition Criteria - Poles

Score	Condition Description
4	Satisfactory
2	Further Testing Required
1	Unsatisfactory
0	Pole Replacement Required

Age Limiting Factor

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Poles age limiting curve are shown in the following table, based on industry practice.

Table 3-6 Age Limiting Curve Parameters - Poles

Asset Type	α	β
Pole - Wood	**52.066**	**2.645**
Pole - Concrete	**55.3547**	**2.9066**

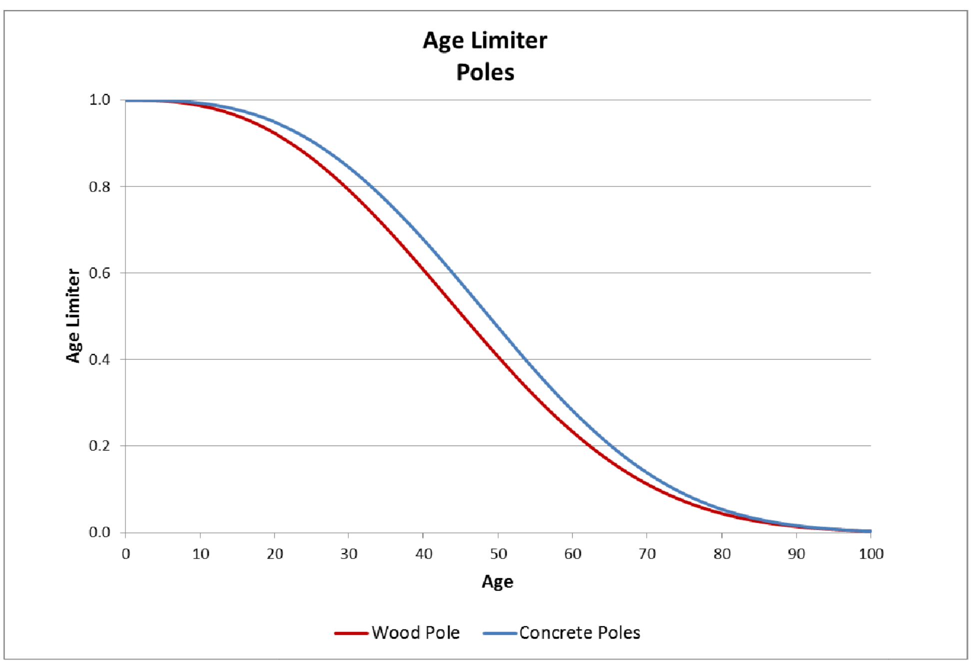

Figure 3-1 Age Limiting Factor Criteria - - Poles

3.2 Age Distribution

The average ages were 29 and 36, for Wood and Concrete Poles respectively. The age distributions were as follows.

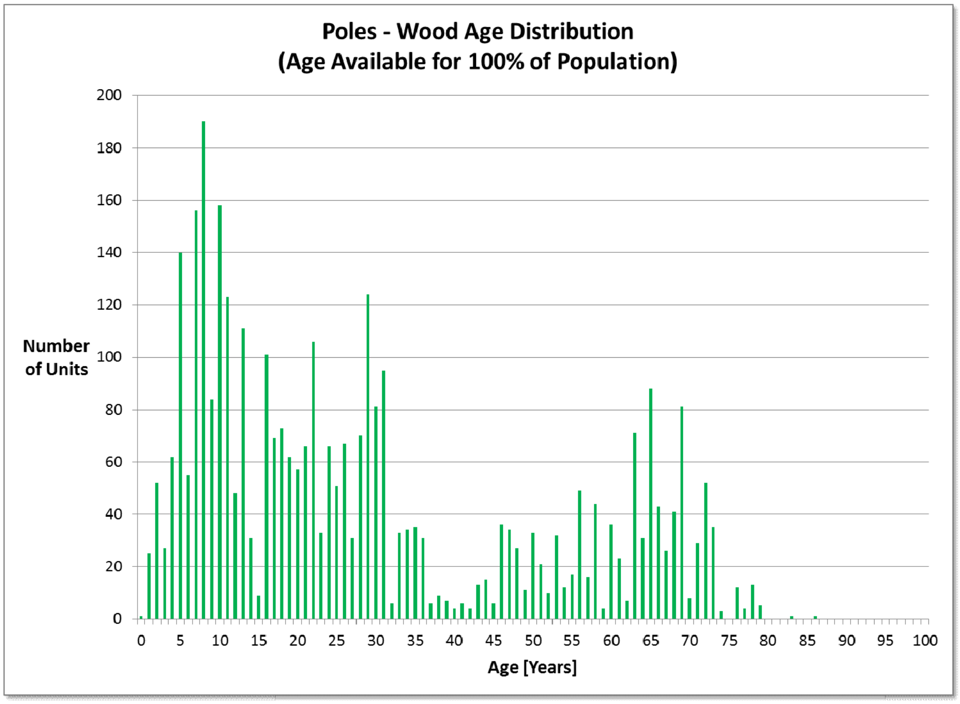

Figure 3-2 Age Distribution –Poles (Wood)

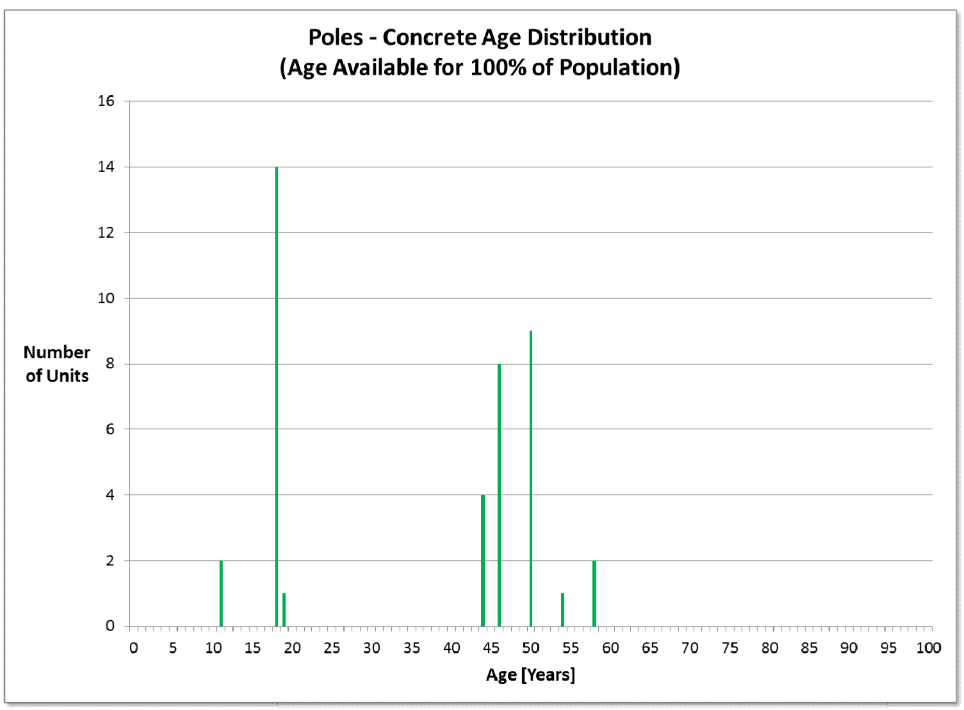

Figure 3-3 Age Distribution –Poles (Concrete)

3.3 Health Index Results

There were 3607 units of Wood Poles at GPI. 3603 of them had sufficient data for a Health Indexing.

There were 69 units of Wood Poles at GPI. All of them had sufficient data for a Health Indexing.

The average Health Indices were 73% and 81%, for Wood and Concrete Poles respectively.

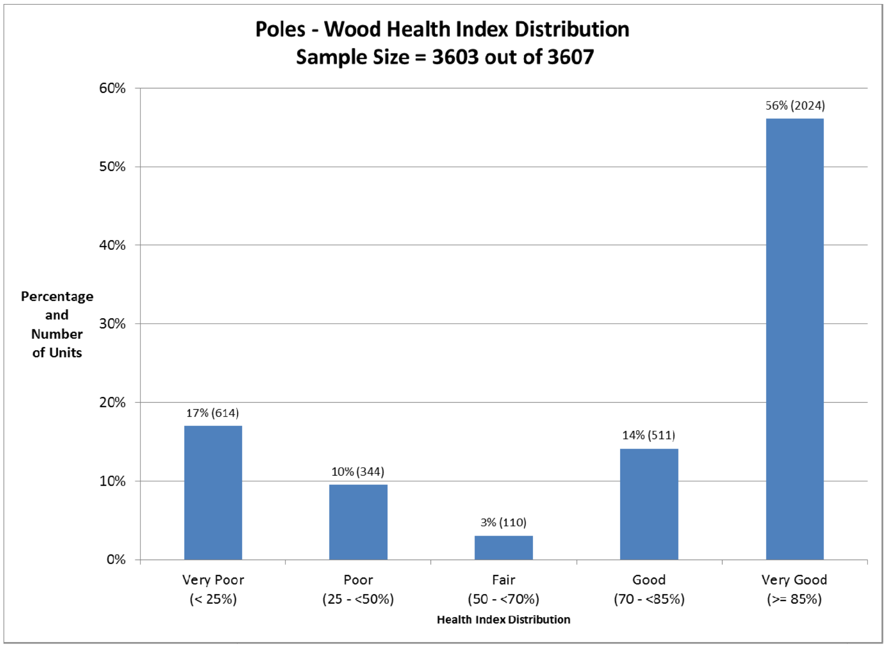

Figure 3-4 Health Index Distribution –Poles (Wood)

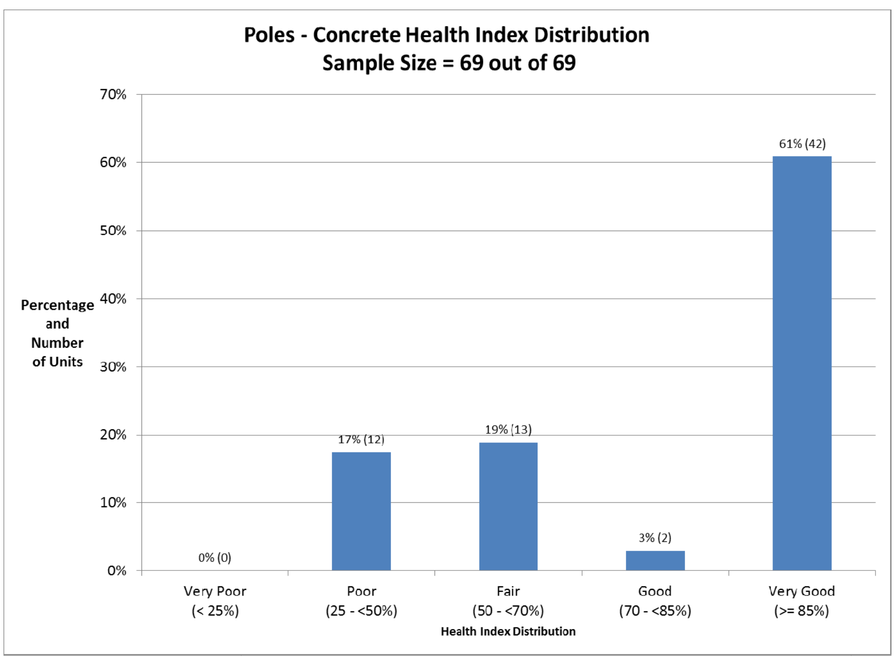

Figure 3-5 Health Index Distribution –Poles (Concrete)

3.4 Flagged for Action Plan

The flagged for action plan was as follows:

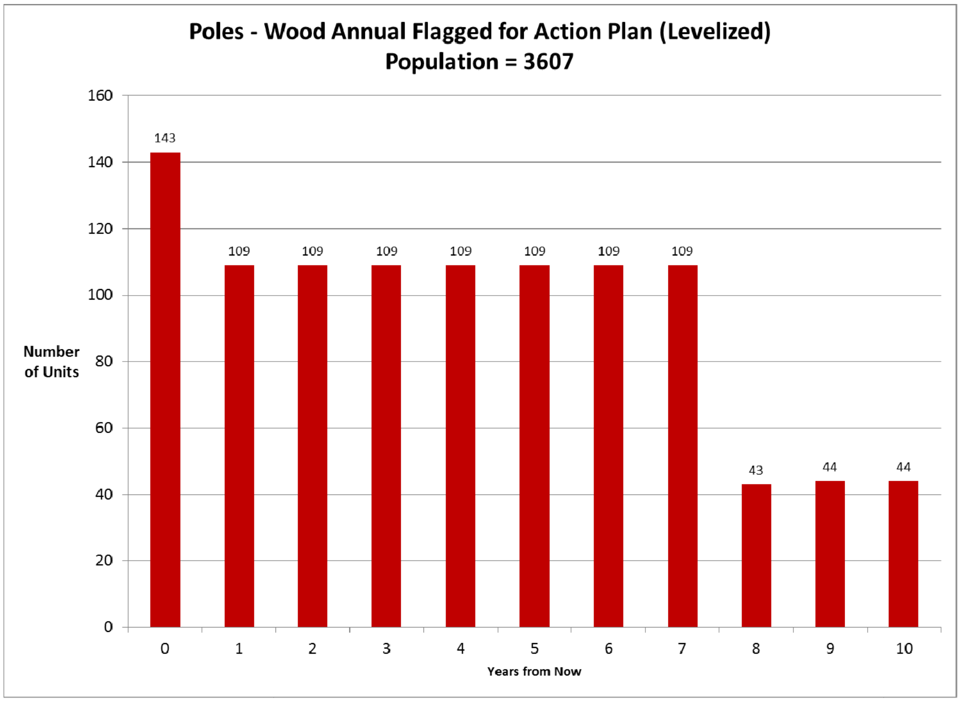

Figure 3-6 Flagged for Action Plan – Poles (Wood)

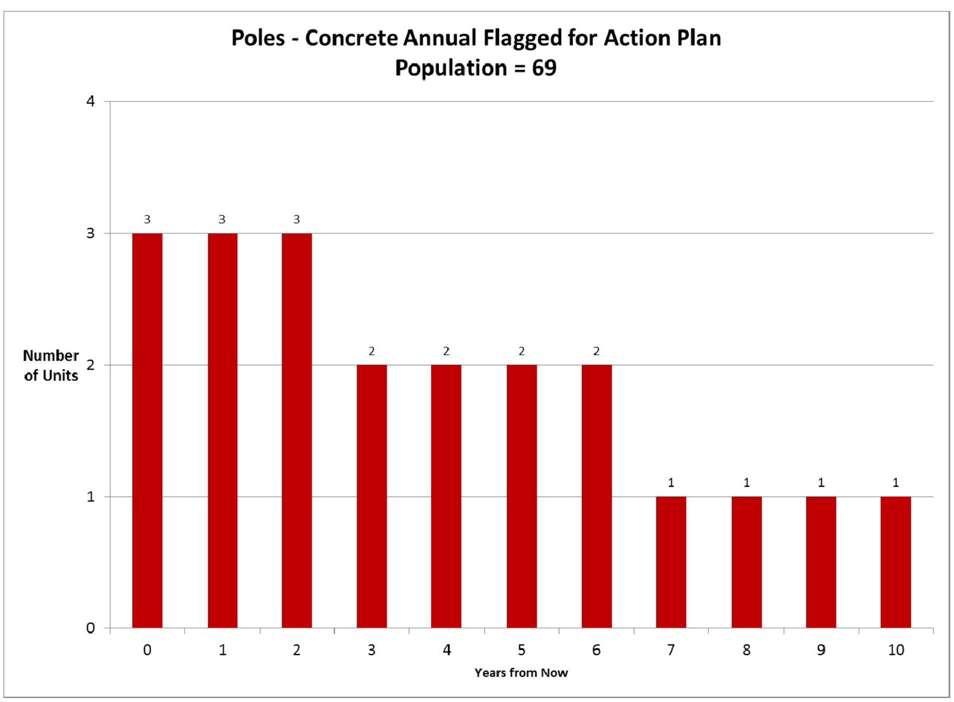

Figure 3-7 Flagged for Action Plan – Poles (Concrete)

3.5 Data Gaps

Data for Poles included age, overall inspection and accessory inspection results.

The following table shows the data gaps.

Table 3-7 Data Gap for Poles

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Pole Degradation	Pole Physical	☆☆	Pole	Rot, damage, crack, separation, void, ant / woodpecker	On-site visual inspection
Historic Removal Record		☆☆☆	Pole Unit	Age at removal	Inventory Database

It is noticed that since 2014, GPI has started collecting historic removal data for its asset groups. However, such collection does not have sufficient data to develop degradation curve of this asset group. GPI is recommended to continue this data collection effort for the beneofit og future ACA study.

4 POLE MOUNTED TRANSFORMERS

4.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Pole Mounted Transformers age limiting curve are shown in the following table, based on industry practice.

Table 4-1 Age Limiting Curve Parameters - Pole Mounted Transformers

Asset Type	α	β
Pole Mounted Transformers	**57.508**	**4.1315**

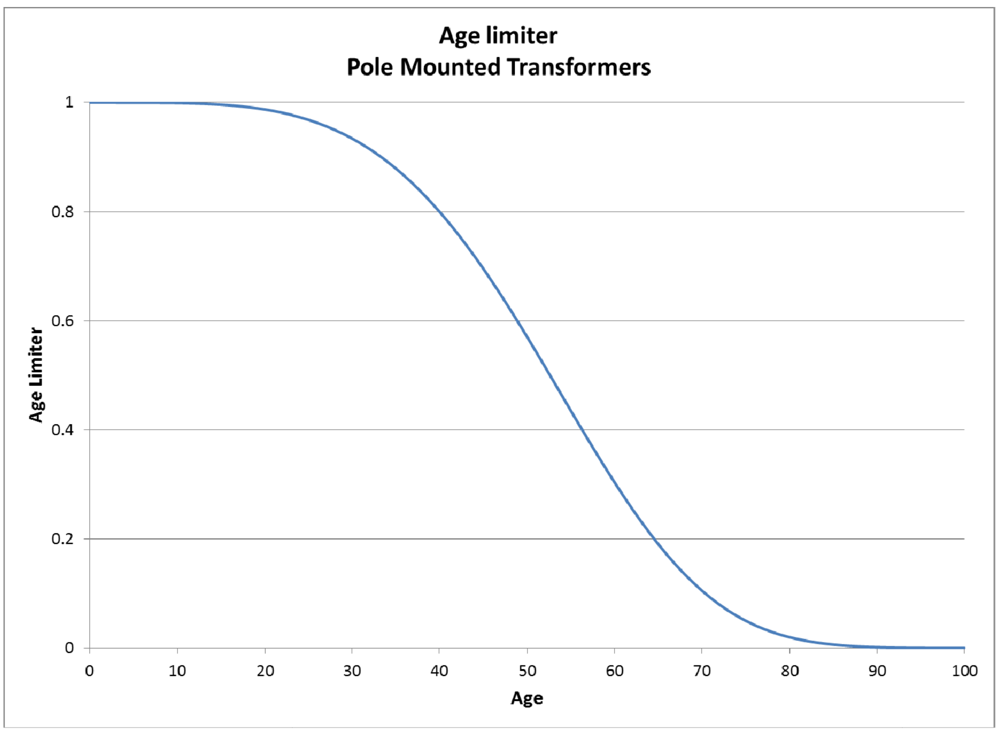

Figure 4-1 Age Limiting Factor Criteria - - Pole Mounted Transformers

4.2 Age Distribution

The average ages of all in service units were 19, 22 and 21, for 1-Phase, 2-Phase and 3-Phase Pole Mounted Transformers respectively. The age distributions were as follows.

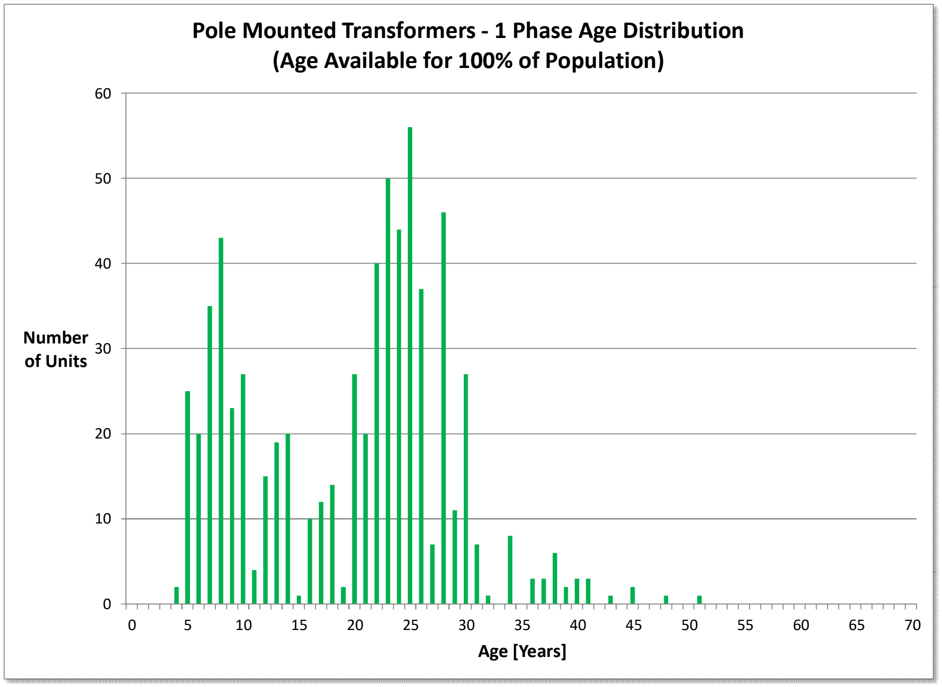

Figure 4-2 Age Distribution - Pole Mounted Transformers (1-Phase)

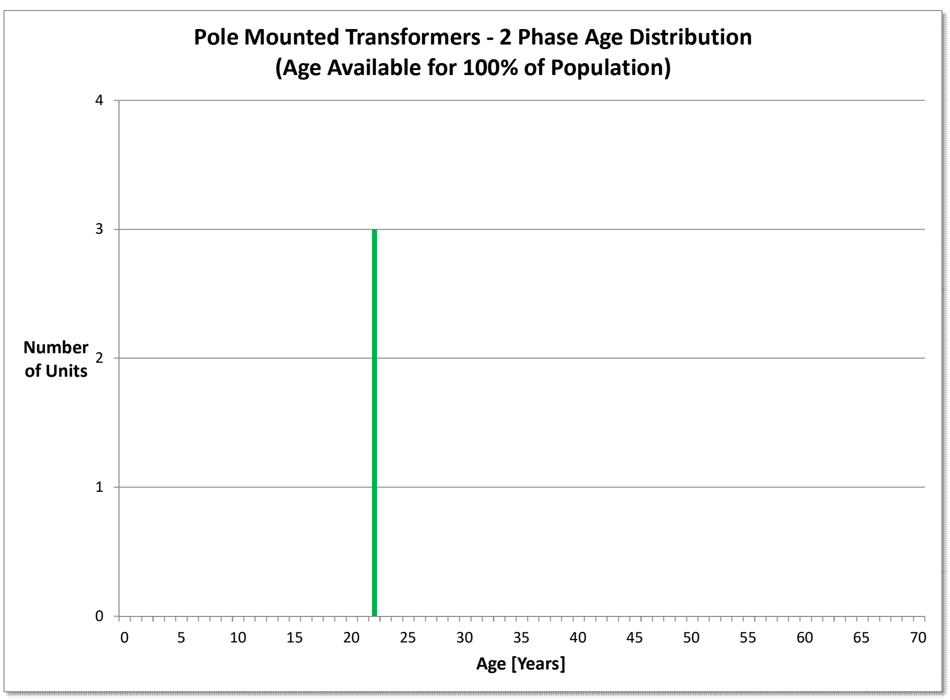

Figure 4-3 Age Distribution - Pole Mounted Transformers (2-Phase)

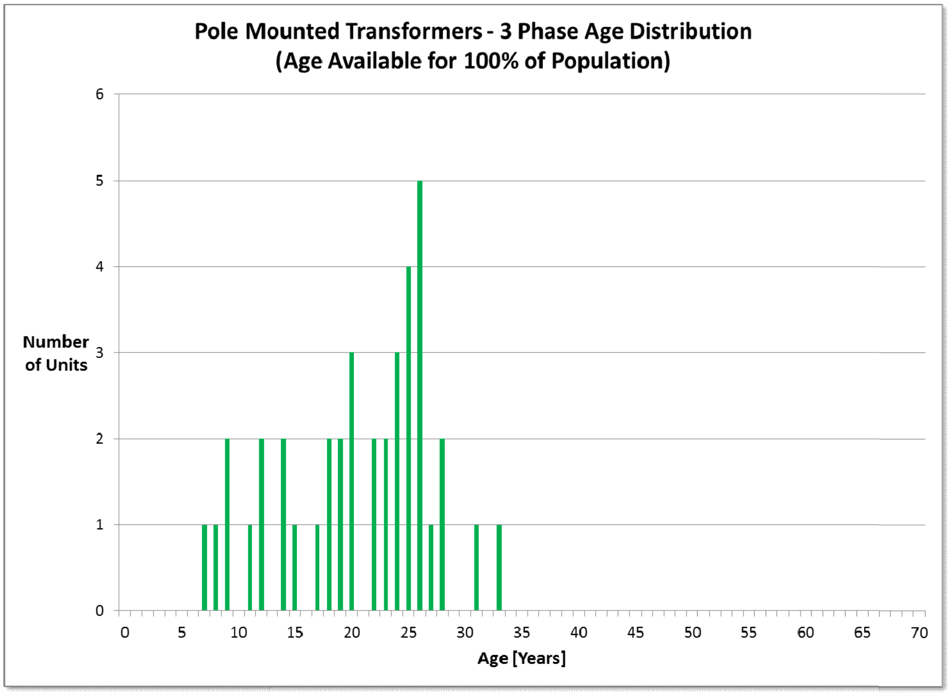

Figure 4-4 Age Distribution - Pole Mounted Transformers (3-Phase)

4.3 Health Index Results

There were 681 units of 1-Phase Pole Mounted Transformers at GPI. Among them, 678 units had sufficient data for a Health Indexing.

There were 3 units of 2-Phase Pole Mounted Transformers at GPI. All of them had sufficient data for a Health Indexing.

There were 39 units of 3-Phase Pole Mounted Transformers at GPI. All of them had sufficient data for a Health Indexing.

The average Health Index was 97%, 98% and 98%, for 1-Phase, 2-Phase and 3-Phase Pole Mounted Transformers respectively.

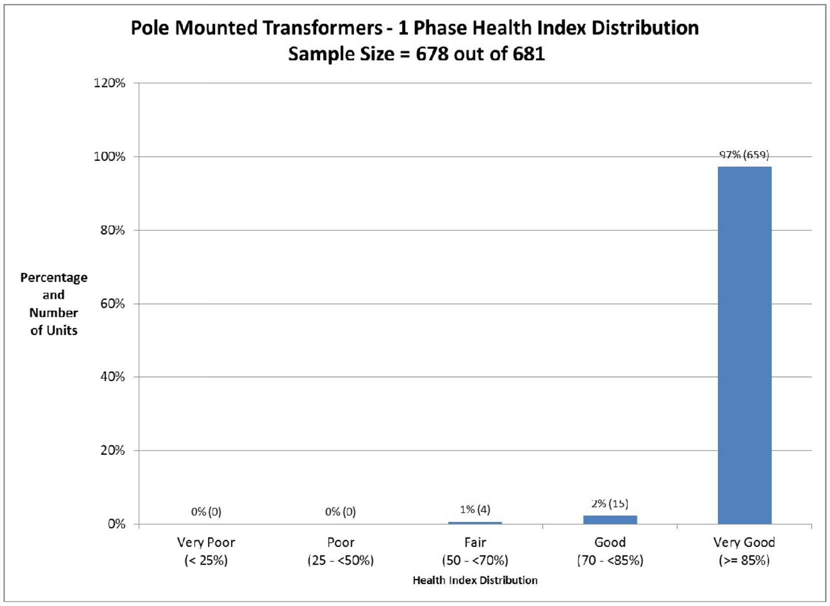

Figure 4-5 Health Index Distribution - Pole Mounted Transformers (1-Phase)

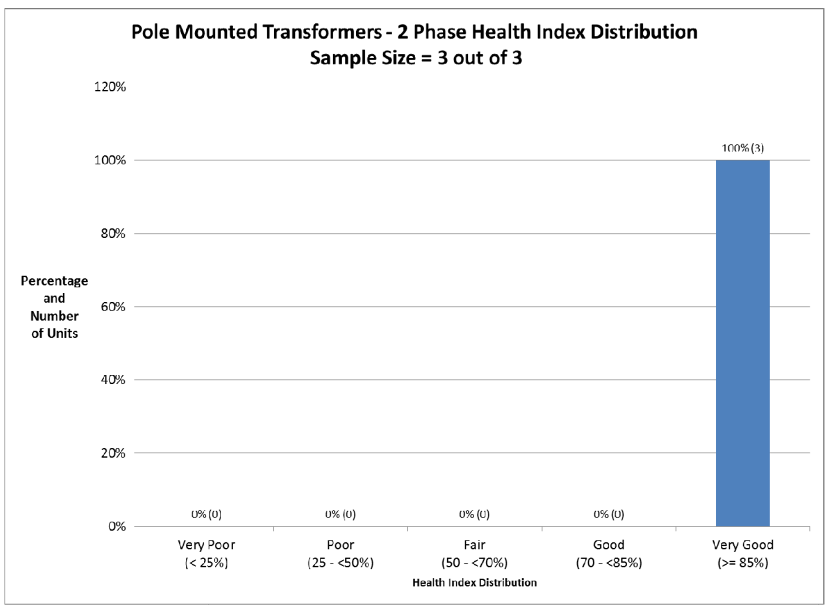

Figure 4-6 Health Index Distribution - Pole Mounted Transformers (2-Phase)

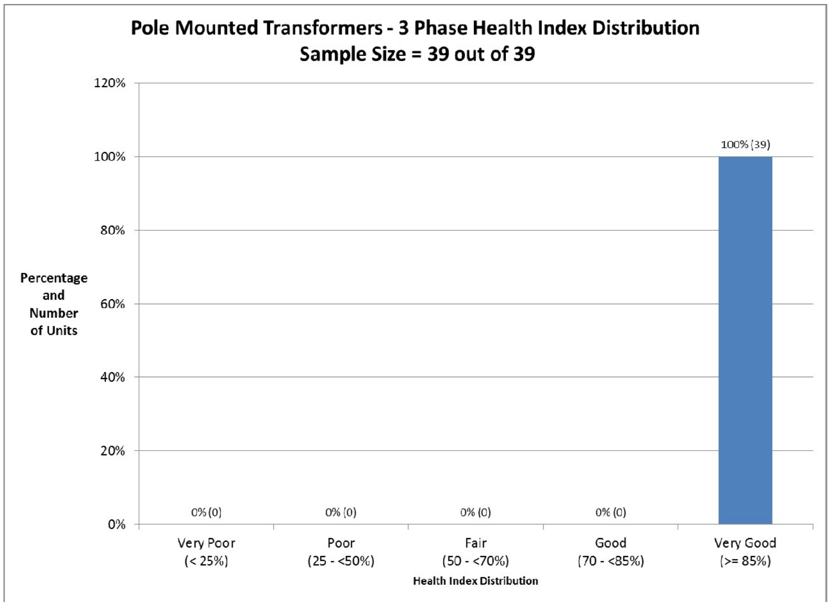

Figure 4-7 Health Index Distribution - Pole Mounted Transformers (3-Phase)

4.4 Flagged for Action Plan

The flagged for action plan for Pole Mounted Transformers were based on the data from sample size and extrapolated to the entire population.

The flagged for action plan for 1-Phase Pole Mounted Transformers was as follows:

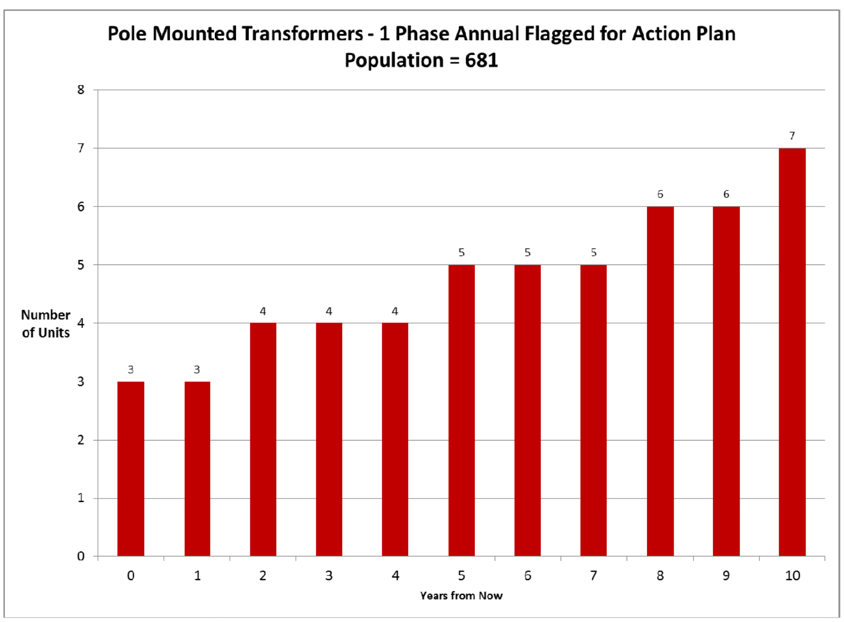

Figure 4-8 Flagged for Action Plan – Pole Mounted Transformers (1-Phase)

As per study, there was no asset unit flagged for action in the next 10 years, for either 2-Phase Pole Mounted Transformers or 3-Phase Pole Mounted Transformers.

4.5 Data Gaps

The data for in service Pole Mounted Transformers included age only.

The data gaps for this asset category are as follows:

Table 4-2 Data Gap for Pole Mounted Transformers

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Tank Corrosion	Physical Condition	☆☆	Enclosure	Surface deterioration	On-site visual inspection
Loading	Service Record	☆☆	Transformer load	Loading History: e.g. monthly peak loads	Operation record
Historic Removal Record		☆☆☆	Transformer Unit	Age at removal	Inventory Database

At GPI, Tank Corrosion is checked during pole inspection. Such information is however stored in pole maintenance database. A unique ID needs to be adopted to map the pole mounted transformer inspection information to its inventory.

In the near future, the loading data could be sampled monthly at fixed time for each transformer unit. In the long term, the monthly maximum 15 minute peak reading is to be taken with the help of smart grid techniques.

It is noticed that since 2014, GPI has started collecting historic removal data for its asset groups. However, such collection does not have sufficient data to develop degradation curve of this asset group. GPI is recommended to continue this data collection effort for the benefit of future ACA study.

5 OVERHEAD LINES

5.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Overhead Lines age limiting curve are shown in the following table, based on industry practice.

Meanwhile, in calculating HI, a de-rating factor of 0.5is applied for the segmentsof size 3/0 ACSR located on Ridge Rd E and the ones of size 336 on Park Rd.

Table 5-1 Age Limiting Curve Parameters - Overhead Lines

Asset Type	α	β
Overhead Lines	**59.2788**	**4.364**

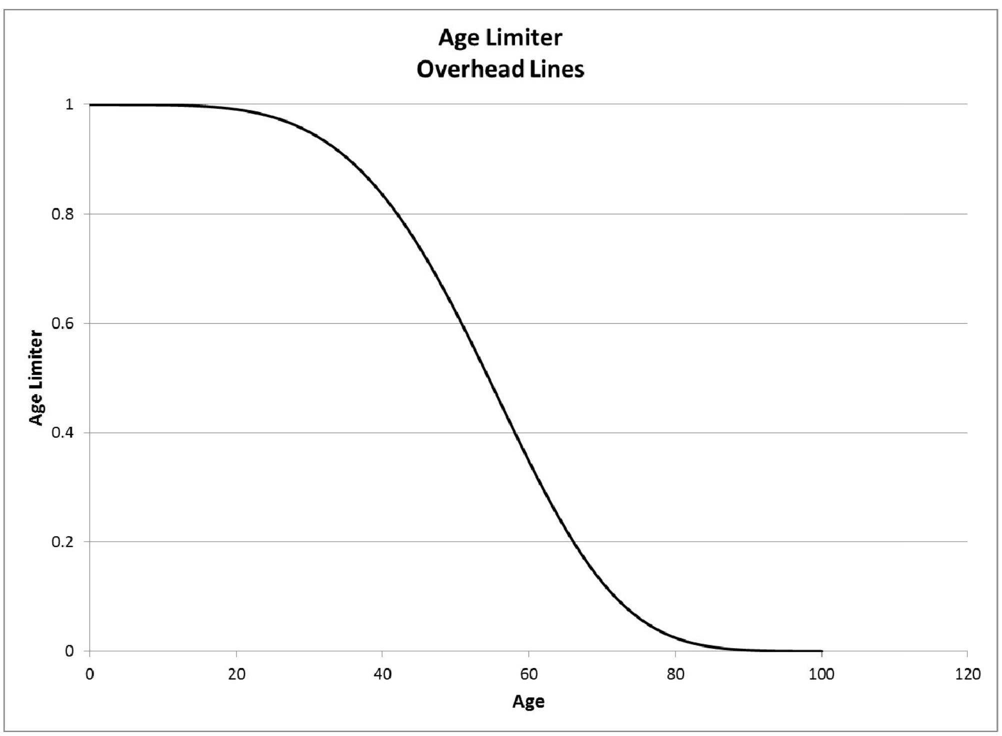

Figure 5-1 Age Limiting Factor Criteria - - Overhead Lines

5.2 Age Distribution

The average ages of all in service units were 33, 45 and 29, for 1-Phase, 2-Phase and 3-Phase Overhead Lines respectively. The age distributions were as follows.

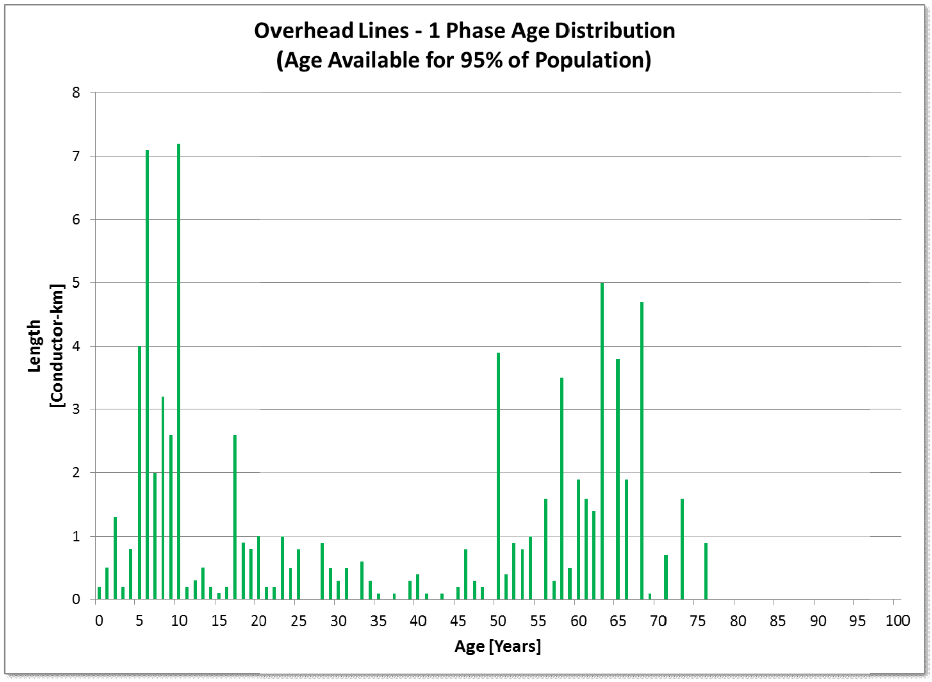

Figure 5-2 Age Distribution - Overhead Lines (1-Phase)

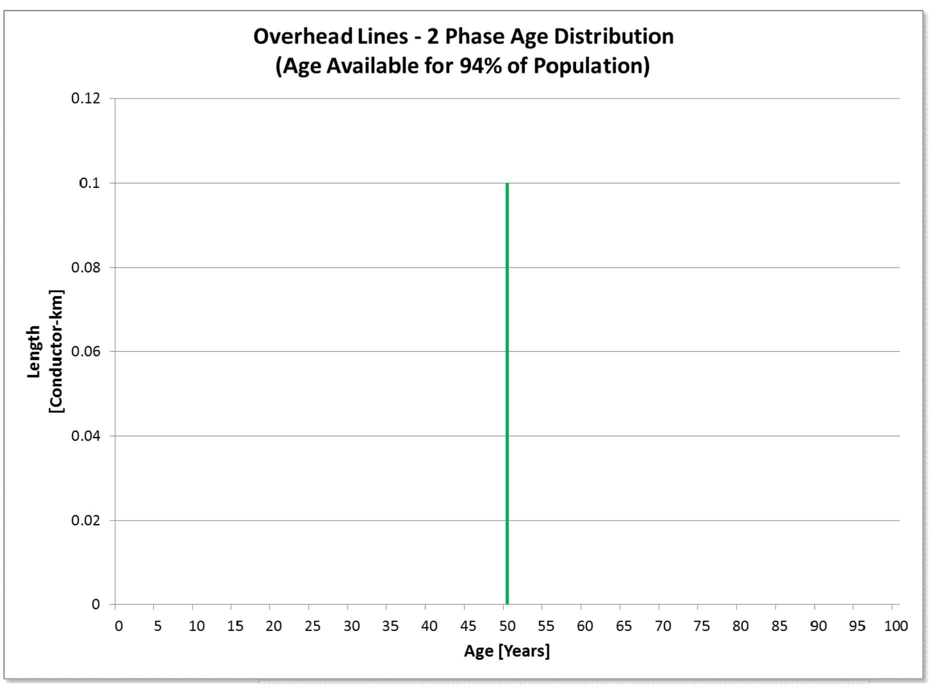

Figure 5-3 Age Distribution - Overhead Lines (2-Phase)

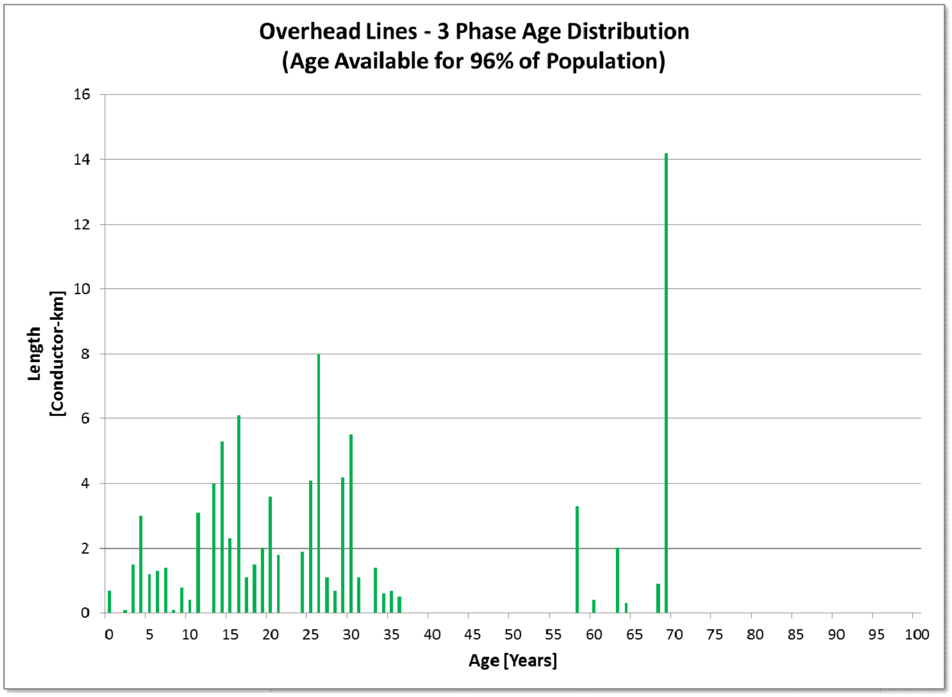

Figure 5-4 Age Distribution - Overhead Lines (3-Phase)

5.3 Health Index Results

There were 85.7 km of 1-Phase Overhead Lines at GPI. Among them, 81 km had sufficient data for a Health Indexing.

There were 0.1 km of 2-Phase Overhead Lines at GPI. All of them had sufficient data for a Health Indexing.

There were 95.6 km of 3-Phase Overhead Lines at GPI. Among them, 92.3 km had sufficient data for a Health Indexing.

The average Health Index was 67%, 64% and 80%, for 1-Phase, 2-Phase and 3-Phase Overhead Lines respectively.

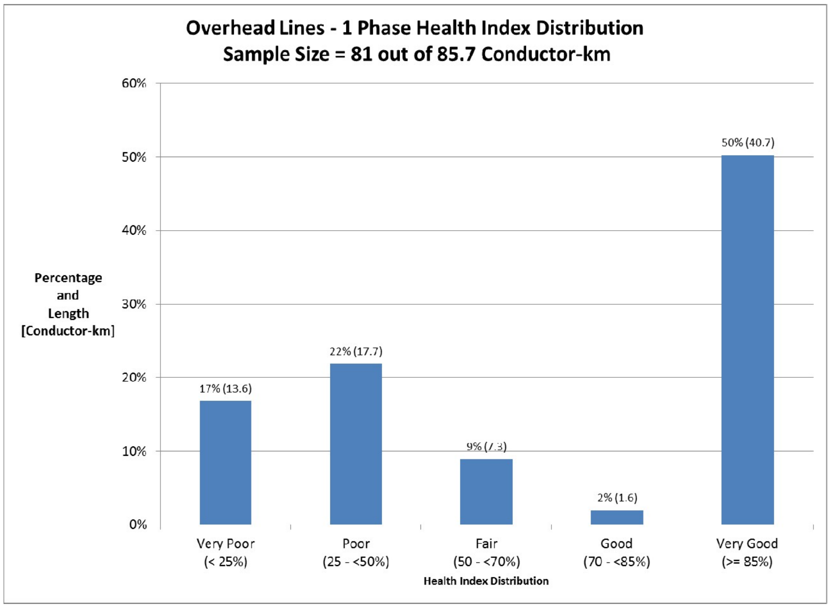

Figure 5-5 Health Index Distribution - Overhead Lines (1-Phase)

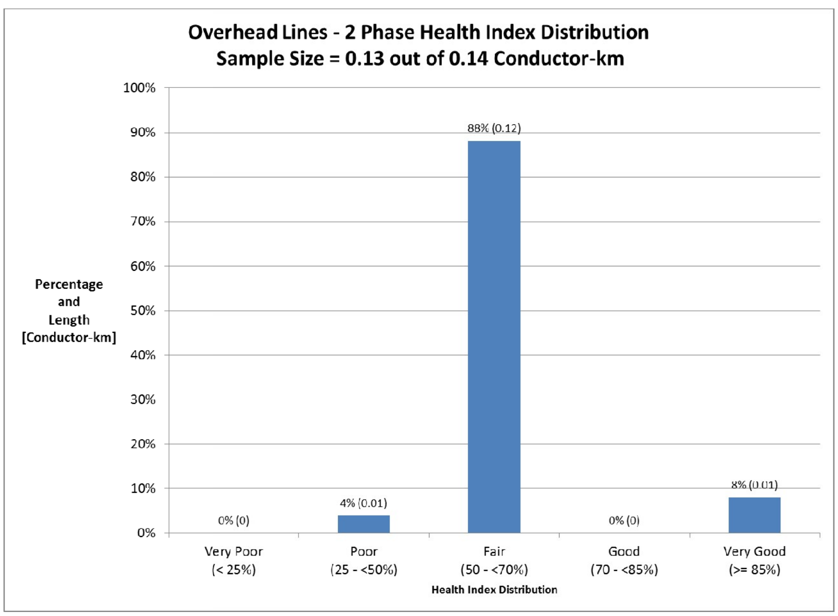

Figure 5-6 Health Index Distribution - Overhead Lines (2-Phase)

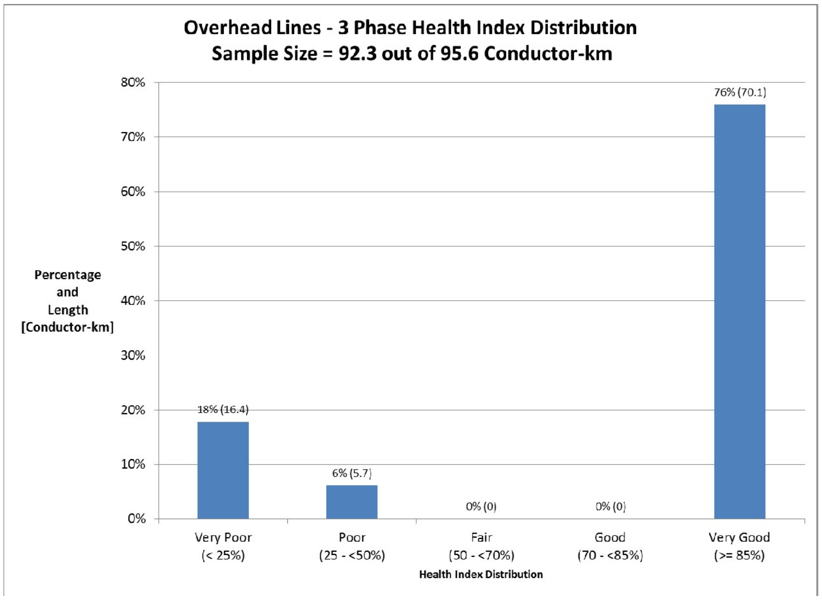

Figure 5-7 Health Index Distribution - Overhead Lines (3-Phase)

5.4 Flagged for Action Plan

The flagged for action plan for Overhead Lines were based on the data from sample size and extrapolated to the entire population.

The flagged for action plan for 1-Phase Overhead Lines was as follows:

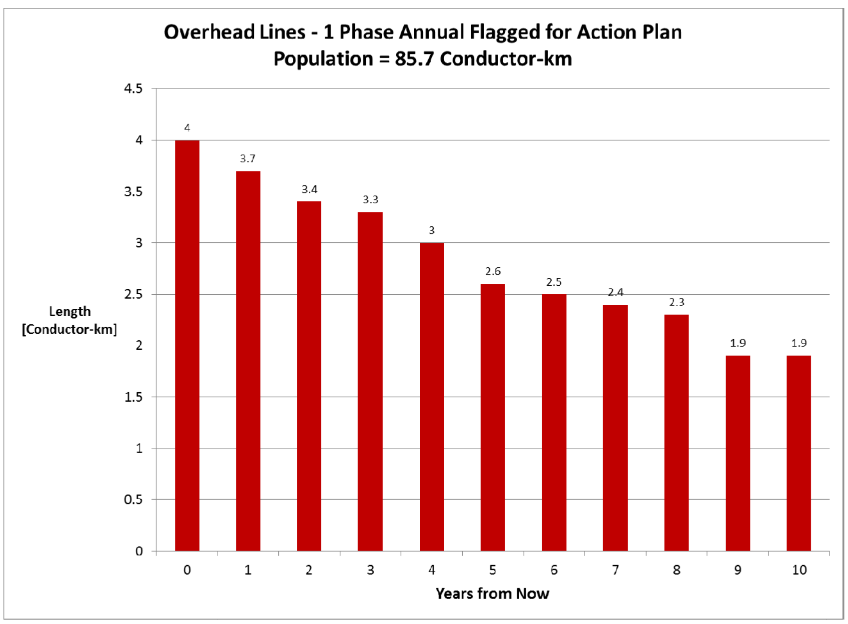

Figure 5-8 Flagged for Action Plan – Overhead Lines (1-Phase)

As per study, there was no asset unit flagged for action in the next 10 years, for 2-Phase Overhead Lines.

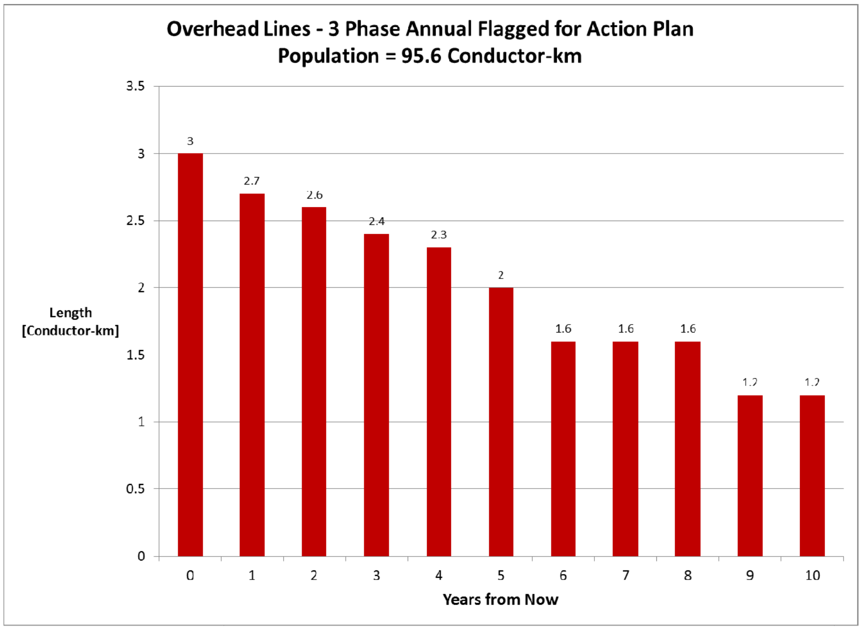

Figure 5-9 Flagged for Action Plan – Overhead Lines (3-Phase)

5.5 Data Gaps

The data for in service Overhead Lines included age only.

The data gaps for this asset category are as follows:

Table 5-2 Data Gap for Overhead Lines

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
Conductor	**Line**	☆☆☆	Broken strand	Inspection/ Maintenance Records
Splice		☆☆	Loose connection (hot spot)	
Clamp	**Hardware**	☆	Loose installation	
Insulator		☆	Crack	
Historic Removal Record		☆☆☆	Age at removal	Inventory Database

At GPI, overhead lines are checked during pole inspection. Such information is however stored in pole maintenance database. In the near future, a unique feeder ID needs to be incorporated in pole maintenance database so as to enable extraction of overhead line inspection information.

It is noticed that since 2014, GPI has started collecting historic removal data for its asset groups. However, such collection does not have sufficient data to develop degradation curve of this asset group. GPI is recommended to continue this data collection effort for the benefoit of future ACA study.

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6 OVERHEAD SWITCHES

6.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Overhead Switches age limiting curve are shown in the following table, based on industry practice.

Meanwhile, in calculating HI, a de-rating factor of 0.5is applied for the vertical type of switches, to reflect the phase-out plan for replacement by horizontal type units with bypass..

Table 6-1 Age Limiting Curve Parameters - Overhead Switches

Asset Type	α	β
Overhead Switches	**31.35**	**2.647**

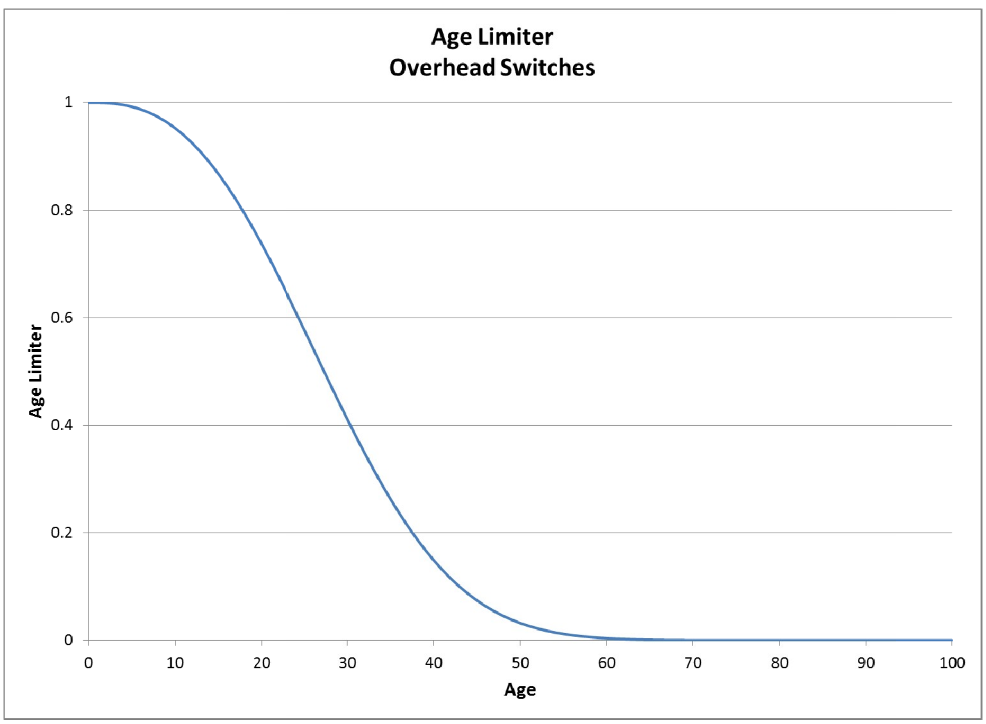

Figure 6-1 Age Limiting Factor Criteria - - Overhead Switches

6.2 Age Distribution

The average ages of all in service units were 4 and 10, for 1-Phase and 3-Phase Overhead Switches respectively. The age distributions were as follows.

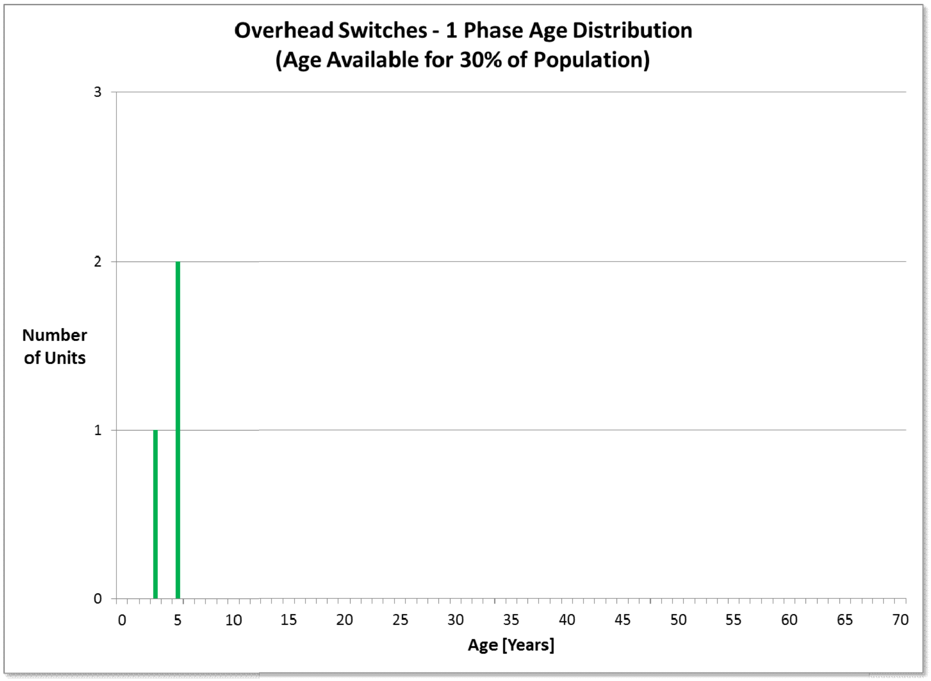

Figure 6-2 Age Distribution - Overhead Switches (1-Phase)

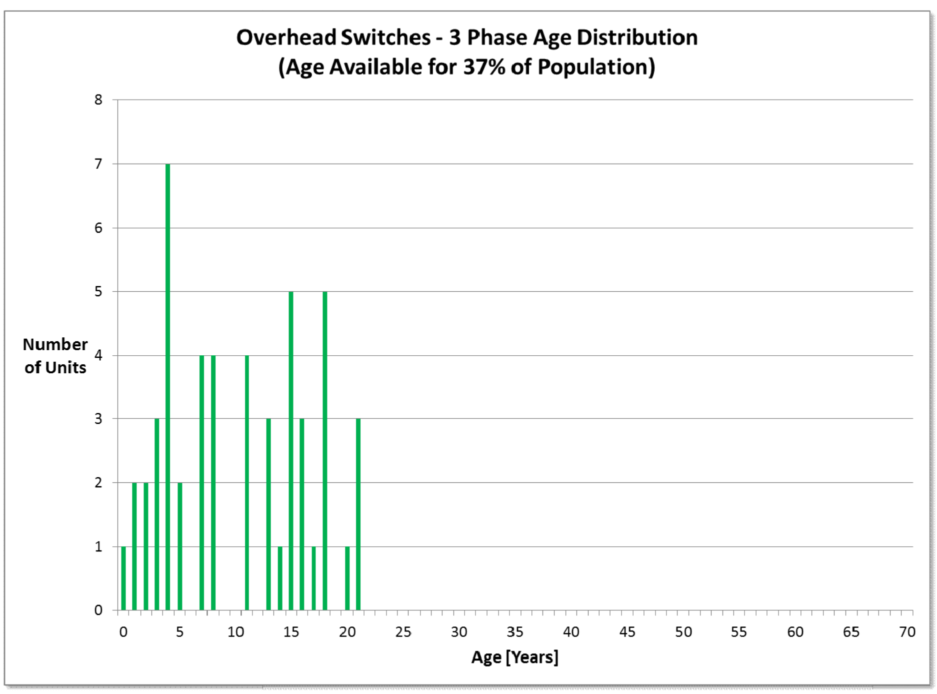

Figure 6-3 Age Distribution - Overhead Switches (3-Phase)

6.3 Health Index Results

There were 10 units of 1-Phase Overhead Switches at GPI. Among them, 3 units had sufficient data for a Health Indexing.

There were 137 units of 3-Phase Overhead Switches at GPI. Among them, 51 units had sufficient data for a Health Indexing.

The average Health Index was 99% and 88%, for 1-Phase and 3-Phase Overhead Switches respectively.

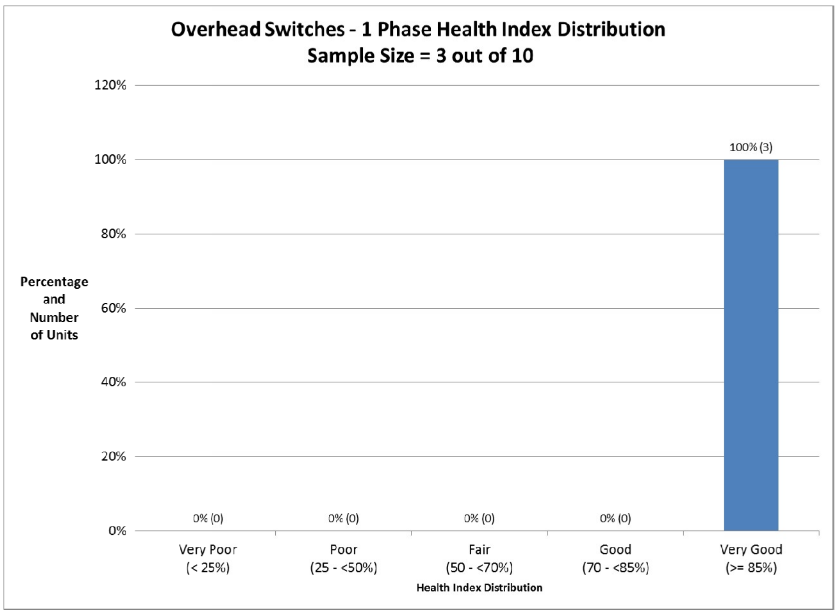

Figure 6-4 Health Index Distribution - Overhead Switches (1-Phase)

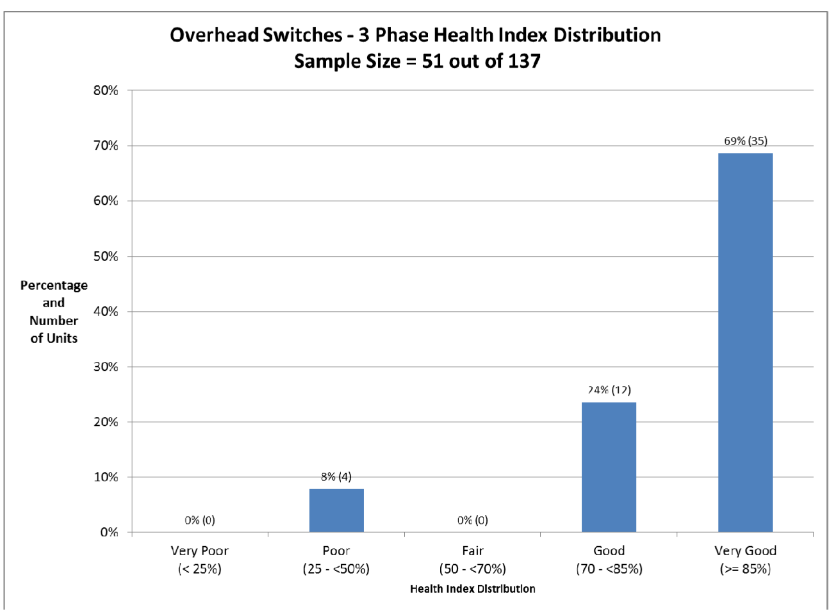

Figure 6-5 Health Index Distribution - Overhead Switches (3-Phase)

6.4 Flagged for Action Plan

The flagged for action plan for Overhead Switches were based on the data from sample size and extrapolated to the entire population.

As per study, there was no asset unit flagged for action in the next 10 years for 1-Phase Overhead Switches.

The flagged for action plan for 3-Phase Overhead Switches was as follows:

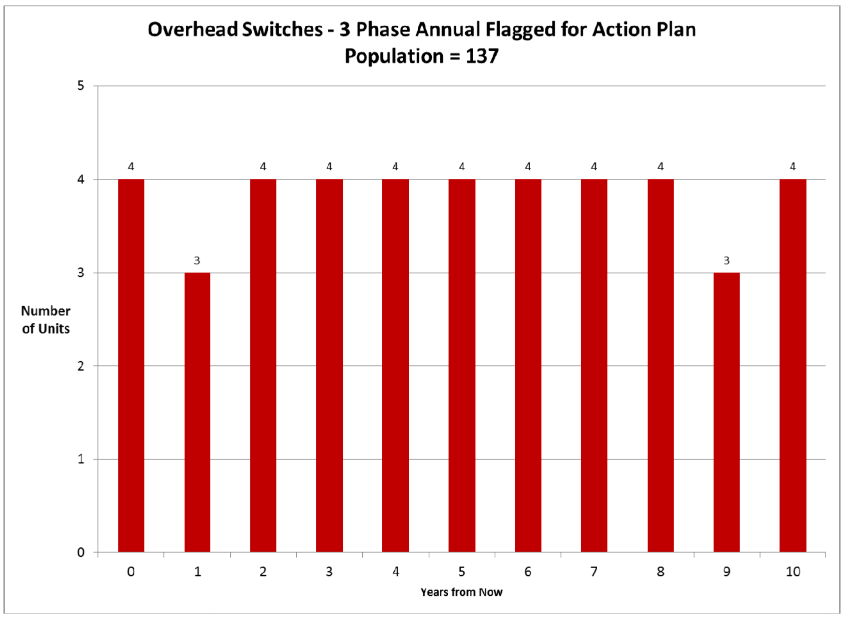

Figure 6-6 Flagged for Action Plan – Overhead Switches (3-Phase)

6.5 Data Gaps

Data for Overhead Switches included age only.

The following table shows the data gaps.

Table 6-2 Data Gap for Overhead Switches

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
Motor Mechanism	Operation Mechanism	☆☆☆	Mechanical part and linkage issue	Inspection/ Maintenance Records
Switch Mounting		☆	Loose installation	
Arc Horn	Arc Extinction	☆	Arc horn surface worn-out	
Arc Interrupter		☆☆	Arc extinction part surface worn-out	
Insulator	**Insulation**	☆	Crack	
Historic Removal Record		☆☆☆	Age at removal	Inventory Database

It is noticed that since 2014, GPI has started collecting historic removal data for its asset groups. However, such collection does not have sufficient data to develop degradation curve of this asset group. GPI is recommended to continue this data collection effort for the benefoit of future ACA study.

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7 PAD MOUNTED TRANSFORMERS

7.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

7.1.1 Condition and Sub-Condition Parameters

Table 7-1 Condition Parameter and Weights - Pad Mounted Transformers

m	Condition parameter	WCP_m	Sub-Condition Parameters
1	Physical	3	Table 7-2
2	Connection	5	Table 7-3
	Age Limiting Factor		Figure 7-1

Table 7-2 Physical Sub-Condition Parameters and Weights (m=1) - Pad Mounted Transformers

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Tank Corrosion	3	Table 7-4
2	Access	1	Table 7-4
3	Base	2	Table 7-4

Table 7-3 Connection Sub-Condition Parameters and Weights (m=2) - Pad Mounted Transformers

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Oil Leak	2	Table 7-4
2	Elbow	4	Table 7-4
3	Grounding	1	Table 7-4
4	Bushing	4	Table 7-4

7.1.2 Condition Criteria

Inspection

All the condition scores are based on GPI's inspection grading results.

Table 7-4 Inspection Result Criteria - Pad Mounted Transformers

Score	Paint	Base	Grounding	Access	Termination	Bushing
4	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY
3	Graffitti	Straighten				
2	Repaint	Too High/Low		Shrubs		
1					No cap	
0	Rustning	Notlevel	Bonding	Fence/Garden	Faulty	Cracked/Leaking

Age Limiting Factor

In this project, age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Principle of applying the degradation survival curve is described in Equation 6 of Section 1.1.2.

In this project, the parameters of Pad Mounted Transformers age limiting curve are shown in the following table, based on industry practice.

Table 7-5 Age Limiting Curve Parameters - Pad Mounted Transformers

Asset Type	α	β
Pad Mounted Transformers	**50.5544**	**6.4053**

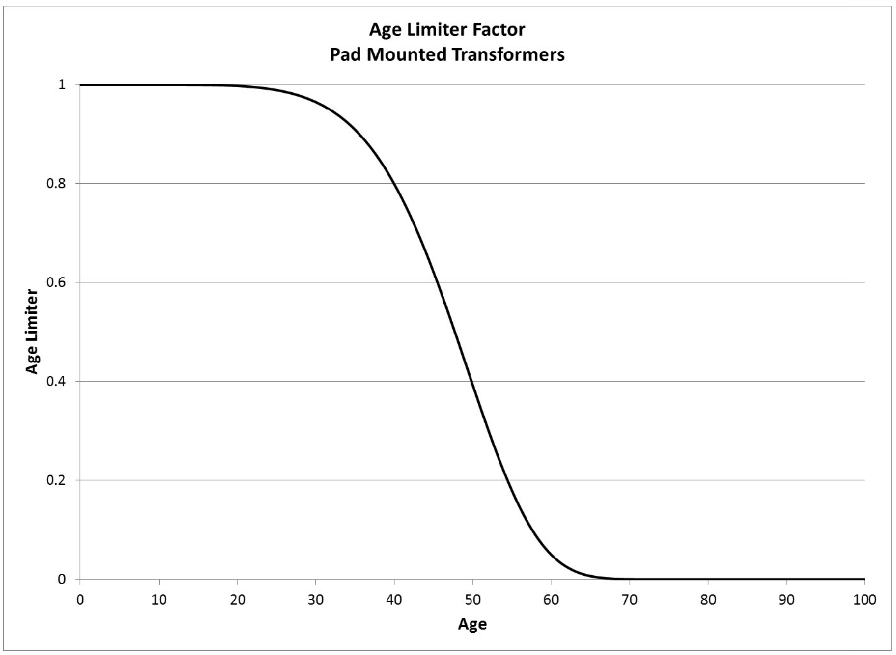


Figure 7-1 Age Limiting Factor Criteria - - Pad Mounted Transformers

7.2 Age Distribution

The average age of the units was 18 and 20 years, for 1-phase and 3-phase Pad Mounted Transformers respectively.

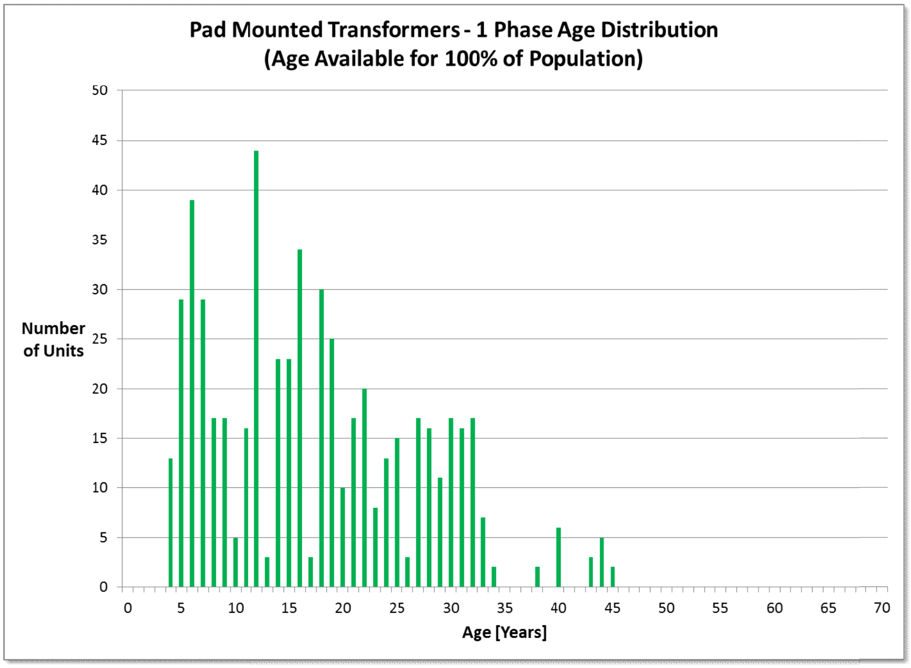


Figure 7-2 Age Distribution - Pad Mounted Transformers (1-Phase)

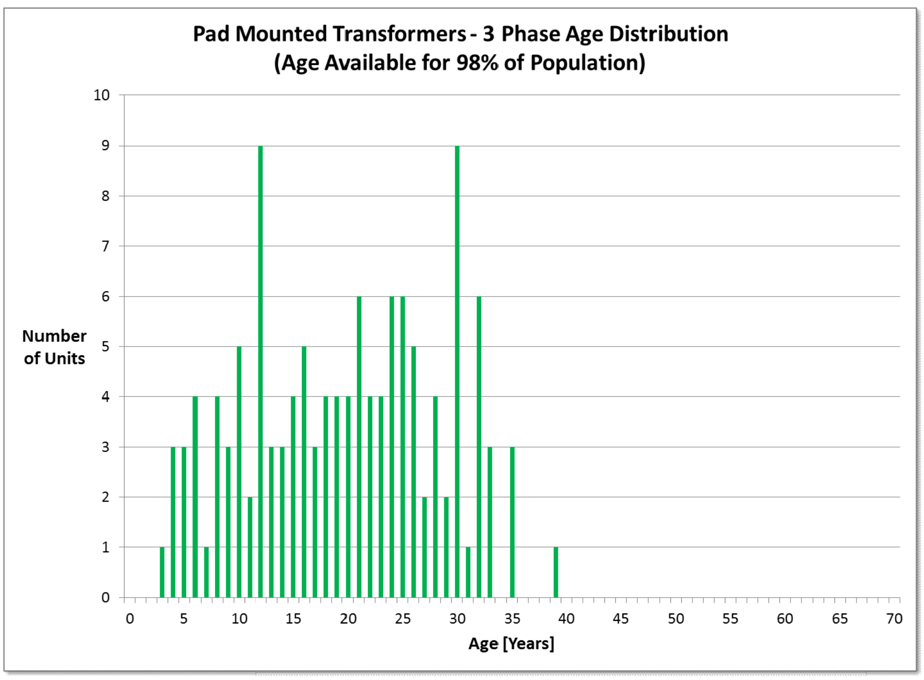


Figure 7-3 Age Distribution - Pad Mounted Transformers (3- Phase)

7.3 Health Index Results

There were a total of 557 units of 1-phase Pad Mounted Transformers at GPI. All of them had sufficient data for a Health Indexing.

There were a total of 129 units of 3-phase Pad Mounted Transformers at GPI. Among them, 127 units had sufficient data for a Health Indexing.

The average Health Index score for this asset group was 98% and 98%, for 1-phase and 3-phase Pad Mounted Transformers respectively.

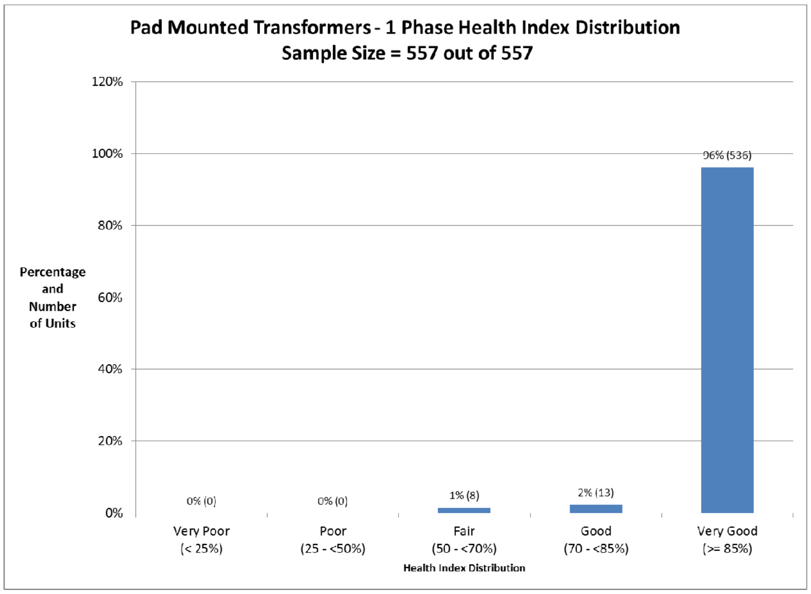


Figure 7-4 Health Index Distribution - Pad Mounted Transformers (1-Phase)

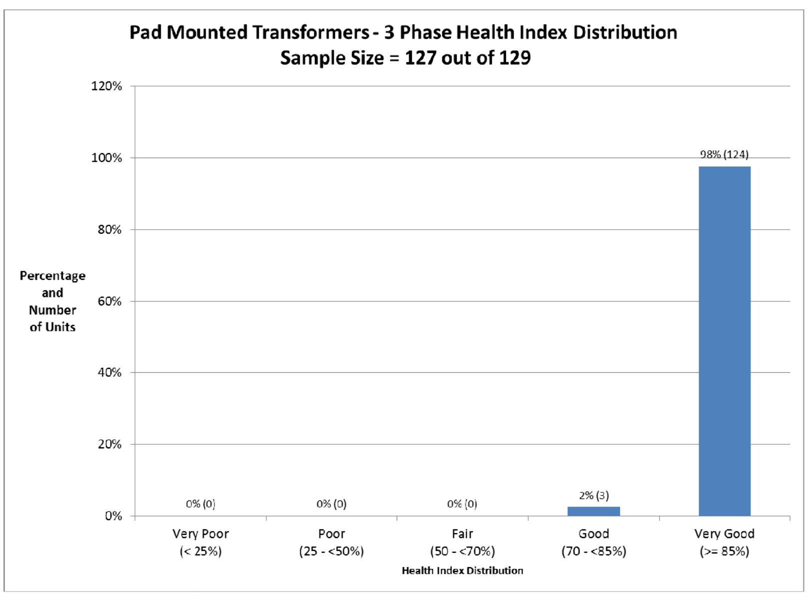


Figure 7-5 Health Index Distribution - Pad Mounted Transformers (3-Phase)

7.4 Flagged for Action Plan

The flagged for action plan of Pad Mounted Transformers was based on the asset removal rate.

The flagged for action plans for Pad Mounted Transformers were based on the data from sample size and extrapolated to the entire population. The following diagram shows the flagged for action plans:

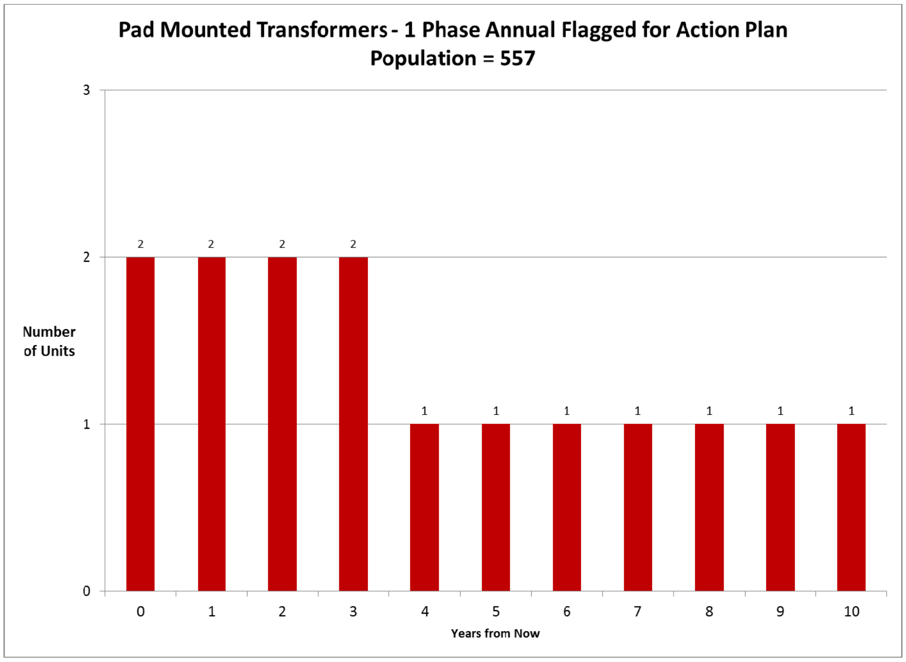


Figure 7-6 Flagged for Action Plan - Pad Mounted Transformers (1-Phase)

As per study, there was no asset unit flagged for action in the next 10 years for 3-Phase Pad Mounted Transformers.

7.5 Data Gaps

The data used for single phase Pad Mounted Transformers assessment included age and inspection results for individual components.

The data gaps are as follows.

Table 7-6 Data Gap for Pad Mounted Transformers

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Gaskets	Connection	☆	Gasket	Sealing issue	On-site visual inspection
Loading	Service Record	☆ ☆	Transformer load	Loading History: e.g. hourly peak loads	Operation record
Historic Removal Record		☆ ☆ ☆	Transformer Unit	Age at removal	Inventory Database

In the near future, the loading data could be sampled monthly at fixed time for each transformer unit. In the long term, the monthly maximum 15 minute peak reading is to be taken with the help of smart grid techniques.

It is noticed that since 2014, GPI has started collecting historic removal data for its asset groups. However, such collection does not have sufficient data to develop degradation curve of this asset group. GPI is recommended to continue this data collection effort for the benefoit of future ACA study.

8 PAD MOUNTED SWITCHGEAR

8.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the “worst” and “best” scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is “4”.

8.1.1 Condition and Sub-Condition Parameters

Table 8-1 Condition Parameter and Weights - Pad Mounted Switchgear

m	Condition parameter	WCP_m	Sub-Condition Parameters
1	Physical Condition	4	Table 8-2
2	Switch	3	Table 8-3
3	Insulation	4	Table 8-4
	Age Limiting Factor		Table 8-6

Table 8-2 Physical Condition Sub-Condition Parameters and Weights (m=1) - Pad Mounted Switchgear

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Debris	1	Table 8-5
2	Paint	1	Table 8-5
3	Foundation	1	Table 8-5
4	Access	1	Table 8-5
5	Enclosure	2	Table 8-5

Table 8-3 Switch Sub-Condition Parameters and Weights (m=2) - Pad Mounted Switchgear

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Termination	2	Table 8-5
2	Connection	1	Table 8-5
3	Fuse	1	Table 8-5

Table 8-4 Insulation Sub-Condition Parameters and Weights (m=3) - Pad Mounted Switchgear

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Insulator	2	Table 8-5
2	Barrier	1	Table 8-5

8.1.2 Condition Criteria

Inspection

All the condition scores are based on GPI's inspection grading results as follows:

Table 8-5 Inspection Result Criteria - Pad Mounted Switchgear

Score	**Inspection Value**
0	Poor/Replacement Required
2	Fair/Wear
4	Good

Age Limiting Factor

In this project, age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Principle of applying the degradation survival curve is described in Equation 6 of Section 1.1.2.

In this project, the parameters of Pad Mounted Switchgear age limiting curve are shown in the following table, based on industry practice.

Table 8-6 Age Limiting Curve Parameters - Pad Mounted Switchgear

Asset Type	α	β
Pad Mounted Switchgear	**44.966**	**1.789**

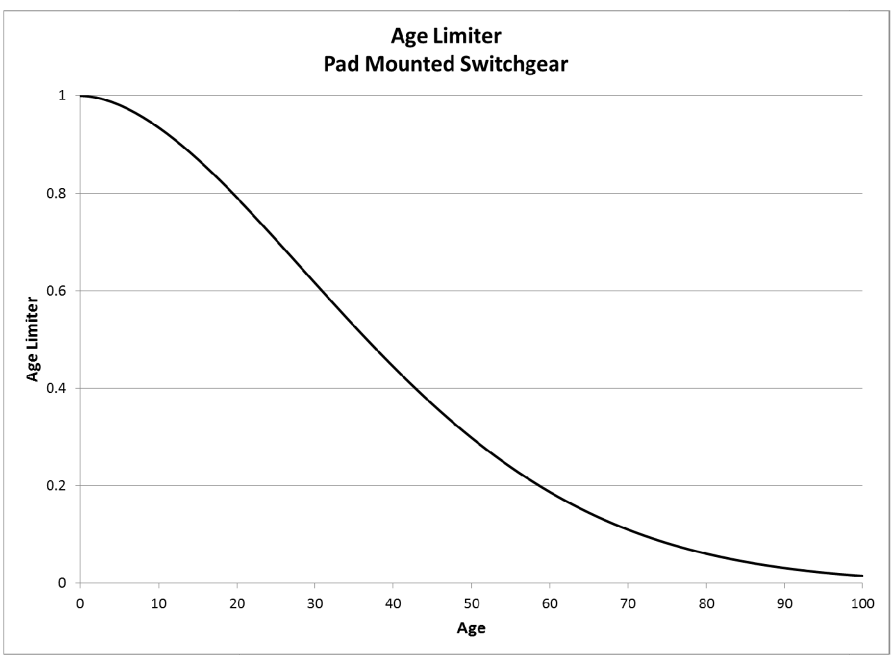


Figure 8-1 Age Limiting Factor Criteria - - Pad Mounted Switchgear

8.2 Age Distribution

The average age of the units was 11 years for Pad Mounted Switchgear.

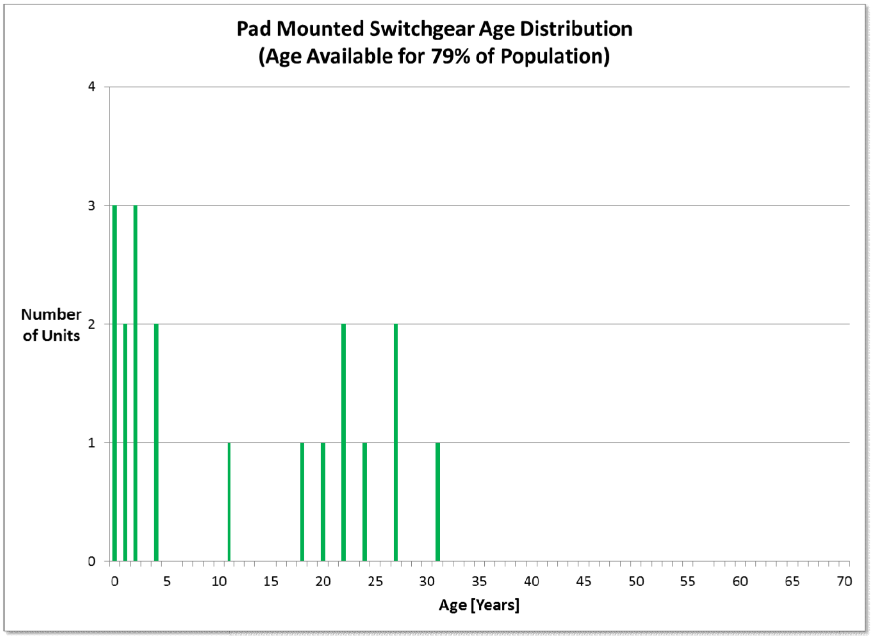


Figure 8-2 Age Distribution - Pad Mounted Switchgear

8.3 Health Index Results

There were a total of 24 units of Pad Mounted Switchgear at GPI. Among them, 19 units had sufficient data for a Health Indexing.

The average Health Index score for this asset group was 88%.

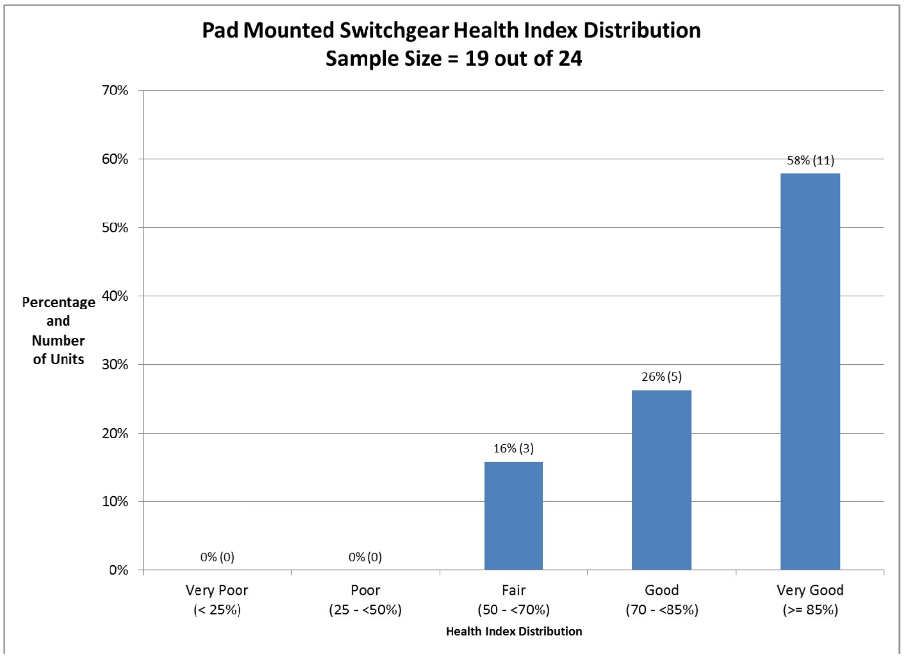


Figure 8-3 Health Index Distribution - Pad Mounted Switchgear

8.4 Flagged for Action Plan

The flagged for action plan of Pad Mounted Switchgear was based on the asset removal rate.

As per study, there was no asset unit flagged for action in the next 10 years for Pad Mounted Switchgear

8.5 Data Gaps

The data used for Pad Mounted Switchgear assessment included age and inspection results.

The data gaps are as follows.

Table 8-7 Data Gap for Pad Mounted Switchgear

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Historic Removal Record		☆☆☆	Switchgear Unit	Age at removal	Inventory Database

The inspection results used in this study were from recent site inspection, for only 1 unit. Historic inspections were not electronically available.

It is noticed that since 2014, GPI has started collecting historic removal data for its asset groups. However, such collection does not have sufficient data to develop degradation curve of this asset group. GPI is recommended to continue this data collection effort for the benefoit of future ACA study.

9 UNDERGROUND CABLES

9.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Underground Cables age limiting curve are shown in the following table, based on industry practice.

Table 9-1 Age Limiting Curve Parameters - Underground Cables

Asset Type	α	β
UG Cable – Direct Buried	**37.9158**	**6.4053**
UG Cable – In Duct	**53.1336**	**9.0278**

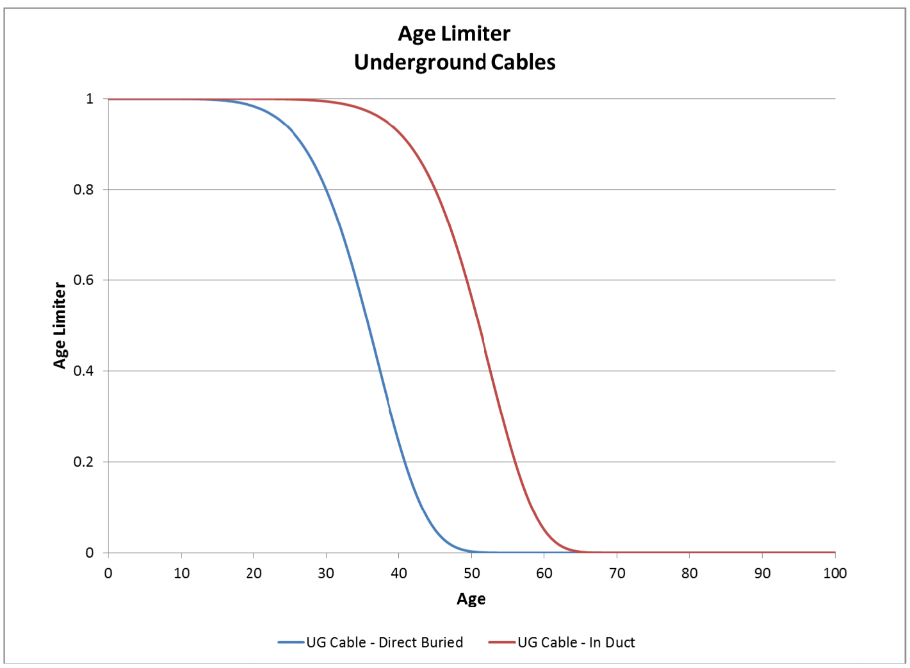


Figure 9-1 Age Limiting Factor Criteria - - Underground Cables

9.2 Age Distribution

The average ages of all in service cable segments were 18, 19, 22 years, for 1-Phase, 2-Phase, and 3-Phase Underground Cables respectively. The age distributions for Underground Cables were as follows.

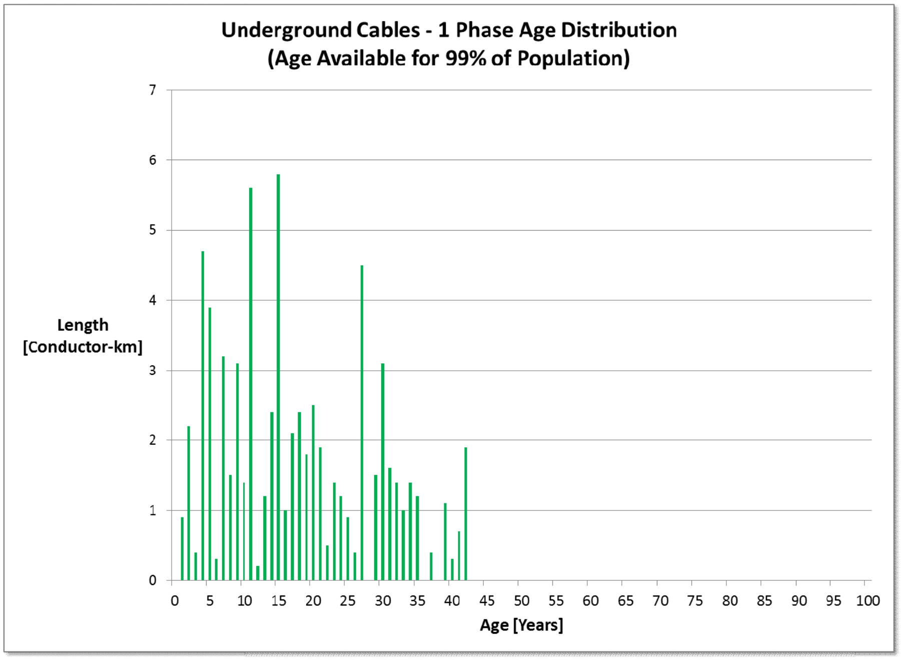


Figure 9-2 Age Distribution - Underground Cables (1-Phase)

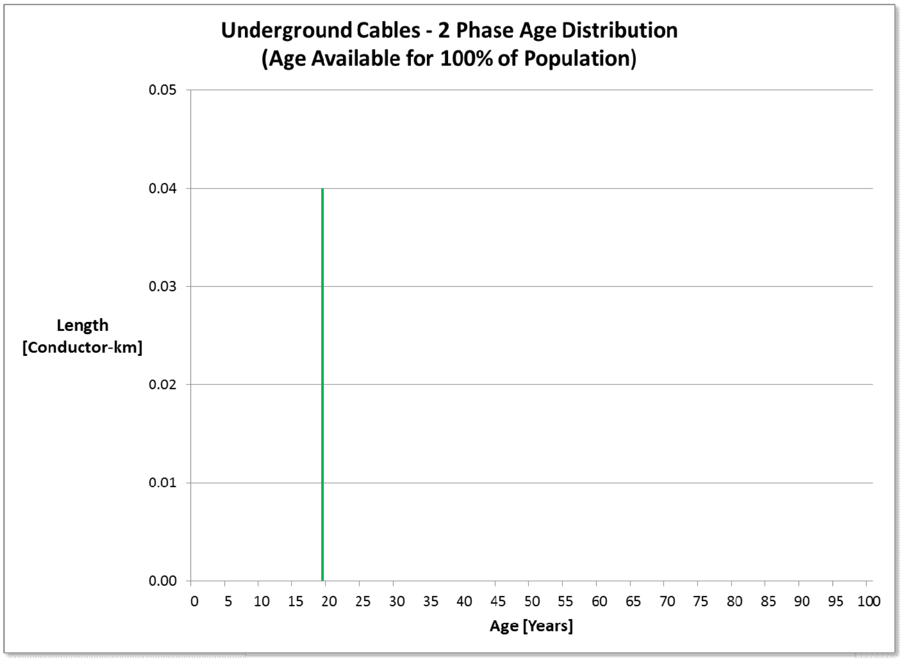


Figure 9-3 Age Distribution - Underground Cables (2-Phase)

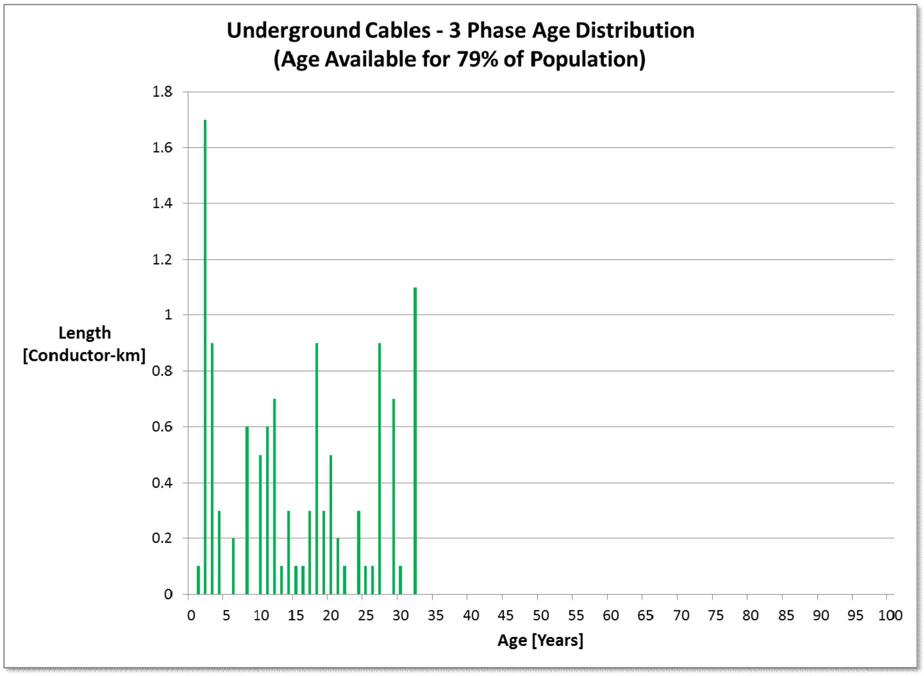


Figure 9-4 Age Distribution - Underground Cables (3-Phase)

9.3 Health Index Results

There were 73.5 km 1-Phase Underground Cables at GPI. Among them, 72.5 km had age data for a Health Indexing.

There were 0.04 km 2-Phase Underground Cables at GPI. All of them had age data for a Health Indexing.

There were 15.4 km 3-Phase Underground Cables at GPI. Anong them 12.2 km had age data for a Health Indexing.

The average Health Index for this asset group was 90%, 100% and 97%, for 1-Phase, 2-Phase, and 3-Phase Underground Cables respectively.

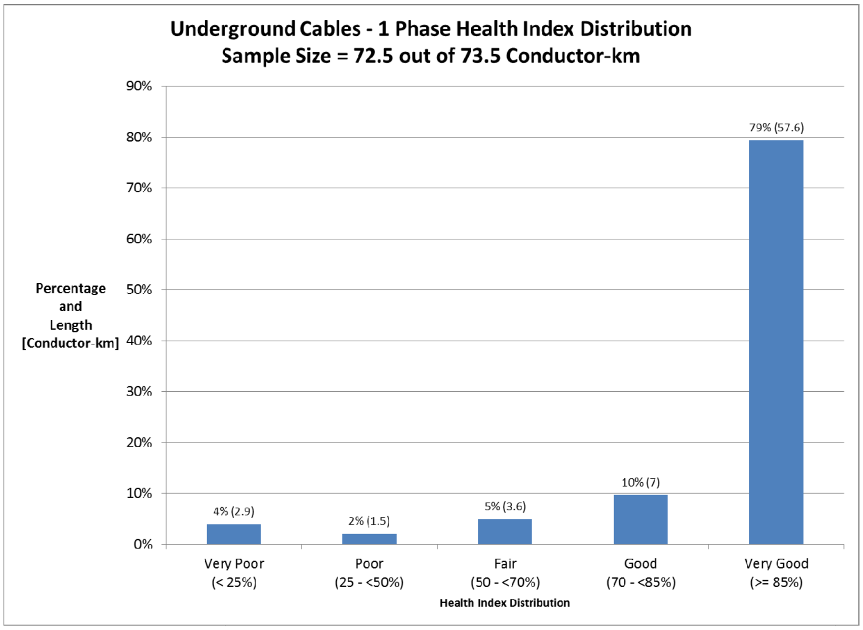


Figure 9-5 Health Index Distribution - Underground Cables (1-Phase)

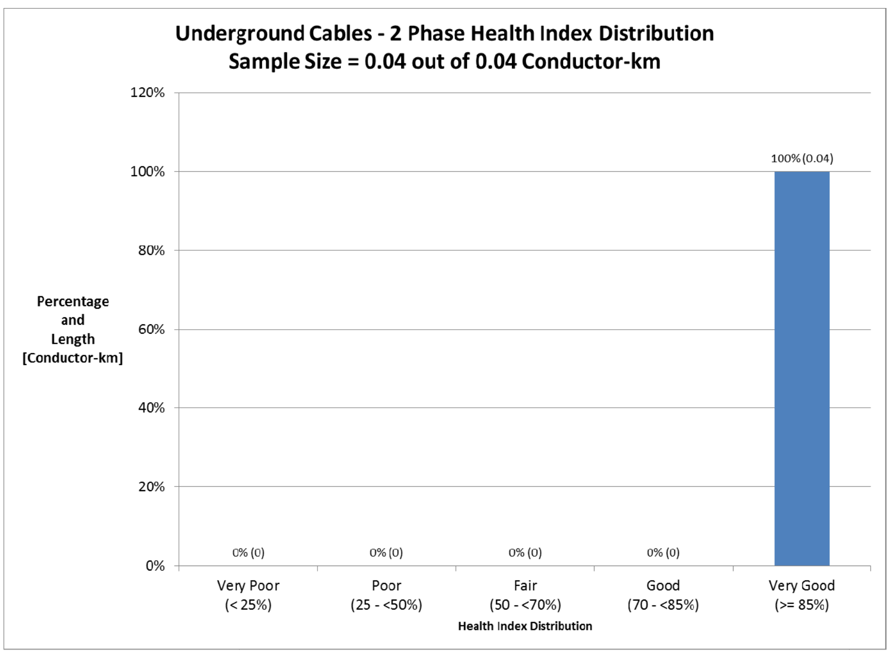


Figure 9-6 Health Index Distribution - Underground Cables (2-Phase)

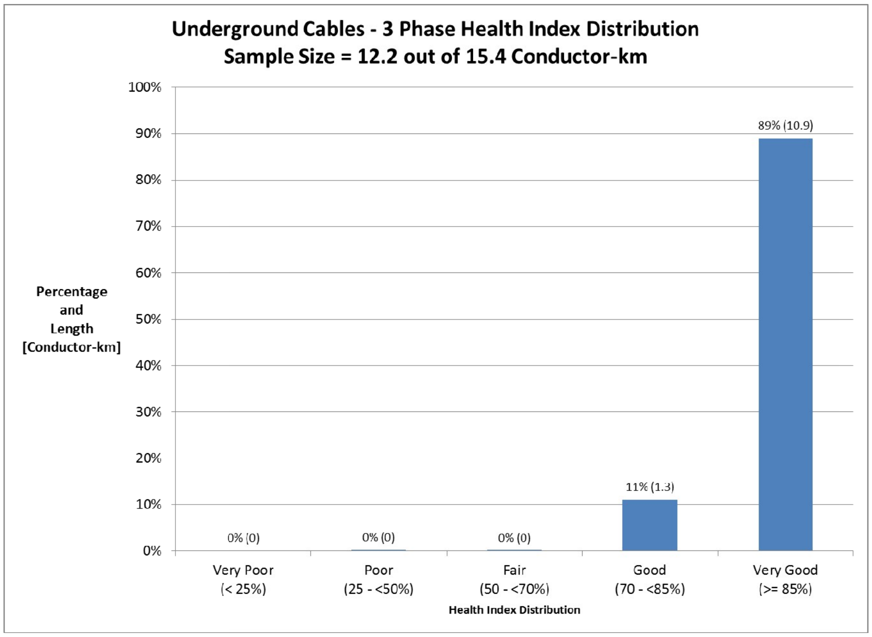


Figure 9-7 Health Index Distribution - Underground Cables (3-Phase)

9.4 Flagged for Action Plan

The flagged for action plan for Underground Cables were based on the data from sample size and extrapolated to the entire population.

The following diagram shows the flagged for action plan:

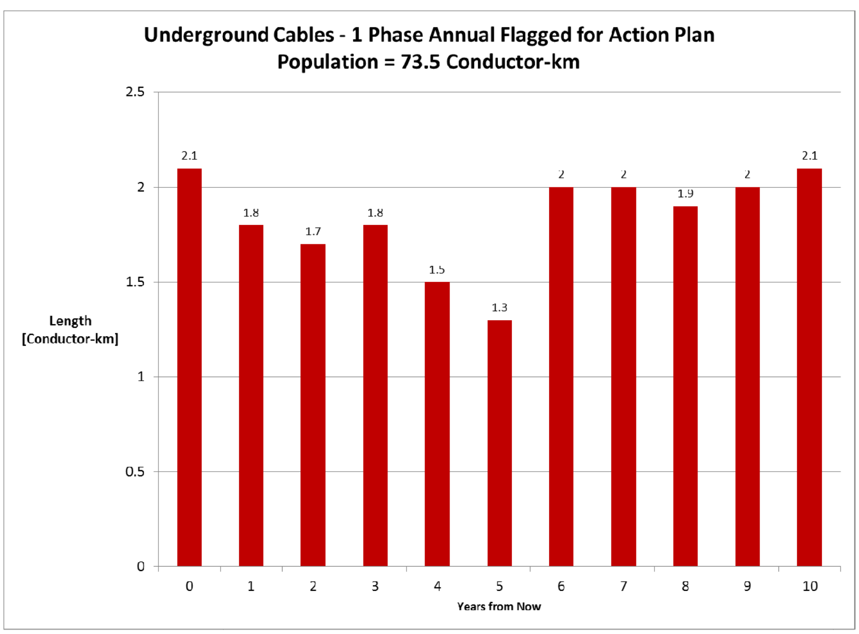


Figure 9-8 Flagged for Action Plan – Underground Cables (1-Phase)

As per study, there was no asset unit flagged for action in the next 10 years, for either 2-Phase Underground Cables or 3-Phase Underground Cables.

9.5 Data Gaps

The data used for Underground Cables assessment included age only.

The data gaps are as follows:

Table 9-2 Data Gap for Underground Cables

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Dielectric Loss	Insulation	☆ ☆ ☆	Cable	Insulation defect	On-site test
Splices	Accessories	☆ ☆	Cable Connection	Connection defect	On-site test
Terminations		☆ ☆			
Neutral Corrosion		☆	Other Component	Neutral defect	
Fault rate at Segment Level	Service Record	☆ ☆ ☆	Cable	Failure records	Historic records
Historic Removal Record		☆ ☆ ☆	Age	Age at Removal	Inventory Database

Since 2017, GPI has implemented an underground cable test program to systematically conduct cable tests. The test data are however not electronically extractable as of now. This needs to be improved in the future.

It is noticed that since 2014, GPI has started collecting historic removal data for its asset groups. However, such collection does not have sufficient data to develop degradation curve of this asset group. GPI is recommended to continue this data collection effort for the beneoit of future ACA study.

APPENDIX E

Distribution System Maintenance and Inspection Program

GRIMSBY POWER INC.

Distribution System Maintenance and Inspection Program

Grimsby Power Inc.
Distribution System Maintenance and Inspection Program
January 3, 2020

Table of Contents

GRIMSBY POWER INC.

Distribution System Maintenance and Inspection Programs

1 General

1.1 Introduction

A Distribution System Maintenance and Inspection Program is a key component to system reliability, customer/public safety and worker safety. The purpose of this program is to document the requirements for the maintenance or inspection of all key distribution system assets. Each distribution system asset has its own program and within each program a procedure is identified as to how the maintenance and inspection will be performed. The procedure identifies the specific asset and assigns responsibility for the delivery of the program.

It is noted that this procedure is not yet fully complete. The program includes completed sections on assets which have established protocols and on assets which are in the process of being implemented. Assets for which the program has not been initiated are in a preliminary state and information in this document may only be the basic template information. Each program identifies whether the program is *established*, in the *implementation* phase, or is in the *development* phase.

This procedure is reviewed annually and is subject to the continuous improvement process.

The following maintenance and inspection programs are detailed in this procedure:

- Line Clearing and Tree Trimming Maintenance Program
- Distribution System Plant Inspections and Ground Level Maintenance
- Distribution Plant Inspections
- Off Road High Voltage Line Inspections
- Switch Maintenance Program

2 Programs

2.1 Line Clearing and Tree Trimming Maintenance Program

2.1.1 Introduction:

The purpose of this program is to clear all lines from the encroachment of trees and branches to eliminate, as best as possible, tree contact with lines. This is a major contributor to improved reliability.

2.1.2 Status of Program

Established

2.1.3 Definition of Geographic Areas and Frequency of Program:

This program is organized on a three year rotating cycle. The areas are defined as follows:

- East
  - Area #3 – Lake Ontario to the north, Niagara Escarpment to the south, NPEI boundary to the east and Nelles Road to the west.
  - Area #6 – Niagara Escarpment to the north, Mud St. (north side) to the south, Russ Road to the west, Fairbrother Road and Thirty Road to the east.
- Central
  - Area #2– Lake Ontario to the north, Niagara Escarpment to the south, Nelles Road to the east, Roberts Rd to west.
  - Area #5 – Niagara Escarpment to the north, Mud St (north side) to the south, Russ Road to the east, Inglehart to the west.
- West
  - Area #1 – Lake Ontario to North, Niagara Escarpment to the south, Horizon boundary to the west and Roberts Rd to the east.
  - Area #4 – Niagara Escarpment to the north, NPEI boundary to the south, Horizon boundary to the west and Inglehart to the east.

See Map included as Appendix A

The timing of each geographic area as completed in the past, present, and future is as follows:

				Geographic Areas	
Cycles	Part	Year	East	Central	West
1	1	2020		A2	
	2			A5	
2	1	2021			A1
	2				A4
3	1	2022	A3		
	2		A6		
1	1	2023		A2	
	2			A5	
2	1	2024			A1
	2				A4
3	1	2025	A3		
	2		A6		

2.1.4 Line Clearing Specifications

All trees, limbs and branches shall be trimmed so that the minimum clearance to the nearest conductor is:

- 4 meters for all primary (high voltage) distribution lines
- 1 meter for all secondary (voltages less than 750V) lines

Note – these specifications are the same as the Ontario Electrical Safety Code Rule 75-326(2) (Tree Trimming)

In locations where it would be considered inappropriate to trim to such clearances then the Contractor will consult with and obtain approval from GPI for alternate clearances.

Prune all branches to direct growth away from the conductors. Any dead wood that is clear of the lines but is above or adjacent to the lines shall be removed.

All primary services supplying GPI customers are to be cleared within the road allowance or within 20 meters of the main distribution line if off road.

All secondary services supplied from a transformer or secondary bus on the main line to be cleared to the house.

Inspections of completed areas are done by Grimsby Power's Power Line Technician to ensure above clearances are maintained. Contractor are required to complete a daily time sheets with street locations of trees that have been trimmed. Any call backs are completed within the timeframe set out in the Request for Quotation.

2.1.5 Responsibility

Administration of the Program	Operations Supervisor
Work Protection	Operations Supervisor

2.1.6 Job Number

Quote Order # 2436000
Job #2379
Work Order #8482
GL # - 51350000
Title – Overhead Distribution Lines and Feeders Right of Way

2.2 Distribution System Plant Inspections and Ground Level Maintenance

2.2.1 Introduction

Distribution System Plant Inspections are regulated under the OEB Distribution System Code. The code specifies the minimum requirements to inspect urban areas on a 3 year cycle and rural areas on a 6 year cycle.

2.2.2 Status of Program

Established

2.2.3 Definition of Geographic Areas and Frequency of Program:

The areas to be utilized are the same as used in the Line Clearing Tree Trimming Maintenance Program (as described in Section 2.1) and are shown on the attached map (Appendix A).

The timing of each cycle including some completed in the past is as follows:

			Geographic Areas		
Cycles	Part	Year	East	Central	West
5	1	2020		A2	
	2			A5	
6	1	2021	A3		
	2		A6		
1	1	2022			A1
	2				
2	1	2023		A2	
	2				
3	1	2024	A3		
	2				
4	1	2025			A1
	2				A4

2.2.4 Specific Work to Be Completed

The specific work to be completed under this program is detailed in the Utilities Standards Forum 2018 –Asset Inspection Testing Recommendation Report. The work involves a visit to each asset location. For overhead distribution plant this means every pole and for underground distribution plant this means all pad mounted equipment.

2.2.4.1 Visual Inspection

The visual inspection is to be completed by meeting the minimum requirements of the Distribution System Code – Appendix C– Minimum Inspection Requirements. The GPI condition of the assets will be documented by completing all required fields in the inspection database form(s). This database is built on Microsoft Access software. Copy of the input form(s) are attached in Appendix H.

2.2.4.2 Date of Completed Inspection

GPI records the date of completed inspections within the GIS / ERSI software.

2.2.4.3 Identification Sign

GPI public warning signs are to be nailed or screwed to the pole at approximately 6 ft high where one has not already been installed. Identification of MicroFIT and FIT customers (i.e. – generators) signs are installed and signs are replaced as necessary.

2.2.4.4 Wood Pole Integrity Tests

The IML Resistograph is a micro-drilling instrument that measures the density and mechanical resistance in timber. The purpose of the instrument is to identify material

density along the drilling by which the user can assess suitability for continued service based on remaining material. Results are recorded on an electronic recording device (Bluetooth technology is available) that measures density on a scale of 1:1. The size of voids, cracks, decay, rot, hollow pockets and shell thickness can be determined with reasonable accuracy. Drill guides allow the technology to be utilized at a 45-degree boring pattern to assess degradation below grade.
Considerations for Use: Assessment of pole quality is dependent on the location of the boring which is based on inspector experience. The process is not purely non-invasive as the drill hole may create an avenue for the entrance of decay if utilized below ground level; thus remedial treatments or plugging with treated dowels may be considered at such locations.

Record are saved in the Operations files on the network.

Failed poles are forward to engineering.

2.2.4.5 Ground Level Repair of Defects

It has been our experience that ground level repairs can be effectively corrected during the inspection process. The contractor may make any of the following repairs as required while on site:

- Replace guy guard
- Bore pole and report findings

2.2.4.6 Remedial Actions to Correct Defects

This program will identify items in the field which will require replacement, repair, or alteration. See “Responsibility” below to identify the person responsible for this remedial action.

2.2.4.7 Responsibility

Administration of Program	Engineering Supervisor
Correction of Defects – Without I/O	Operations Supervisor
Correction of Defects – With I/O	Engineering Supervisor

2.2.4.8 Job Number

Quote Order # 2436000
Job #2379
Work Order #8487
GL# - 51200000
Title – Maintenance of Poles Towers and Fixtures

2.3 *Off Road High Voltage Line Inspections & Maintenance*

2.3.1 Introduction – Off Road Primary

Within the boundaries of Grimsby a number of line sections are off road and inaccessible by truck for parts of the year or at any time. All of these line sections are overhead and are located on unopened road allowances and private land. Inspection & maintenance of these lines is necessary on a regular basis to safeguard the reliability of the electrical supply.

2.3.2 Location of Specific Line Sections:

Grimsby Power only has one off road line – from Kelson Road heading east to our eastern boundary with NEPI at Durham Road. This line parallels the CN Rail tracks and is broken into 12 different sections with approximately 200 poles in this line.

2.3.3 Frequency and Type of Program

All sections are to be patrolled by foot once per year.
All sections are to be inspected approximately once every ten years

2.3.4 Cycles

The inspection program was initiated in 2014 as follows in table D:

Table D

	Line Selections											
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2020	X	X	X	X	X	X						
2021							X	X	X	X	X	X
2022	X	X	X	X	X	X						
2023							X	X	X	X	X	X
2024	X	X	X	X	X	X						
2025							X	X	X	X	X	X

2.3.5 Description of Program

2.3.5.1 Patrol

A patrol consists of a visual inspection of each pole and components from the ground below the pole. Defects are noted and corrective actions put in place by Operations and/or Engineering. Field condition reports are used for reporting actions required. Information about the inspection is noted in the pole inspection database. The inspection form for "Annual Patrol – Off Road Primary" is attached as Appendix B.

2.3.5.1.1 Status of Program

Development

2.3.5.2 Inspection & Maintenance

An inspection consists of hands on inspection of the pole and components to identify defective equipment. The inspection is to be a close inspection using a track mounted aerial device. Minor repairs are to be made on the spot – such as reframing, changing insulators, replacing guy wires, etc. Defects and actions taken are noted on the Instruction order documents and input into the pole inspection database. A sample of an instruction order is attached as Appendix J.

2.3.5.2.1 Status of Program

Development

2.3.5.3 Responsibility

Administration of Program	Operations Supervisor
On the Spot Corrections	Line Crew
Correction of Defects – Without I/O	Operations Supervisor
Correction of Defects – With I/O	Engineering Supervisor

2.3.5.4 Job Number

Quote Order # 2436000
Job #2379
Work Order #8487
GL # - 51200000
Title – Maintenance of Poles Towers and Fixtures

Note – Regular job numbers are used to replace equipment

2.4 Thermography/Ultrasound Inspection Program

2.4.1 Introduction

Infrared thermography and Ultrasound inspection has proven to be an excellent tool to identify poor electrical connections and overloaded equipment on the distribution system. The purpose of the Thermography/Ultrasound Inspection Program is to identify any issues and remediate them as quickly as possible to ensure continuous operation of the distribution system. Grimsby Power's reliability is excellent and as such thermography/ultrasound is not used on a regular basis.

2.5 Switch Maintenance Program

2.5.1 Introduction

The purpose of the Switch Maintenance Program is to ensure the continued reliability of all switching devices in the electrical distribution system. The goal of the program will be to maintain all switches on a three year rotational basis. This program consists of physically cleaning, lubricating, and ensuring the switch operates smoothly. This program applies to three phase gang operated switches only (pole and pad-mounted).

There are approximately 61 overhead three phase gang operated switches and 14 pad-mounted switching cubicles installed on the system (2016 statistics).

2.5.2 Overhead Switches

2.5.2.1 Status of Program

Implementation

2.5.2.2 Frequency of Program

Approximately 20 three phase gang operated switches will be maintained in each year of a 3 year cycle.

2.5.2.3 Specifics of Program

In the absence of inspection and maintenance instructions from all manufacturers GPI will utilize GPI procedure 4.06 Load Interrupter Switch Maintenance to complete this maintenance program. (File located in M:\POLICIES\Section 4 – Operations)

2.5.2.4 Retention of Data from Inspections

The data collected from the inspections and maintenance activities will be filed in Engineering in their respective paper folders.
In the future an MS Access database or Asset Management Software Program will be utilized to store this data.

2.5.2.5 Responsibility

Administration of Program	Operations Supervisor
Schedule and Complete Work	Operations Supervisor

2.5.3 Job Number

Quote Order # 2436000
Job #2379
Work Order #8484
GL # - 51250000
Title – Maintenance of Overhead Conductor and Devices

2.5.4 Pad-Mounted Switches

2.5.4.1 Status of Program

Implementation

2.5.4.2 Frequency of Program

Approximately 3 pad mounted switching cubicles will be maintained in each year of a 3 year cycle.

2.5.4.3 Specifics of Program

GPI pad-mounted switches are all manufactured by S & C Electric. Inspection and maintenance instructions are as follows:

- S&C Manual PMH Pad-Mounted Gear – (Outdoor Distribution (14.4 kV and 25 kV) – Inspection Recommendations – Instruction Sheet 662-590.

See Appendix C for listing of S&C's manufacturer's information.

For each switch a "Pad-Mounted Switch Maintenance form will be completed. See Appendix B - Forms.

2.5.4.4 Retention of Data from Inspections

The data collected from the inspections and maintenance activities will be filed in Engineering in their respective paper folders.
In the future an MS Access database or Asset Management Software Program will be utilized to store this data.

2.5.4.5 Responsibility

Administration of Program	Operations Supervisor
Schedule and Complete Work	Operations Supervisor

2.5.4.6 Job Number

Quote Order # 2436000
Job #2379
Work Order #8488
GL # - 51500000
Title – Maintenance of Underground Conductors and Devices

2.6 Niagara West Transformer Station Inspection

2.6.1.1 Status of Program

Implementation

2.6.1.2 Frequency of Program

Starting April 2016, Grimsby Power Inc. will be completing weekly inspections at 3021 Grimsby Rd Grassie ON,

2.6.1.3 Specifics of Program

To ensure that the stations meets criteria
Main Indoor Building

- Security System Operational
- Thermostat Reading 22^{o}C (HELD)
- Basement Sump Pump Operational

Main Indoor Substation – Relay Targets

- Check 230kV Protection and 27.6kV SF6 Switchgear and record if applicable

Main Outdoor Substation

- Perimeter Fence Secure
- Outdoor Lighting Operational

See Appendix B for Weekly Station Inspection Report form.

2.6.1.4 Retention of Data from Inspections

The data collected from the inspections and maintenance activities will be filed in Engineering in their respective paper folders.
In the future an MS Access database or Asset Management Software Program will be utilized to store this data.

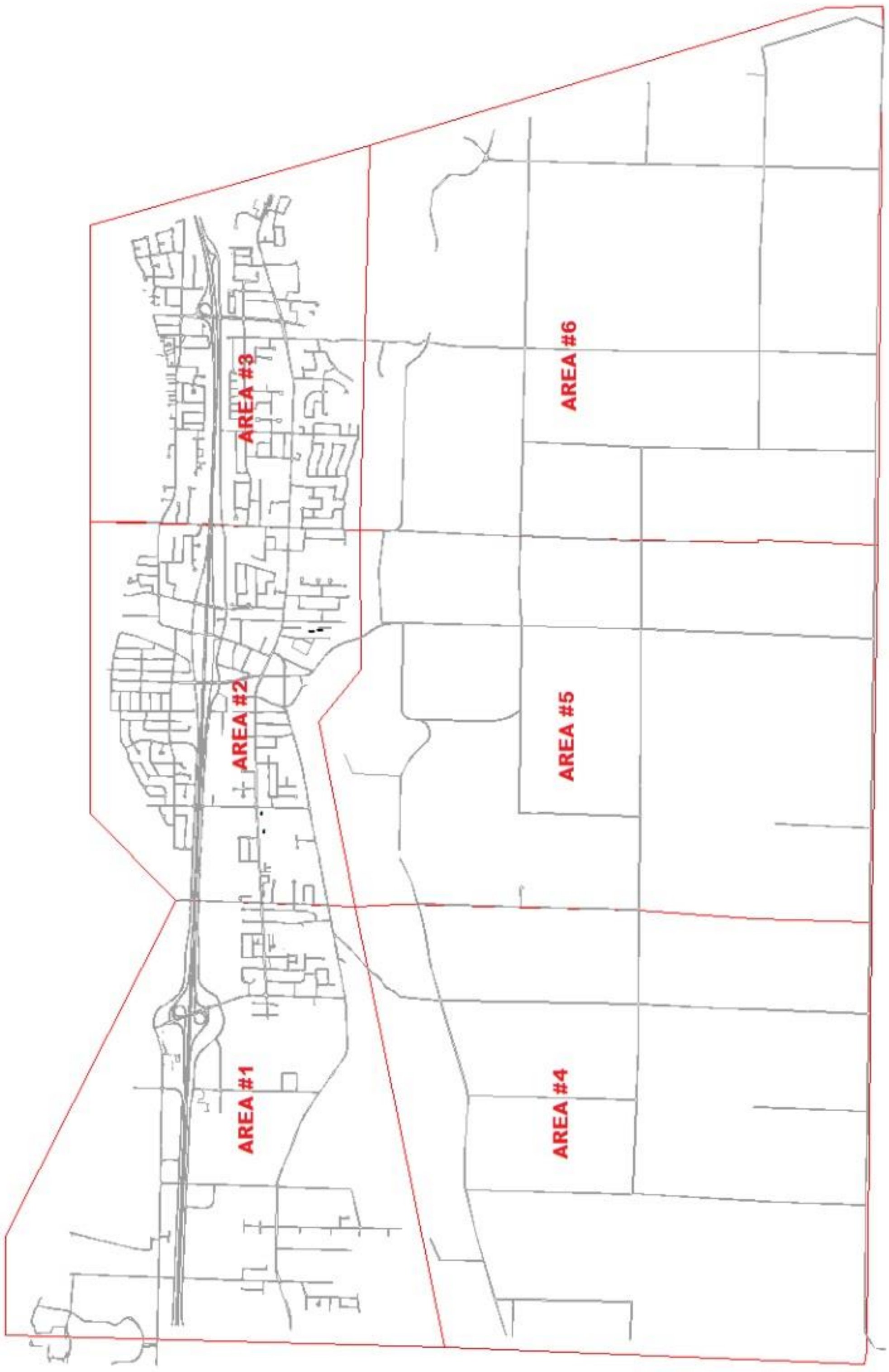
2.6.1.5 Responsibility

Administration of Program	Engineering Supervisor
Schedule and Complete Work	Engineering Supervisor

2.6.1.6 Job Number

Quote Order # 2346000
Job # 2379
Work Order # 8486
GL # - 51140000
Title – Maintenance of Underground Conductors and Devices Appendix A - Map - Geographic Areas for Distribution System Maintenance & Inspection

Appendix A – Area Map



Appendix B – Maintenance Forms

- Overhead Switch Maintenance
- Pad-Mounted Switch Maintenance
- Annual Patrol – Off Road Primary

2018 Asset
Inspection Testing R

Grimsby Power Incorporated Maintenance Inspection Program
Annual Patrol - Off Road Primary

Page ___ of ___

Off Road Line Section Number:	
Date Inspected:	
Inspectors Name:	
Instructions: Write pole number in column and check each category where there are no corrective actions required.	

Pole Number	Pole	Pole Hardware	Insulators	Pole Mounted Equipment	Incumberances	Guying	Signage	Corrective Actions to Take Place

Annual Patrol - Off Road Primary - Form

Pole Inspection
Form - SURVERY123.

Minimum Inspection Requirements

Appendix C – S&C Reference Material

Reference # 1 - S&C Manual PMH Pad-Mounted Gear (Outdoor Distribution (14.4 kV and 25 kV) – Inspection Recommendations – Instruction Sheet 662-590

Reference #2 – S&C Manual PMH Pad-Mounted Gear (Outdoor Distribution (14.4 kV and 25 kV) – Specifications - Specification Bulletin 662A-31

Reference # 3 - S&C Manual PMH Pad-Mounted Gear (Outdoor Distribution (14.4 kV and 25 kV) – Instructions for Installation - Instruction Sheet 662-505

Reference # 4 - S&C Manual PMH Pad-Mounted Gear (Outdoor Distribution (14.4 kV and 25 kV) – Instructions for Operation - Instruction Sheet 662-510

Reference # 5 - S&C Manual PMH Pad-Mounted Gear (Outdoor Distribution (14.4 kV and 25 kV) – Descriptive Bulletin 662-30

Reference # 6 - S&C Manual Metal-Enclosed Switchgear (Indoor and Outdoor Distribution (4.16 kV through 34.5 kV)) – Inspection Recommendations – Data Bulletin 620-95

Reference #7 – S&C Alduti-Rupter Switches – Outdoor Distribution (14.4kV through 69kV) – Descriptive Bulletin

Reference #8 – S&C Alduti-Rupter Switches – Outdoor Distribution (14.4kV through 46kV) – Specification Bulletin – 761-31

Reference #9 – S&C Alduti-Rupter Switches – Outdoor Distribution – Addendum to Instruction Sheets 761-5XX – 761-31 – Instruction Sheet 761-500A

Reference #10 – S&C Alduti-Rupter Switches – Outdoor Distribution – Three-Pole Double-Break Style Rotating Operating Mechanism – 35.5kV and 47kV – Instructions for Installation and Operation - Instruction Sheet 761-500

Reference #11 – S&C Alduti-Rupter Switches – Outdoor Distribution – Three-Pole Vertical-Break Integer Style Tiered-Outboard Mounting Configuration – 25/34.5kV and 34.5kV – Instructions for Installation - Instruction Sheet 761-530 – GPI Stock Code 681910

Reference #12 – S&C Alduti-Rupter Switches – Outdoor Distribution – Three-Pole Side-Break Integer Style Rotating Operating Mechanism – 25/34.5kV and 34.5kV – Instructions for Installation and Operation- Instruction Sheet 761-580 – GPI Stock Code 681905

Reference #13 – S&C Alduti-Rupter Switches – Outdoor Distribution – Three-Pole Vertical-Break Integer Style – 25/34.5kV and 34.5kV – Instructions for Installation - Instruction Sheet 761-535 – GPI Stock Code 681900

Appendix D – Cooper Power Systems Reference Material

Reference # 1 - S280-40-8 – Reclosers – Type RVE and WVE Maintenance Instructions dated September 1988

Reference # 2 - S280-40-2 – Reclosers Types VWE, VWVE27, VWVE38X, WE,WVE27, and WVE38X – Three Phase Electronically Controlled – Installation and Operation Instructions dated March 2003

Reference # 3 – Cooper Power Systems Reclosers – Types H, 4H, and V4H Maintenance Instructions – Service Information S280-10-9

Reference # 4 – Cooper Power Systems Reclosers – Type L Maintenance Instructions – Service Information S280-15-1

Reference # 5 – Cooper Power Systems Reclosers – Type H Single Phase Maintenance Instructions – Service Information S280-10-1

Reference # 6 – Cooper Power Systems Reclosers – Type D, DV Single Phase Maintenance Instructions – Service Information S280-20-2

Reference # 7 – Cooper Power Systems Reclosers – Type 4H Single Phase Oil Circuit Recloser Equipment Specifications

Reference # 8 – Cooper Power Systems Reclosers – Type L Single Phase Oil Circuit Recloser Equipment Specifications

Appendix E – Hubbell Power Systems Inc. Reference Material

Reference # 1 - Hubbell Power Systems Inc. – Chance – P818-2040 Rev. B – Type AR Unitized, Gang-Operated Overhead Switches for Distribution Switching

Reference # 2 - Hubbell Power Systems Inc. – Chance – P818-2040 - Installation, Operation, & Maintenance Manual for A.B. Chance Company Unitized Overhead Switchgear

Appendix F – Sample of GPI Inspection Report

APPENDIX F

Fleet Maintenance Policy

Purpose

This policy is to establish an organizational policy on vehicles to provide for consistent management of its fleet of vehicles and equipment, including its operation, maintenance, repair and replacement.

Policy

This policy applies to all employees of Grimsby Power Incorporated (GPI), including volunteers or employees of other agencies performing work for Grimsby Power that have access to a Grimsby Power vehicle.

Purpose & Scope:

1. The primary criteria best suited for the decision to replace Grimsby Power vehicles is as follows: (either/or)

Type	Age	Usage
Pickup/van/car	8 yrs	200,000 km
Medium Trucks with Mounted Equipment	12 yrs	220,000 km or 10,000 hrs.
Large Trucks with Mounted Equipment	15 yrs	10,000 hrs.
Trailers	As required	

2. Vehicles deteriorate differently depending on factors such as quality of manufacture and the severity of usage. The Fleet Management Policy is not intended to be a stringent set of rules that does not allow for the flexibility needed for asset management, but is a working target.

3. Different vehicles and equipment also wear out more rapidly than others depending on their usage type and frequency. To incorporate vehicles and equipment not referenced in the above criteria, there must be a second type of criteria used for this type of evaluation in addition to the above or on an individual basis. The following criteria chart is presented to be incorporated as secondary criteria:

Grimsby Power Secondary Criteria Replacement Guideline

Factor	Points
Age	One point for each year of chronological age, based on in-service data.
Kilometres	One point for each 16,000 km
Hours	One point for 640 hours
Type of Service	1, 3 or 5 points are assigned based on the type of service that vehicle receives. Light duty - Small Vehicles - Engineering or Administrator Use - Large vehicles - on road use only and lightly loaded **= 1**, Medium Duty - Small Vehicles - trucks used by trades which are commonly loaded - Large vehicles - mainly on road use and with average payload **= 3**, Heavy Duty - Small & Large Vehicles - Trades use and commonly loaded for road and off road use **= 5**.
Reliability	Points are assigned as 1, 3, or 5 depending on the frequency that a vehicle is in the shop for repair. A **5** would be assigned to a vehicle that is in the shop two or more times per month on average. A **3** would be assigned to a vehicle in the shop two to three times in a three month period, while a **1** be assigned to a vehicle in the shop an average of once every three months or less.
Maintenance and Repair Costs	1 to 5 points are assigned based on total life M&R costs (not including repair of accident damage). A 5 - Accumulated cost as compared to original purchase cost - ≥ 100%. A 4 - Accumulated cost as compared to original purchase cost - > 74% & < 100%. A 3 - Accumulated cost as compared to original purchase cost - > 47% & ≤ 74%. A 2 - Accumulated cost as compared to original purchase cost - > 20% & ≤ 47%. A 1 - Heavy Duty - Small & Large Vehicles - Trades use and commonly loaded for road and off road use
Condition	This category takes into consideration body condition, rust, interior condition, accident history, anticipated repairs, etc. A scale of 1 to 5 points is used. A5 - Poor - Truck has signs of rust perforation, seat covers are worn thru, and repairs have been postponed due to age and cost benefit. A 4 - Fair - Truck is showing signs of early deterioration with advanced signs of rust, & worn interior components. A 3 - Good - Truck has signs of regular use. A 2 - Very Good - Truck is no longer in new condition but is still in very good shape. A 1 - Excellent - Truck has no signs of deterioration and is close to like new condition

Point Ranges	Under 18 points	Condition I	Excellent
	18 to 22 points	Condition II	Good
	23 to 27 points	Condition III	Qualifies for replacement
	28 points and above	Condition IV	Needs immediate consideration

* Source: APWA Replacement Guide

4. In order to properly maximise the useful life of assets, an overall analysis must be undertaken for evaluation purposes. The following list of analysis criteria would be used to augment the primary and secondary evaluation criteria:

Extending Useful Life

- The availability to rotate vehicles between users to maximize the mileage driven in respect of the vehicle's age.
- The availability to transfer a vehicle to another department where usage is less severe or addressing a need for a spare vehicle or for parts.
- Analysis if the vehicle is in sufficiently good shape to extend its useful life past the primary or secondary criteria.

Decreasing Useful Life

- Other facets or technologies required of the vehicle that can no longer receive maintenance support or uses parts or updates that can no longer be supplied.
- Analysis if the vehicle expenses exceed depreciation which may warrant an early retirement date.
- Analysis if the vehicle no longer has a useful purpose or is in sufficiently poor shape to warrant an early retirement date.
- Sufficient mechanical or structural damage caused by an accident or abnormal wear.
- A mechanical analysis supporting the early retirement of a vehicle will be provided.

5. All requests for additions to a division's fleet or replacement of existing equipment should be made during the budgeting process. The Department Director should budget accordingly and document the justification in the Capital Budget Sheets. Purchases and disposals of surplus vehicles and equipment shall be traded in or sold at auction.

6. The actual acquisition and disposal of vehicles shall be undertaken according to Grimsby Power's governing Financial Policy.

7. As drivers and operators, Grimsby Power employees serve as ambassadors of the Town and as such, should exhibit exemplary driving habits. Drivers should always practice good, courteous, defensive driving habits at all times. All drivers shall comply with the Motor Vehicle Traffic laws at all times, observing posted speeds, traffic control signals and signs as well as all other laws pertaining to the operation of motor vehicles on public streets and highways. When two employees are in a vehicle that needs to back-up, one employee shall get out of the vehicle and assist the driver in backing up the vehicle.

8. The operators' manual for each vehicle is provided when the vehicle is issued. In each manual is the manufacturers recommended lubrication intervals. With each oil change interval, the vehicle will be greased and serviced. The daily, weekly and bi-weekly service intervals are the responsibility of the operator.

9. All fuel will be purchased and dispensed by the Town of Grimsby Roads' division. Fuel is available 24 hours per day and is accessed with a fuelling fob. Each vehicle operator will be issued a fuelling code for all vehicles. Failure to use gas fobs properly not only affects the reliability of the preventative maintenance programs but also destroys the integrity of vehicle mileage statistics. Some exception may be made for vehicles traveling outside of the municipality or with extenuating circumstances. In these cases, credit cards may be used for the charging of fuel expenses. All fuel receipts as a result of these charges shall be recorded with the unit number of the vehicle for which the fuel was purchased and an odometer reading for the vehicle at the time of fill up.

10. The repair of all equipment shall be completed by the appropriate department. Under no circumstances shall equipment be repaired, altered, or modified in any way by anyone except personnel authorized by the appropriate department. When making repairs, the department's budget and the practicality of the repair of a vehicle that may be close to the end of its useful life will be considered. Operationally non-critical items such as hour-meters and odometers are necessary and need to be kept in working order. This allows for better records to determine replacement intervals and to justify additional equipment. The vehicle should be in as good condition as practical when it is turned in for sale to bring as much revenue back to Grimsby Power as possible.

11. Procurement, transferring, repair and replacement of all two-way radio equipment, is the responsibility of the appropriate department. Vehicles are not authorized to carry any radio or communications equipment that is not specifically approved for use by that department. Under no circumstances shall radio and communication equipment be repaired, altered, or modified in any way by anyone except personnel authorized by the appropriate department.

12. All vehicle accidents will be reported to the Department Supervisor at the time of the accident regardless of the extent of the damage. Failure to report accidents may be cause for disciplinary procedure including termination of driving privileges.

13. No employee is authorized to use a Grimsby Power vehicle for personal use without the consent of that employee's Supervisor. Employees will reimburse Grimsby Power for personal use at the higher of the per kilometer rate that Grimsby Power pays to employees that use their personal vehicle on company business or actual costs as determined by the Finance Department.

14. Grimsby Power at all times wants to present an image of professionalism and pride in the manner in which it takes care of its assets. Therefore, all vehicle and equipment operators are expected to maintain their vehicles in a clean and orderly fashion. Exteriors will be washed on a regular basis and interiors will be kept free of trash and debris. Vehicle operators will report damaged decals, peeling paint and rusted exteriors to their Supervisor and make arrangements to have any deficiencies repaired as needed.

15. Vehicles may be equipped with GPS devices for the purposes of safety and operational efficiency. GPS tracking information shall not be released by Grimsby Power to third parties unless sanctioned by the vehicle driver or summoned by appropriate authorities. GPS tracking information shall not be used as sole evidence regarding any disciplinary proceedings.

16. The consumption of any alcoholic beverage or any controlled substance within or upon any Grimsby Power vehicle is expressly prohibited. Smoking is also not permitted inside Grimsby Power vehicles or equipment.

17. Accurate records of maintenance, repairs or alterations are to be kept at the vehicle department’s home site for the lifetime of the vehicle as per Commercial Vehicle Operators Registration (CVOR) requirements.

18. Grimsby Power vehicles shall display a magnetic logo decal on the left and right sides of the vehicle. It is the responsibility of all employees using Grimsby Power vehicles to ensure that the decaling displayed is in accordance with this policy and are kept visible to the best of their ability.

19. Equipment shall have displayed on each side of the vehicle or unit, a two digit designated unit number. The numeric numbers shall be 2 inches in height and where possible be black in colour and reflective.

20. Where it is felt by management or supervisory staff that additional information would benefit the public or aid in a certain operation, additional decaling may be added to a vehicle, piece of machinery or piece of equipment.

21. All pick-up trucks, vans and other passenger vehicles shall be purchased in the colour of bright white. All service trucks (cab and chassis) and trailers shall be purchased in the colour of bright white and where metal service bodies are being added, they shall be painted to match the colour of the cab and chassis. All service bodies which are constructed from aluminum shall be left in this state.

22. All equipment and machinery shall be purchased in the colour specific to the supplier (e.g. forklifts).

23. When choosing the specifications for a new vehicle purchase, energy efficiency shall be factored in (e.g. Hybrids).

24. Vehicle accessorizing standards are for guidance purposes. Due to the diversity of vehicle purchases, the Accessorizing Standards can be established but the appropriate Director should be allowed some flexibility in amending vehicle accessories that best suits a particular application. Standard equipment on vehicle purchases may include non-standard accessories offered by the dealer and their purchase should not be disqualified.

The following list provides a guideline of standard accessories for vehicle purchases:

Fleet	PW	PS	PB	Auto	Std Radio	Air	Floor Mats	Trailer Hitch	Light Bar	Strobe Lts	Push Bar	Running Boards	Tool Box	Std Tires & wheels	Racking	Box Cap/ Cover	Box liner	Winch	4x4
Van	X	X	X	X	X	X	X			X		**		X	X				X
Med-HD Full Size PU	X	X	X	X	X	X	X	X	X	X		**	X	X		X	X		X
Light Duty Full Size PU	X	X	X	X	X	X	X	X	X	X		**	X	X		X	X		X
Compact-Mid Size PU	X	X	X	X	X	X	X			X		**	X	X		X	X		X
SUV	X	X	X	X	X	X	X			X		**		X					X
Car	X	X	X	X	X	X	X			X		**		X					

X - indicates an approved accessory. Other accessories will be permitted if provided by the dealer as a standard option or package deal.

** - indicates an approved accessory provided the top of the rocker panel is higher than 15" (38cm).

The Director will be allowed some flexibility in amending vehicle accessories that best suits a particular application.

Policy and Procedure Check Sheet

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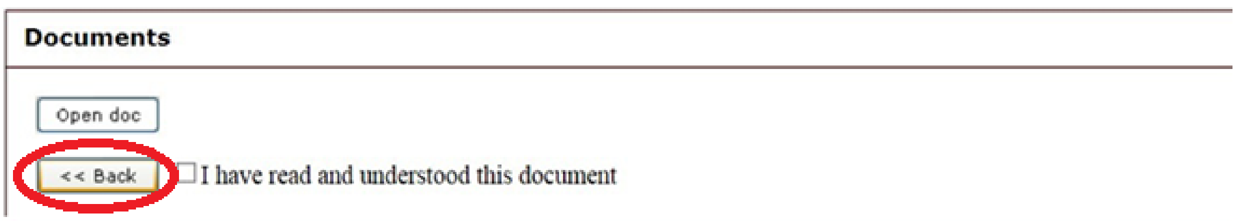
If you have read and would like to make changes to this document click on the <<Back button,



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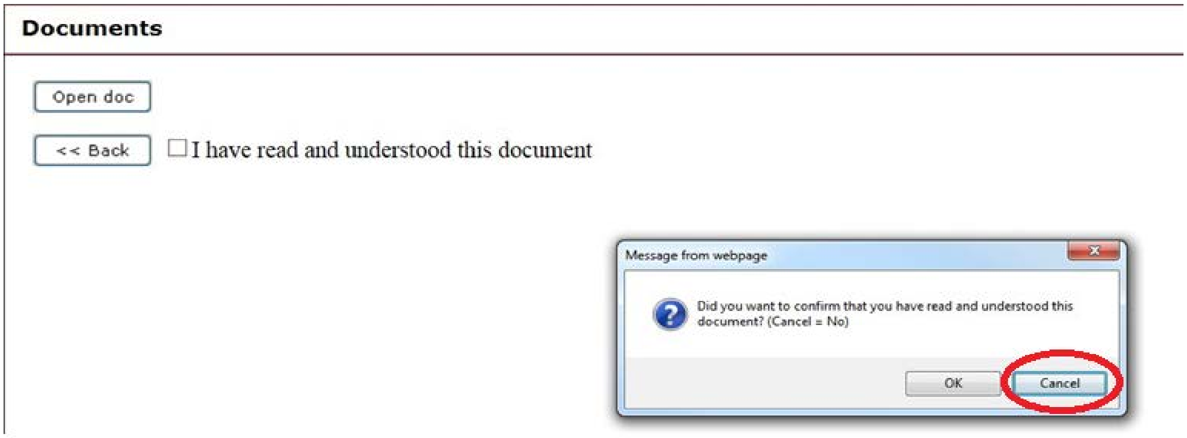


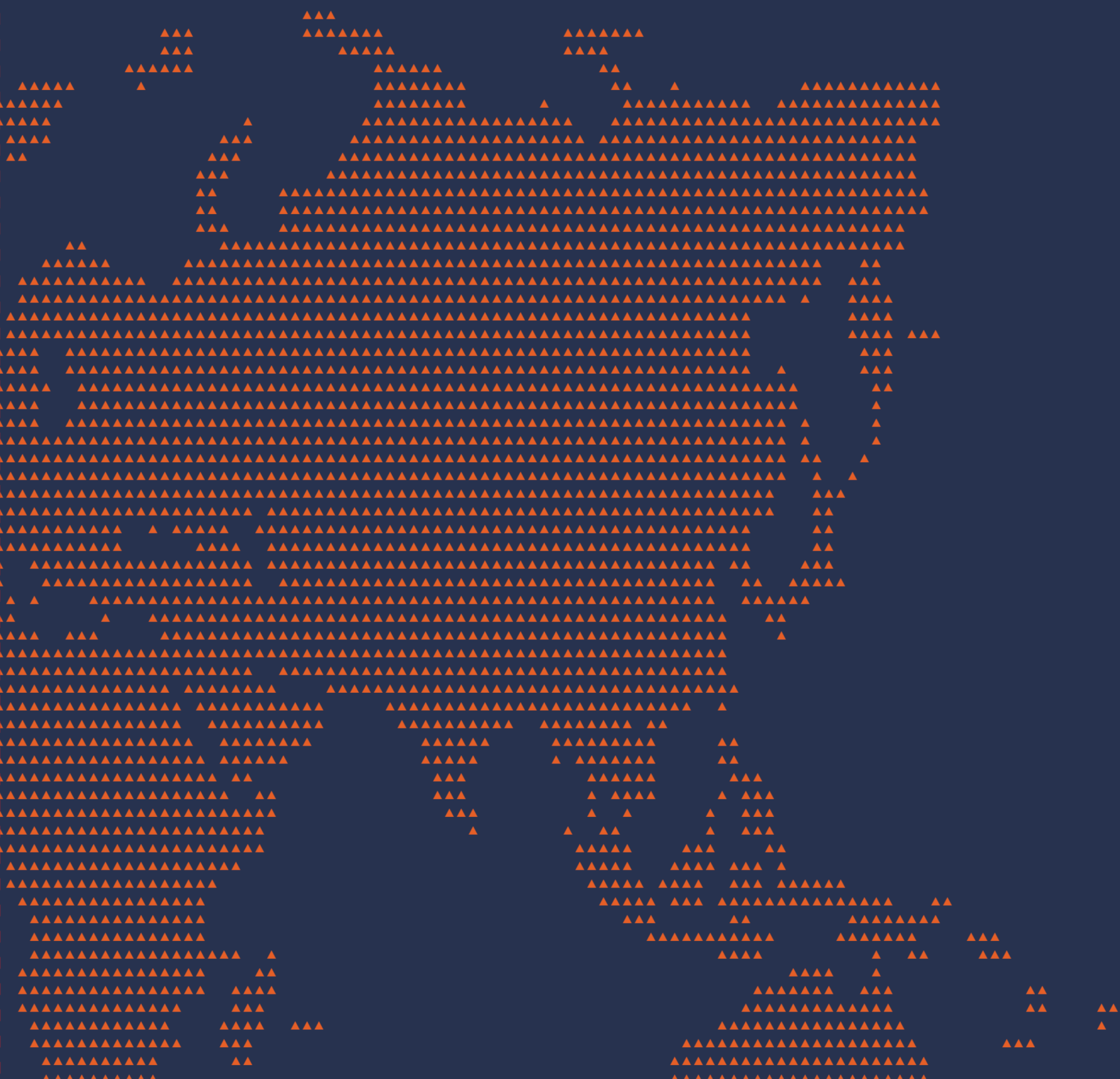
Input can be verbal, written, or via e-mail and needs to be addressed to the originator of the document.

APPENDIX G

Cable Testing Report

METSCO

MAKING IT POSSIBLE



Medium Voltage Cable Testing Services (P-19-209)

Final Report

Prepared For:

Grimsby Power

Prepared By:

METSCO Energy Solutions Inc.
2250 Matheson Blvd E Unit 215
Mississauga, Ontario

Contents

1. Introduction

METSCO Energy Solutions was commissioned to perform cable testing on three phase and single-phase systems on specified locations in Grimsby, Ontario that were serviced by Grimsby Hydro. A total of 30 cables were tested belonging to 26 Cable Circuits. Locations that were tested from the week of October 7th, 2019 to October 11th, 2019 include:

- Livingston Avenue (East and West of Sobeys)
- Tami Crescent
- Bayview Drive
- Peach Tree Lane
- Stonegate Drive
- Woodeden Road
- Highland Drive
- Sacks and Sandra Crescent

All testing was performed on 15kV primary medium voltage cable with cable insulation rated at 28 kV. Cables tested are classified as 2/0 aluminum compact with full copper neutral and PVC jacketed. Tested subjects were installed prior to the 1990s and some were in fact, injected recently in the 2000s.

1.1 Scope of Testing:

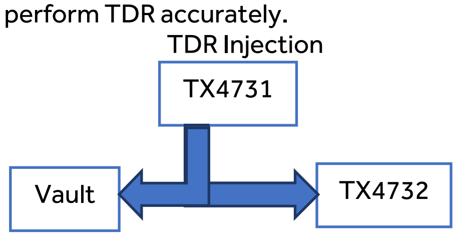
METSCO proposed to perform diagnostics testing based on the latest industry practice for XLPE/TR-XLPE cables including:

1- Time Domain reflectometry (TDR) to check the neutral corrosion and neutral continuity;
2- VLF Tan-Delta test to assess the overall condition of the XLPE cable;
3- Partial Discharge Testing to check the cable PD, splice, and terminations;

2. Tests Results

2.1. TDR

Time Domain Reflectometry (TDR) was one of the tests conducted by METSCO. TDR can be used for a few purposes, primarily to assess concentric neutral corrosion, continuity, cable length and the number of splices. The TDR tests typically do not provide a Pass/Fail criterion unless it is used for determining a cable fault location. It is possible to perform cable diagnostics using the waveform analysis by means of comparing phases or comparing with previous waveform recordings.

Test #	TDR Waveform #	Location, Cable Circuit and Phase Description	Observations	Cable Date and Injection Date
1	60	Figure 2: Peach Tree Lane - C032B to TX 5279 – Blue Phase	Cable length detected: 135m No corrosion detected on the concentric neutral.	Installed in 1987 and injected in 2010.
2	61 62 (Splice)	Figure 3,4: Peach Tree Lane- TX 5279 to TX 5201	Cable length detected: 352m Splice with minor corrosion detected at 189m on the TDR.	N/A
3	63	Figure 5: Peach Tree Lane- TX 5201 to TX 5200 – Blue Phase	Cable length detected: 80m No corrosion detected on the concentric neutral.	N/A
4	64	Figure 6: Stonegate Drive – C021R to TX 5290 -Red Phase	Cable length detected: 110m No corrosion detected on the concentric neutral.	Installed in 1988 and injected in 2010.
5	65 66	Figure 7,8: Stonegate Drive – TX 5290 to TX 5289 -Red Phase	Cable length detected: 117m No corrosion detected on the concentric neutral.	Installed in 1988 and injected in 2010.
6	67 68	Figure 9, 10: Stonegate Drive – TX 5289 to TX 5288 -Red Phase	Cable length detected: 80m Minor Corrosion detected on the concentric neutral.	Installed in 1988 and injected in 2010.
7	69 70	Figure 11, 12: Woodeden Road – C008B to TX 4730 - Blue Phase	Cable length detected: 154 m Minor corrosion. Possible splice at 140m close to the end of cable.	Installed in 1979 and injected in 2006.
8	71	Figure 13: Woodeden Road – Tx 4730 to TX 4731 - Blue Phase	Cable length detected: 80 m No corrosion detected on the concentric neutral.	N/A
9	72, 73, 74 (Combined Reflection from two sources) 75 (TX4731 to TX4732 including vault) 76 (TX4731 to TX4732 only)	Figure 14, 15, 16, 17, 18: Woodeden Road – Tx 4731 to TX 4732 to Vault - Blue Phase	Cable length detected: 105 m No corrosion detected on the concentric neutral. The length to the vault was 10m-20m. Due to the overlap of the signals from two direction, it was not possible to perform TDR accurately.  	N/A
10	77 (Corrosion) 78 (Splice)	Figure 19,20: Highland Drive – C124R to TX 4907 – Red Phase	Cable length detected: 106 m Minor Corrosion detected on the concentric neutral. Possible Splice located at 97m as identified on the TDR.	Installed in 1978 and injected in 2008.
11	79	Figure 21: Highland Drive – TX 4907 to TX	Cable length detected: 205 m No corrosion detected on the concentric	Installed in 1978 and injected in 2008.

		4799 – Red Phase	neutral.	
12	80	Figure 22: 44 Livingston Avenue-West of Sobeys – TX 6223 to TX 5422 – Red Phase	Cable length detected: 218 m No corrosion detected on the concentric neutral.	Installed in 1997 and not injected.
	81	Figure 23: 44 Livingston Avenue-West of Sobeys TX 6223 to TX 5422 – White Phase	Cable length detected: 220 m No corrosion detected on the concentric neutral.	Installed in 1997 and not injected.
	82	Figure 24: 44 Livingston Avenue-West of Sobeys TX 6223 to TX 5422 – Blue Phase	Cable length detected: 216 m No corrosion detected on the concentric neutral.	Installed in 1997 and not injected.
15	83	Figure 25: Sacks and Sandra Crescent - C471W to TX 5244- White Phase	Cable length detected: 294 m Minor corrosion detected on the concentric neutral.	Installed in 1983 and not injected.
16	84	Figure 26: Sacks and Sandra Crescent - TX 5244 to TX 5243 - White Phase	Cable length detected: 60 m No corrosion detected on the concentric neutral.	Installed in 1983 and not injected.
15	85	Figure 27: Sacks and Sandra Crescent - TX 5243 to TX 5245- White Phase	Cable length detected: 95 m No corrosion detected on the concentric neutral.	Installed in 1983 and not injected.
16	86	Figure 28: Bayview Drive - C009B to TX 5346 - Blue Phase	Cable length detected: 95 m No corrosion detected on the concentric neutral.	Installed in 1984 and not injected.
17	87	Figure 29: Bayview Drive - TX 5346 to TX 5345 - Blue Phase	Cable length detected: 95 m No corrosion detected on the concentric neutral.	Installed in 1984 and not injected.
18	88	Figure 30: Bayview Drive - C010B to TX 5344 - Blue Phase	Cable length detected: 351 m No corrosion detected on the concentric neutral	Installed in 1984 and injected in 2008.
19	89	Figure 31: Bayview Drive - TX 5344 to TX 5345 - Blue Phase	Cable length detected: 57 m No corrosion detected on the concentric neutral.	Installed in 1984 and not injected.
20	90 91 (Splice)	Figure 32,33: Bayview Drive – C009W to TX5343 – White Phase	Cable length detected: 278 m Corrosion detected on the concentric neutral, possible old splice at 220m.	N/A
21	92	Figure 34: Bayview Drive- TX5343 to TX 5342 - White Phase	Cable length detected: 55 m No corrosion detected on the concentric neutral.	Date installed not known and injected in 2008.

22	93 94 (Splice)	Figure 35,36: Tami Crescent - C068R to TX 5358 -Red Phase	Cable length detected: 88 m Minor corrosion detected. One splice was located at 84m verified by visual inspection.	Installed in 1985 and injected in 2009.
23	98	Figure 37: Tami Crescent - TX 5360 to TX 5359 - Red Phase	Cable length detected: 38.5 m Minor corrosion detected on the concentric neutral.	Date installed not known and injected in 2009.
24	95	Figure 38: Tami Crescent- TX 5358 to TX 5359 - Red Phase	Cable length detected: 86 m No corrosion detected on the concentric neutral.	N/A
25	96 97	Figure 39,40: Tami Crescent - TX 5360 to C068R - Red Phase	Cable length detected:105 m Possible splice or localized corrosion close to the end of the cable (97 m)	Date installed not known and injected in 2009.
26	99	Figure 41: 44 Livingston Avenue- East of Sobey's - TX 5422 to TX 6464 - Red Phase	Cable length detected: 164 m No corrosion detected on the concentric neutral. Proposed as a good candidate for injection.	N/A
	100	Figure 42: 44 Livingston Avenue- East of Sobey's - TX 5422 to TX 6464 - White Phase	Cable length detected: 174 m No corrosion detected on the concentric neutral. Proposed as a good candidate for injection.	N/A
	59	Figure 44: 44 Livingston Avenue- East of Sobey's - TX 5422 to TX 6464 - Blue Phase	Cable length detected: 168 m No corrosion detected on the concentric neutral. Proposed as a good candidate for injection.	N/A

Table 1: TDR test results

2.2. VLF Tan-Delta

A VLF Tan-Delta test (based on IEEE 400.2-2013) was performed to determine the overall insulation condition of the cables. Immediate, short-term (1-2 years), mid-term (3-5 year), or long-term (5-10 year) corrective actions were identified based on the test results. The test was performed at 3 increasing voltage intervals ($0.5U_0$=8kV, U_0=16 kV, 1.5 U_0=23 kV) on each cable to assess the integrity of the insulation and the presence water trees. The 3 voltages were chosen conservatively based on concerns of the cable insulation while testing at the rated voltages and adding additional stresses. The tests for each phase per cable segment were performed every 3 minutes with each voltage interval allotted 1 minute. As per IEEE 400.2-2013, VLF Tan-Delta, differential tangent delta, tangent delta stability, leakage current, and loss current harmonics measurements may be used to monitor aging and deterioration of cable systems. However, the most commonly used methods in the field are tangent delta (VLF-TD), differential tangent delta (VLF-DTD), and tangent delta stability (VLF-TDTS) measurements. The differential tangent delta (VLF-DTD) was calculated as:

$$VLF\ DTD\ =\ TD\ (1.5\ U_0)\ -\ TD\ (0.5U_0)$$ *Eq. 1: The differential tangent delta*

The variation of tangent delta with time at a specific voltage (TDTS), typically for a period of several minutes, can also be measured. These measurements can be used to calculate the mean and standard deviation of the readings. The tangent delta stability, in this document, is defined as the measurement of the standard deviation of tangent delta with time at a specific voltage (U_0):

$$STDEV\ =\ \sqrt{\frac{\sum(TD-\overline{TD})^2}{n-1}}$$ *Eq. 2: Standard deviation of tangent delta*

Condition assessment	VLF-TD Time Stability (VLF-TDTS) measured by standard deviation at U_0, $[10^{-3}]$		Differential VLF-TD (VLF-DTD) (difference in mean VLF-TD) between 0.5 U_0 and 1.5 U_0 $[10^{-3}]$		Mean VLF-TD at U_0 $[10^{-3}]$
No Action Required	<0.1	and	<5	and	<4
Further Study Advised	0.1 to 0.5	or	5 to 80	or	4 to 50
Action Required	>0.5	or	>80	or	>50

Figure 1: VLF Condition Assessment as per IEEE 400.2-2013

The measured values of VLF-TD, VLF-DTD, and temporal stability (VLF-TDTS) are primarily influenced by the condition (age, contamination, and moisture ingress) of the various cable system components (accessories, cable insulation, and metallic shield). These measurements provide a global assessment of the dielectric loss. Therefore, a single region of high loss such as degraded accessory, area of high moisture or different cable insulation can cause the measured value to rise even though the bulk loss of most of the system is lower. The measured value is less than the actual loss of the high loss region. A comparison of results between different phases of the same segment or sequential sections helped identify if this is the case. Selected results of the Tan-Delta tests are provided in the following table with a full list of test results provided in Appendix B. Note that due to testing equipment limitations, the maximum range of insulation resistance that could be measured was 20 GΩ and any number higher would produce a result of >20GΩ. In these cases, the maximum of 20 GΩ was used as the worst case to produce the Tan-Delta.

Cable Circuit	Location Description	Phase	Mean TD at U_0 [$x10^{-3}$]	TDT Stability [$x10^{-3}$]	VLF DTD $1.5U_0$-$0.5U_0$ [10^{-3}]	IEEE 400.2 Condition Assessment	Injected? Yes/No
TX5201to TX5200	Peach Tree Lane	B	6.2	0	0.1	Further Study Advised	No
C021R to TX5290	Stonegate Drive	R	4.7	0	3.1	Further Study Advised	Yes
TX5290 to TX5289	Stonegate Drive	R	4.4	0	0.7	Further Study Advised	Yes
C008B to TX 4730	Woodeden Road	B	6.6	0	6.7	Further Study Advised	Yes
TX 4731 to 4732 to Vault	Woodeden Road	B	5.2	0	0	Further Study Advised	No
TX5243 to TX5245	Sacks and Sandra Cres	R	5.4	0	0	Further Study Advised	No
TX5346 to TX5345	Bayview Dr	B	5.5	0	0.4	Further Study Advised	No
C010B to TX5344	Bayview Dr	B	5.4	0	3.1	Further Study Advised	Yes
TX5344 to TX5345	Bayview Dr	B	9.1	0	0.5	Further Study Advised	No
TX5343 to TX5342	Bayview Dr	W	10.0	0	0	Further Study Advised	Yes
C068R to TX5358	Tami Crescent	R	7.1	0	8.2	Further Study Advised	Yes
TX5360 to TX5359	Tami Crescent	R	13.2	0	0	Further Study Advised	Yes
TX5358 to TX5359	Tami Crescent	R	5.8	0	0	Further Study Advised	Yes
TX5360 to C068R	Tami Crescent	R	4.7	0	8.5	Further Study Advised	No

Table 2: Selected VLF Tan Delta test results and assessment

The Tan-Delta Stability of all the cables are OK. The mean Tan-Delta at U_0 for good cables should be less than $4X10^{-3}$. Most of the cables have a higher number, however the numbers are close to the limit.

Some of the cables in Bayview Drive have a double digit mean Tan-Delta at U0. There is no neutral corrosion on these cables. It is recommended to consider cable injection on those cables that have not been injected yet.

VLF DTD 1.5U0-0.5U0 are reasonably low for all the cables.

2.3. Partial Discharge

Partial discharge (PD) tests were performed at the termination of the cable to observe any abnormal PD pattern or high PD values. Irregularities or high PD values related to the insulation may indicate cavities within the insulation or at interfaces between the insulation and the semiconducting shields. These types of values can also indicate interfacial cavities in cable and accessory interfaces, high-resistance insulation shield, broken neutral or the presence of electrical trees.

Rank	PD (pC) at rated voltage		PDEV (kV)	Condition assessment
1	0-10	and	Above min limit	Acceptable
2	10-50	Or	Less than min limit but higher than rated voltage U_0	Minor PD
3	50-500	Or	Less than min limit but higher than rated voltage U_0	Some concern, yearly monitor/test
4	More than 500	Or	Less than rated voltage U_0	Major concern, repair termination, splice, or replace

Table 3: Typical condition assessment based on PD limits

Background noise is taken as a first measurement in PD testing and compared to partial discharge results at U_o and $1.5U_o$ voltages. If results show minor differences, it signifies a significant portion of the measurements originate from the background and reflect minor or no PD.

The tables below provide the results of the PD test conducted for select cable segments and the typical condition assessment criteria used by METSCO SMEs as well as in the industry standards. A full list of PD values and test results can be found in Appendix C. It should be noted that PD measurements could not be obtained on October 11th, 2019. This was due to equipment issues that arose with the data acquisition module and battery interface. Thus, results from Tami Court and 44 Livingston Avenue – East of Sobeys could not be provided.

Cable Circuit	Location Description	Phase	Max PD at U_0=8 kV [pC]	Max PD at $1.5U_0$=23 kV [pC]	Assessment
TX 5289 to TX 5288	Stonegate Drive	R	2.7 to 5.5 pC	2.7 to 31.6 pC	Minor PD- monitor every 3-5 years
C008B to TX 4730	Woodeden Road	B	8.4 to 9.2 pC	8.5 to 20 pC	Minor PD- monitor every 3-5 years
TX 4730 to TX 4731	Woodeden Road	B	27.1 pC	25.5 to 42 pC	Minor PD- monitor every 3-5 years
TX 4907 To TX 4799	Highland Drive	R	16 to 311 pC	16 to 364 pC	PD Concern – PD from near end elbow- sign of corrosion on the elbow – plan to replace the elbow within 1 year
TX 6223 to TX 5422	44 Livingston Avenue -West of Sobey's	R	8.4 to 9.2 pC	8.5 - 20 pC	Minor PD- monitor every 3-5 years
TX 6223 to TX 5422	44 Livingston Avenue -West of Sobey's	W	8.2 to 96.6 pC	7.6 to 105.7 pC	Minor PD- monitor every 3-5 years
TX 6223 to TX 5422	44 Livingston Avenue -West of Sobey's	B	8.8 to 19.9 pC	9.1 to 109.6 pC	Minor PD- monitor every 3-5 years
C471W to TX 5244	Sacks and Sandra Crescent	W	11.1 – 25 pC	11.4 to 130.9 pC	Minor PD- monitor every 3-5 years
TX 5244 to TX 5243	Sacks and Sandra Crescent	W	8.5 to 51.9 pC	8.4 to 122.5 pC	Minor PD- monitor every 3-5 years
TX 5243 to TX 5245	Sacks and Sandra Crescent	W	8.6 to 47.4 pC	9 to 100.6 pC	Minor PD- monitor every 3-5 years
C009B to TX 5346	Bayview Dr	B	12.5 pC	12-77.12 pC	Minor PD- monitor every 3-5 years
TX 5346 to TX 5345	Bayview Dr	B	14.9 to 112.1 pC	13.4 to 52 pC	Minor PD- monitor every 3-5 years

Table 4: Selected Partial Discharge test results

3. Conclusions & Recommendations

METSCO conducted a comprehensive series of tests (VLF Tan-Delta, Partial Discharge, and Time Domain Reflectometry) on selected cable segments for Grimsby Power. Specified segments of concern are summarized in the sub sections. A full assessment of cable segments can be found in Appendix D.

1- At Highland Drive on the cable circuit TX 4907 to 4799, it is recommended to replace the elbow due to high PD possibly due to visual corrosion from the near end elbow. This was discussed in field with foreman and supervisors.

2- Some of the cables in Bayview Drive have a double-digit Tan-Delta at U0, However the numbers are within the IEEE 400.2. There is no neutral corrosion on these cables detected by TDR. It is recommended to consider cable injection on those cables that have not been injected yet.

3- Minor PD was detected on 14 cables as outlined in Section 2.3.

4- Tan-Delta testing resulted in further study being required on 14 cables as outlined in Section 2.2. 7 cables required no action. It is recommended to test these cables every 3 to 5 years given its proximity to the IEEE criteria in further study being required.

5- Using TDR testing, corrosion was detected on 6 cables where there were 5 cases of minor corrosion and 1 case of corrosion. For the cables marked as "Minor Neutral Corrosion", it is recommended to perform TDR testing every 3-5 years to monitor the trend of neutral corrosion.

6- At Bayview Drive on the cable circuit C009W to TX5343, corrosion was detected on the concentric neutral and an older splice was detected. It is recommended to re-test this cable within 1-2 years and investigate if the cable has a splice at 220m from TX 5343. If more corrosion is detected, it is recommended to look into a replacement in 3-5 years.

7- 13 of the 30 cables tested were injected. 12 of the 13 injected cables had minor sign of aging in one of the three categories (VLF Tan Delta, Partial Discharge & Time Domain Reflectometry). 5 of the 13 reported issues in two of three categories, and no cable had issues in all three categories. Injections were reported as early as 2008 and as late as 2010.

Appendix A: TDR Waveforms

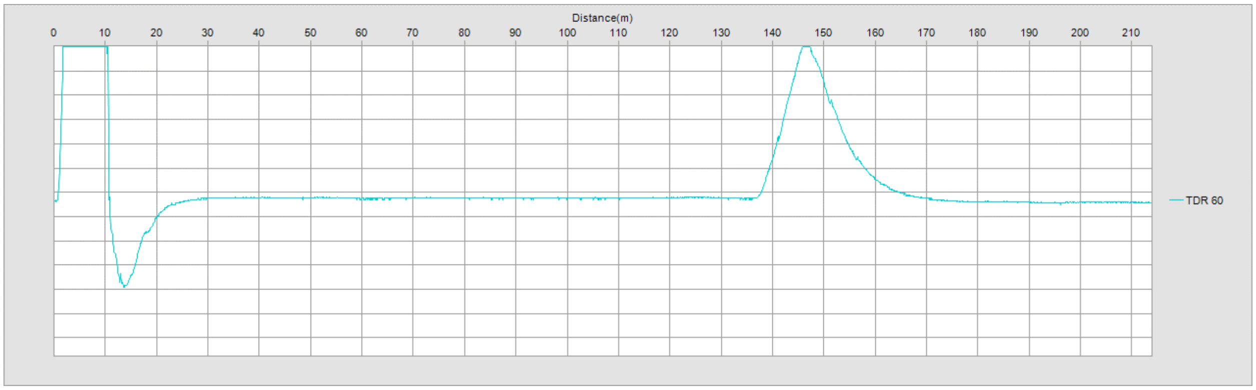


Figure 2: Peach Tree Lane - C032B to TX 5279 – Blue Phase

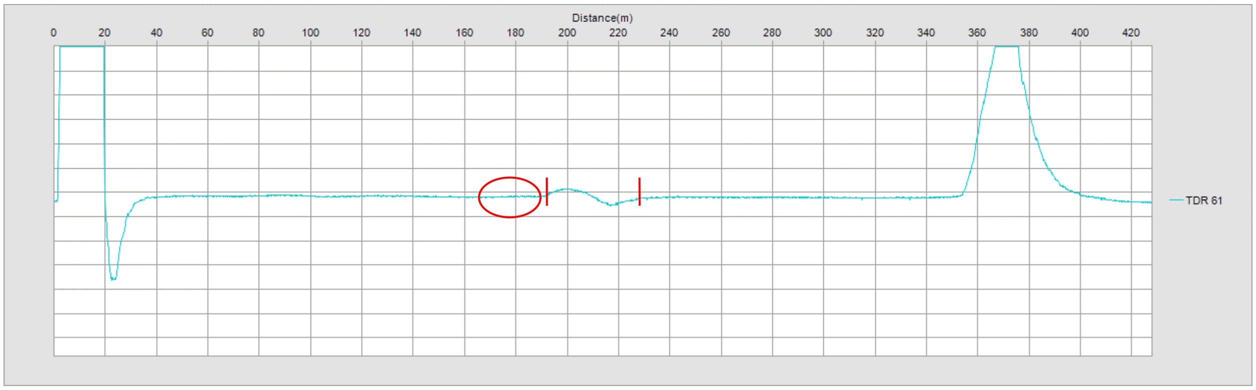


Figure 3: Peach Tree Lane - TX 5279 to TX 5201 – Blue Phase (Splice at 192m)

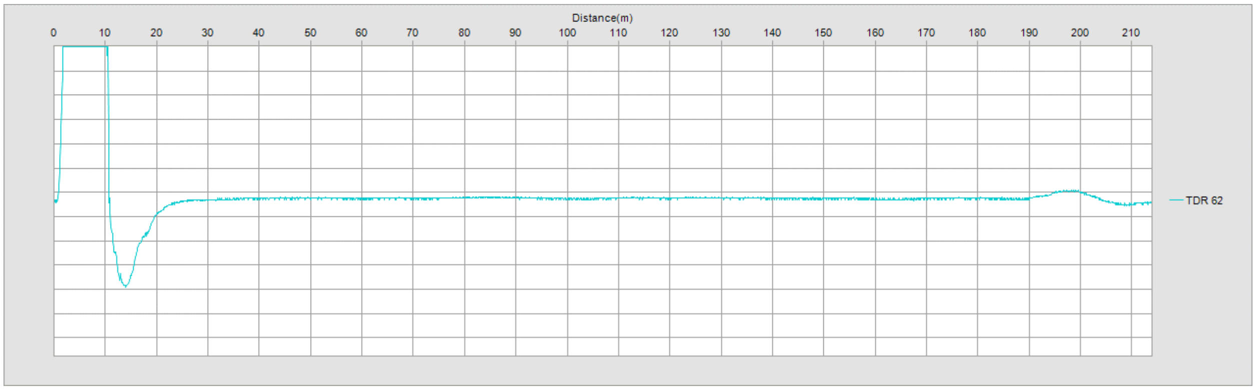


Figure 4: Peach Tree Lane - TX 5279 to TX 5201 – Blue Phase

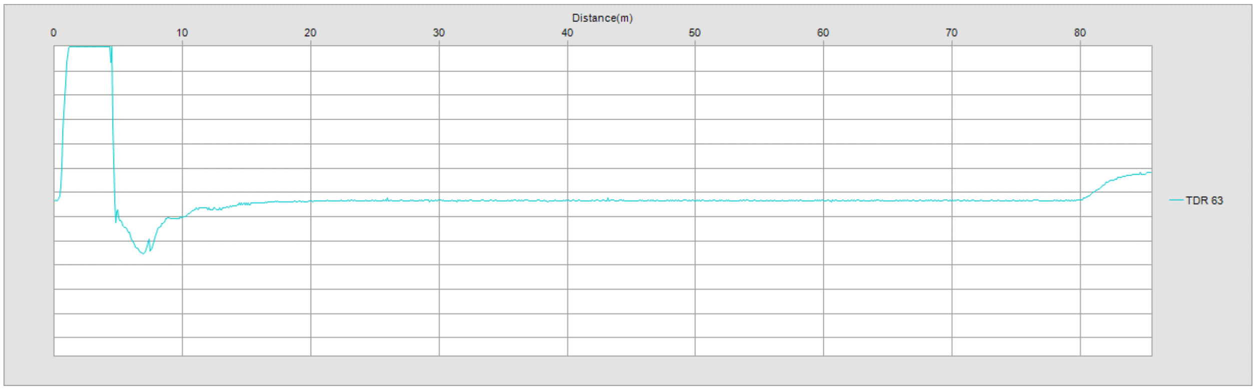


Figure 5: Peach Tree Lane - TX 5201 to TX 5289 – Blue Phase

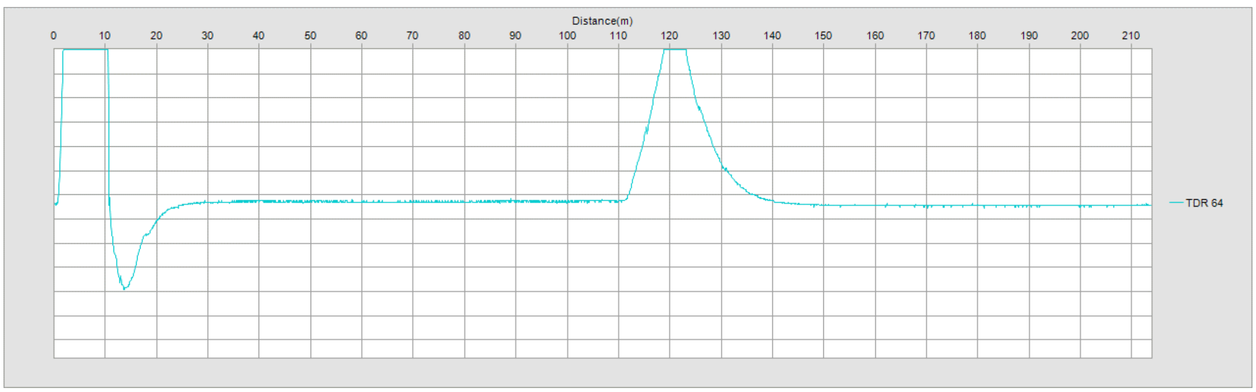


Figure 6: Stonegate Drive – C021R to TX 5290 – Red Phase

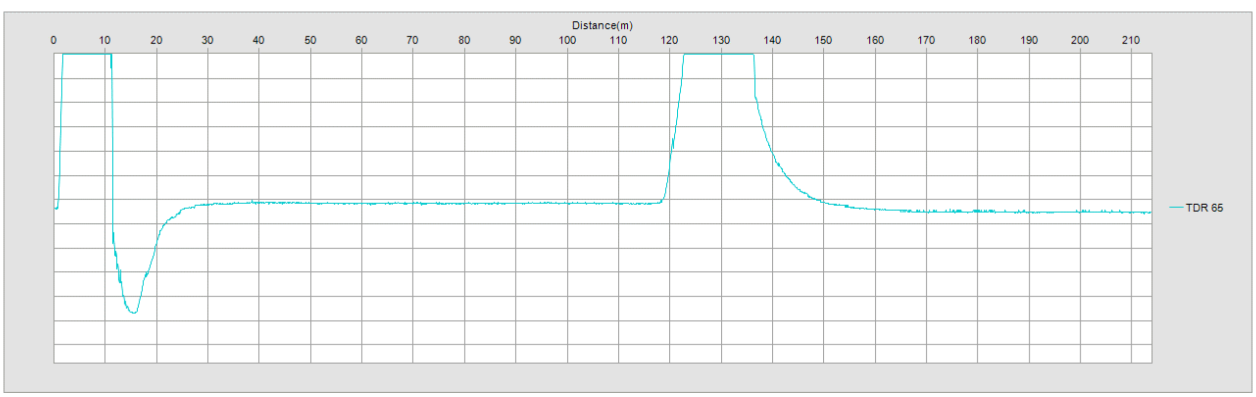


Figure 7: Stonegate Drive –TX 5290 to TX 5289 – Red Phase

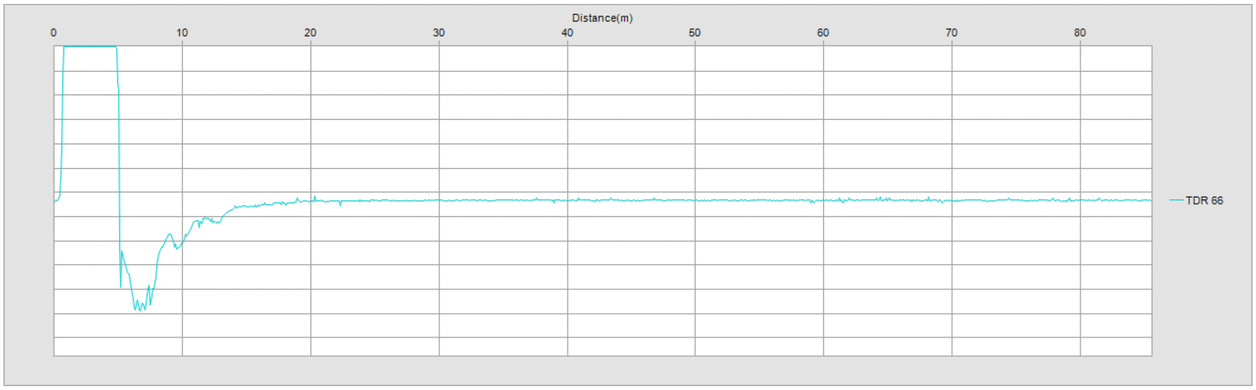


Figure 8: Stonegate Drive – TX5290 to TX 5289 – Red Phase

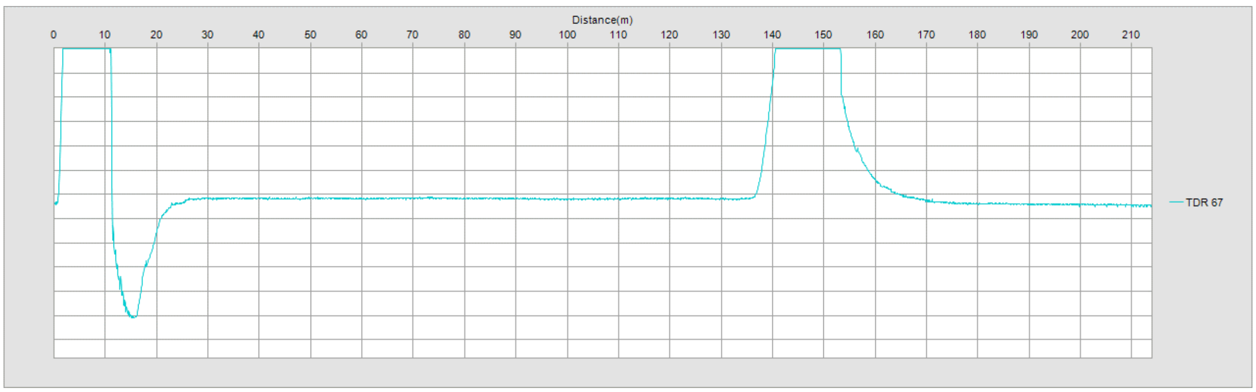


Figure 9: Stonegate Drive –TX 5289 to TX5288 – Red Phase

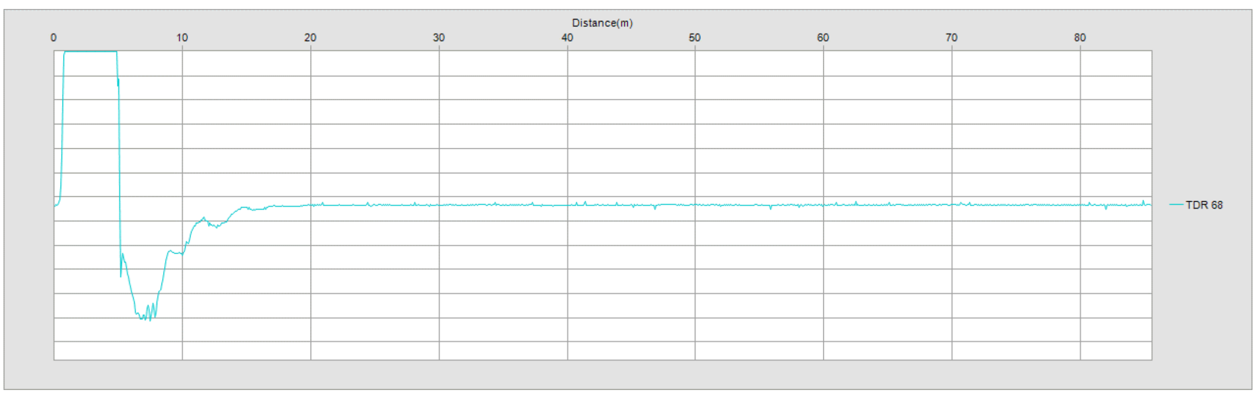


Figure 10: Stonegate Drive –TX 5289 to TX5288 – Red Phase

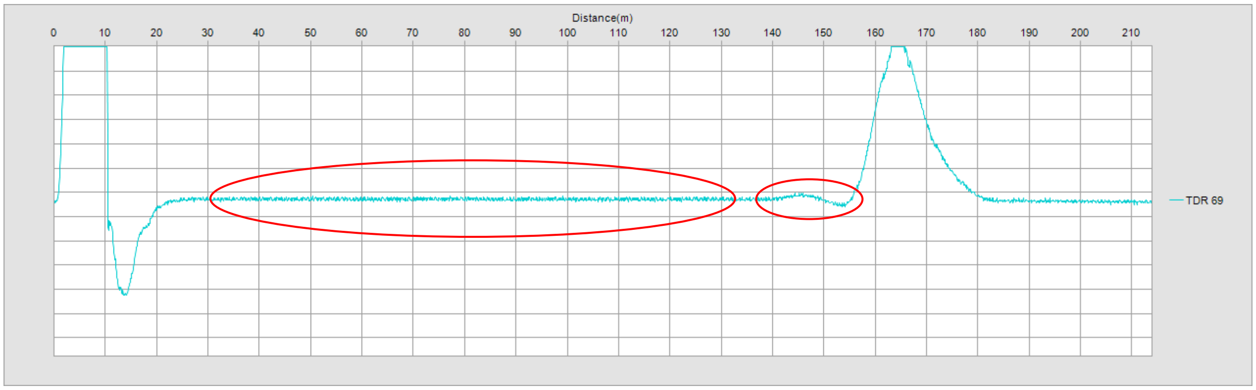


Figure 11:Woodeden Road – C008B to TX 4730 – Blue Phase

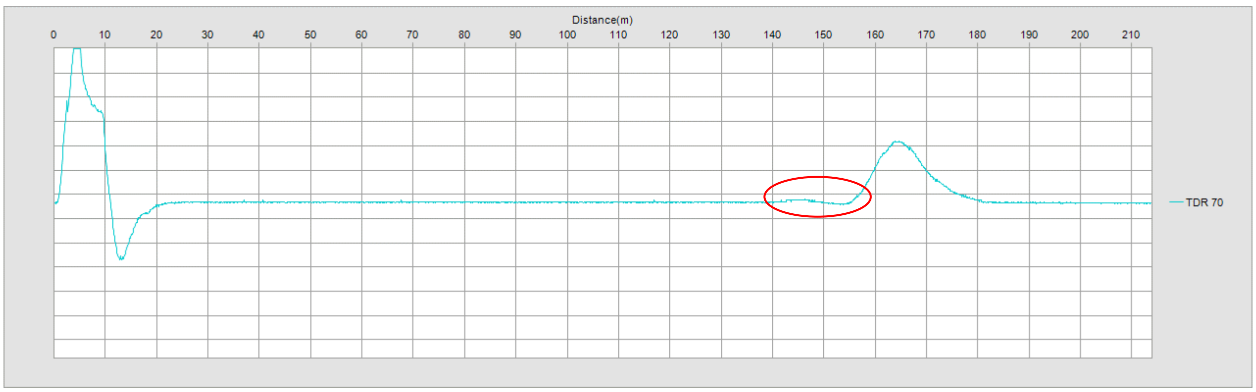


Figure 12: Woodeden Road – C008B to TX 4730 – Blue Phase

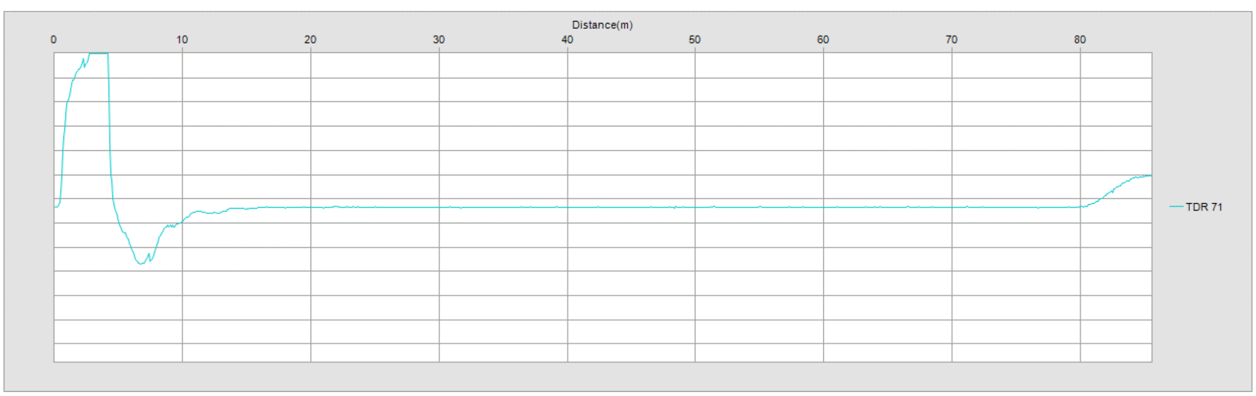


Figure 13: Woodeden Road – Tx 4730 to TX 4731 – Blue Phase

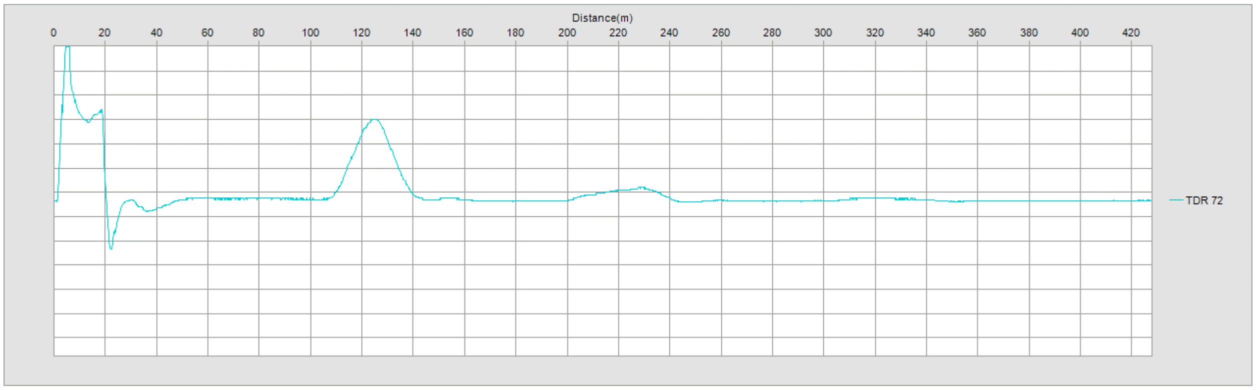


Figure 14:Woodeden Road – Tx 4732 to TX 4731 to Vault – Blue Phase

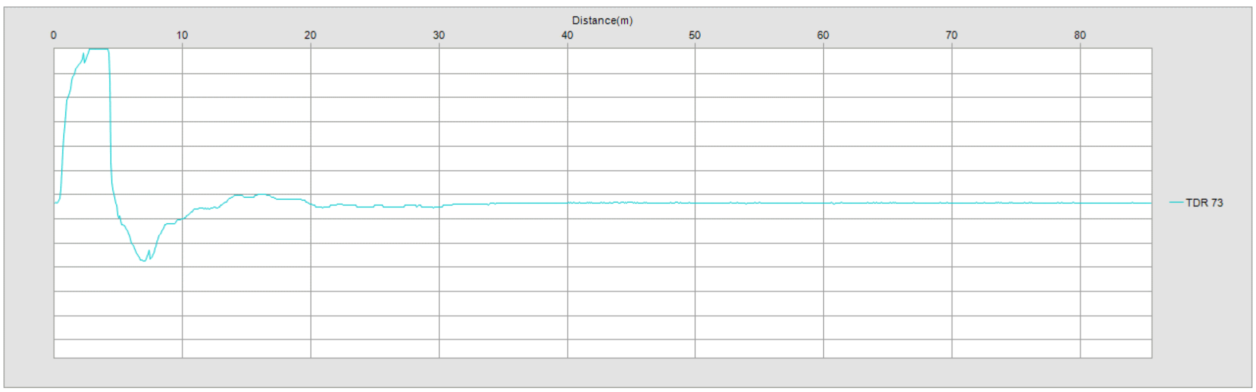


Figure 15: Woodeden Road – Tx 4732 to TX 4731 to Vault – Blue Phase

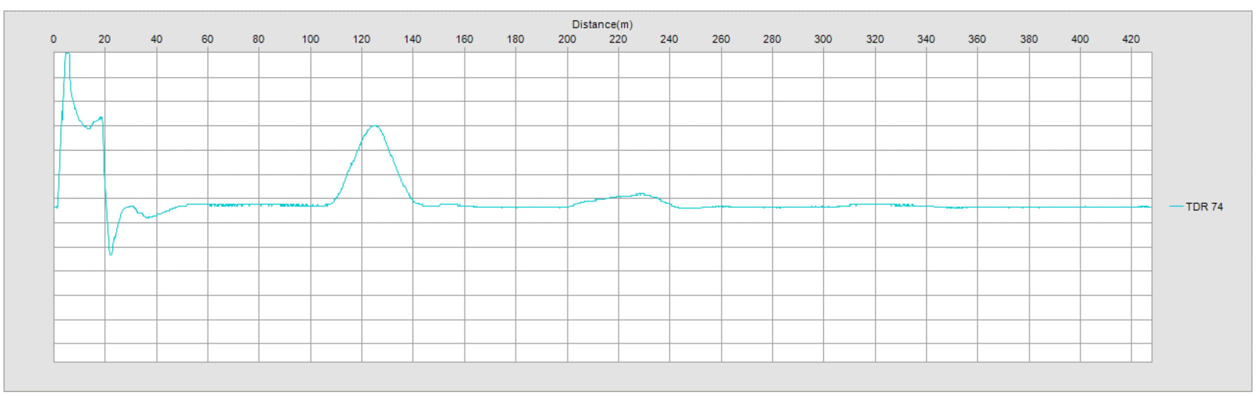


Figure 16: Woodeden Road – Tx 4732 to TX 4731 to Vault – Blue Phase

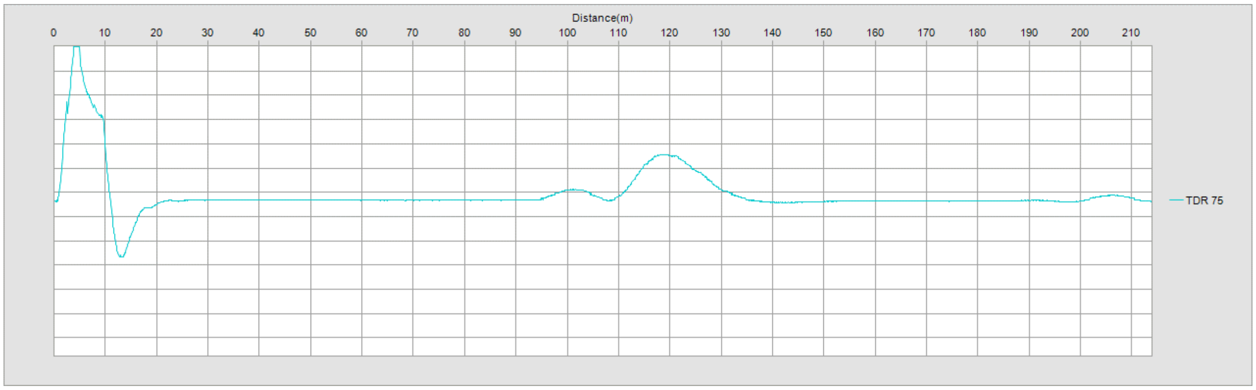


Figure 17: Woodeden Road – Tx 4732 to TX 4731 to Vault – Blue Phase

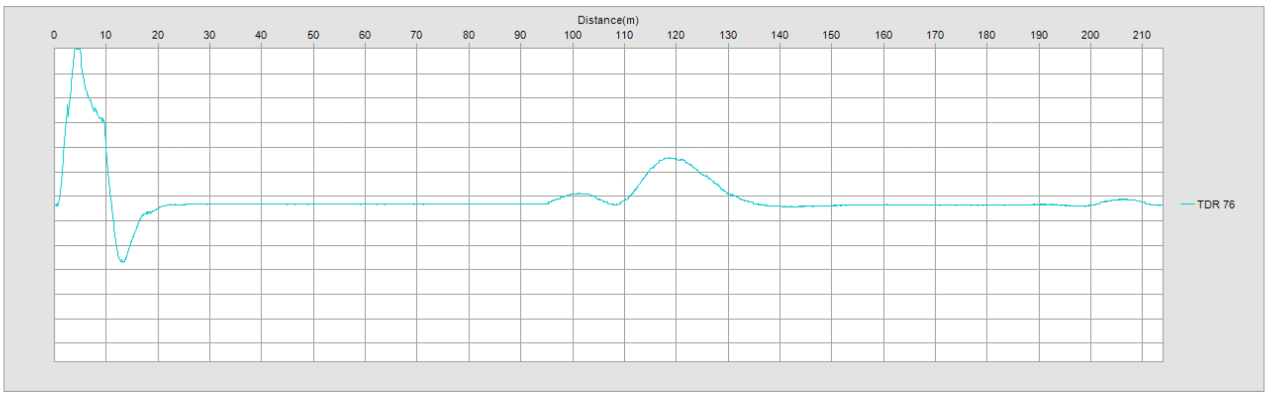


Figure 18: Woodeden Road – TX4731 to TX4732 only – Blue Phase

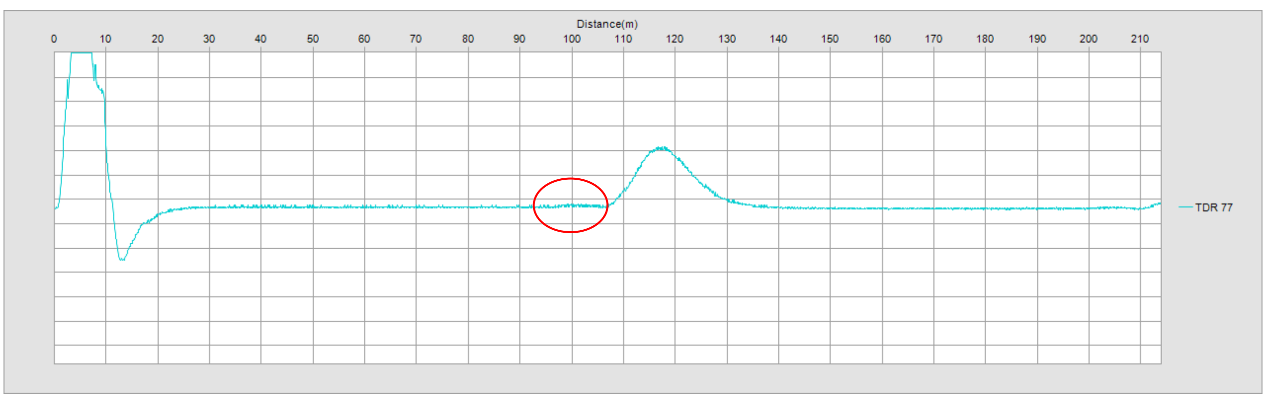


Figure 19: Highland Drive – C124R to TX 4907 – Red Phase

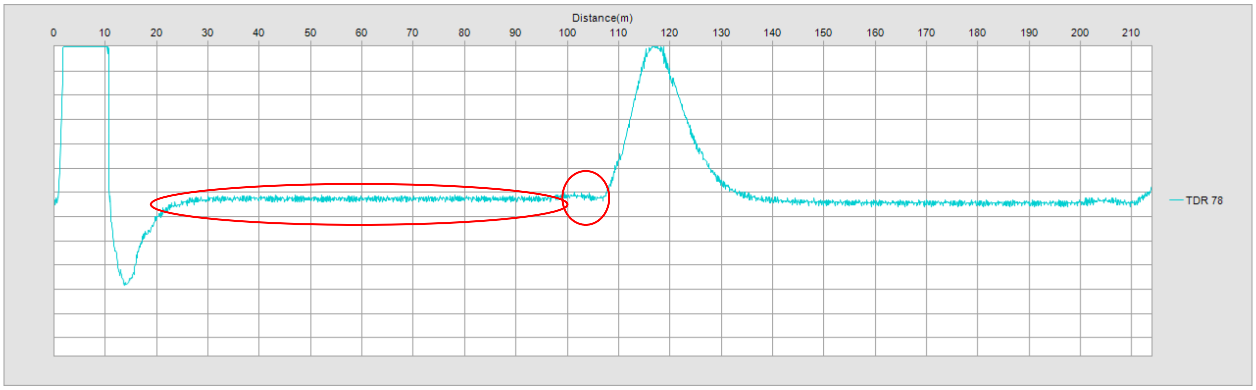


Figure 20: Highland Drive – C124R to TX 4907 –Red Phase

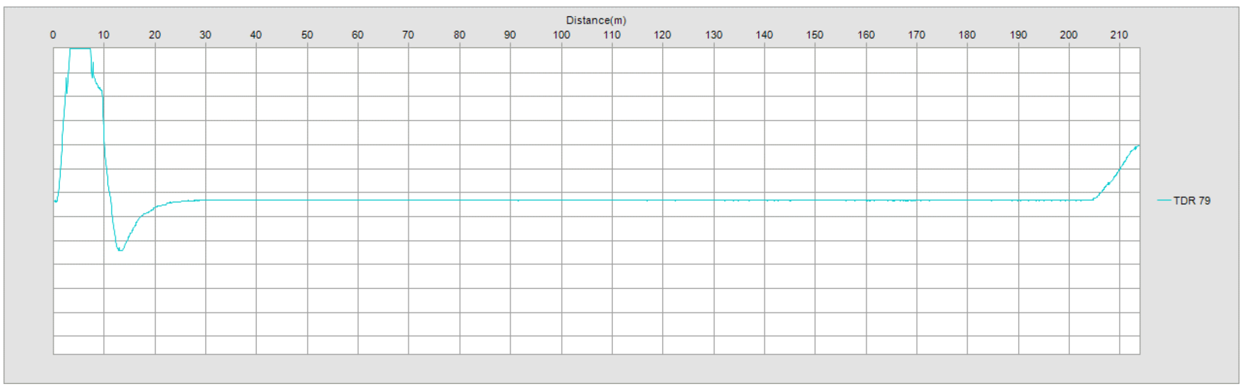


Figure 21: Highland Drive – TX 4907 to TX 4799 –Red Phase

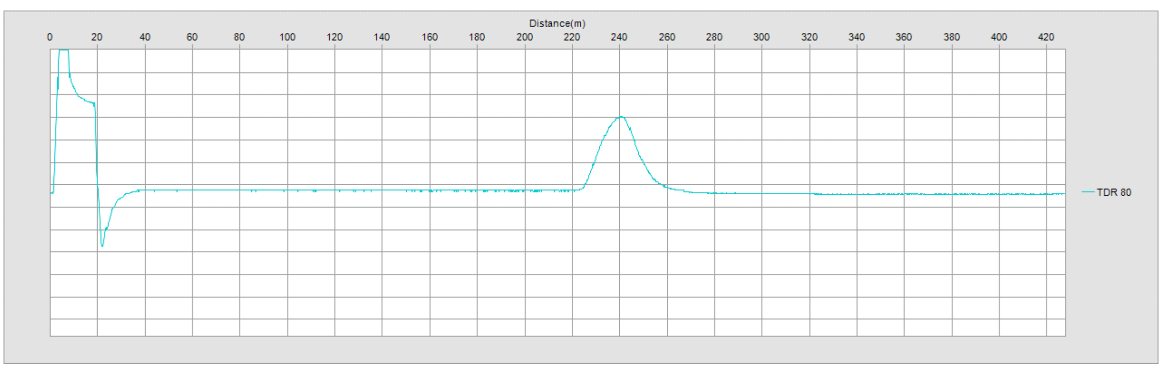


Figure 22: 44 Livingston Avenue-West of Sobeys – TX 6223 to TX 5422 –Red Phase

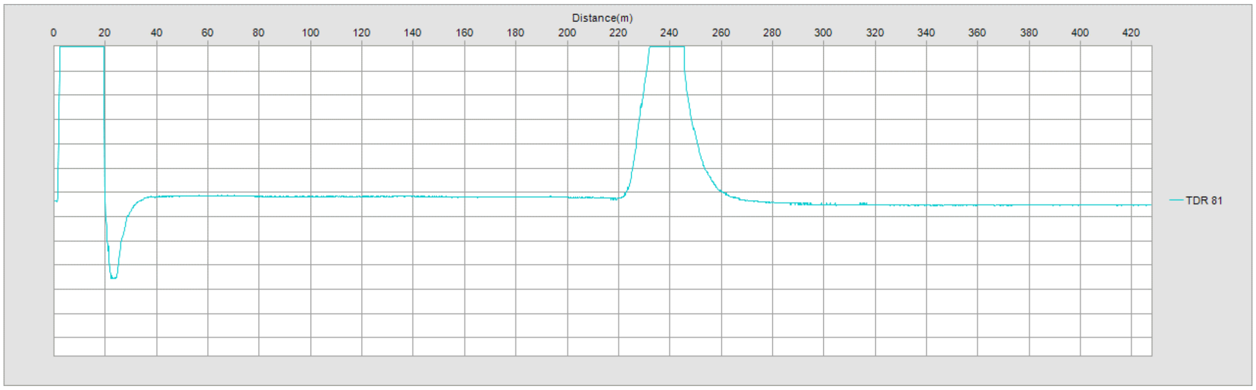


Figure 23: 44 Livingston Avenue-West of Sobeys TX 6223 to TX 5422 –White Phase

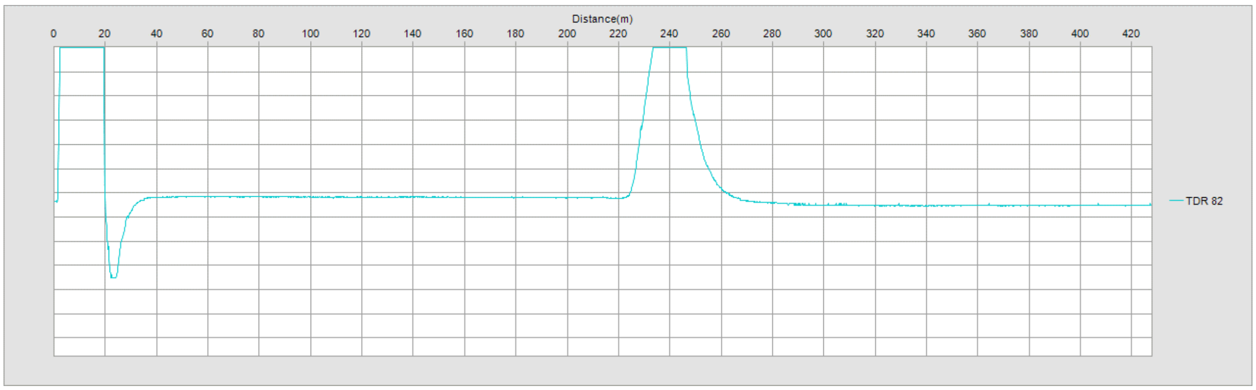


Figure 24 : 44 Livingston Avenue-West of Sobeys TX 6223 to TX 5422 –Blue Phase

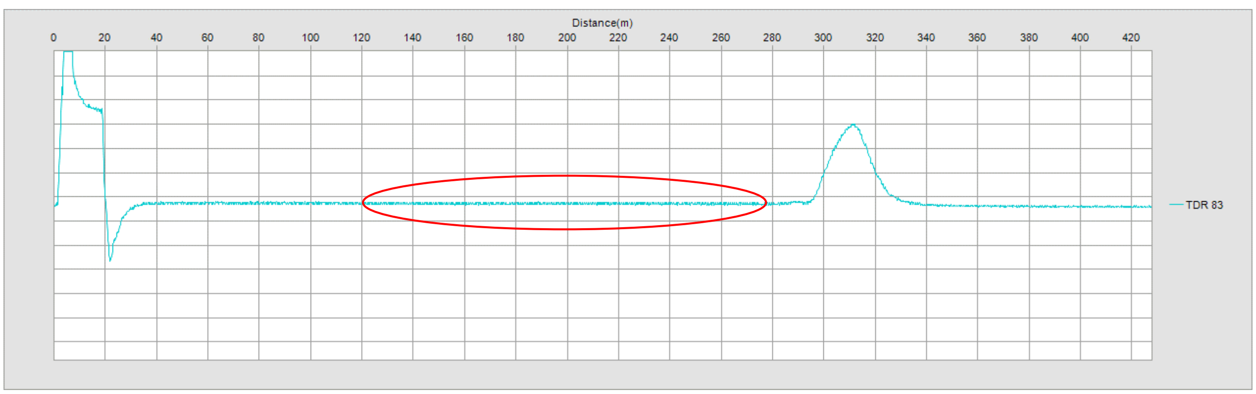


Figure 25: Sacks and Sandra Crescent - C471W to TX 5244 – White Phase

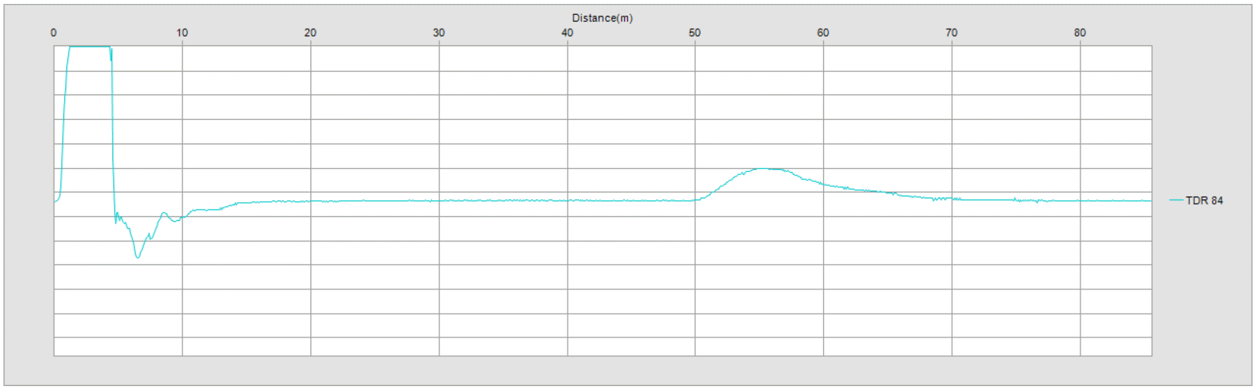


Figure 26: Sacks and Sandra Crescent - TX 5244 to TX 5243 – White Phase

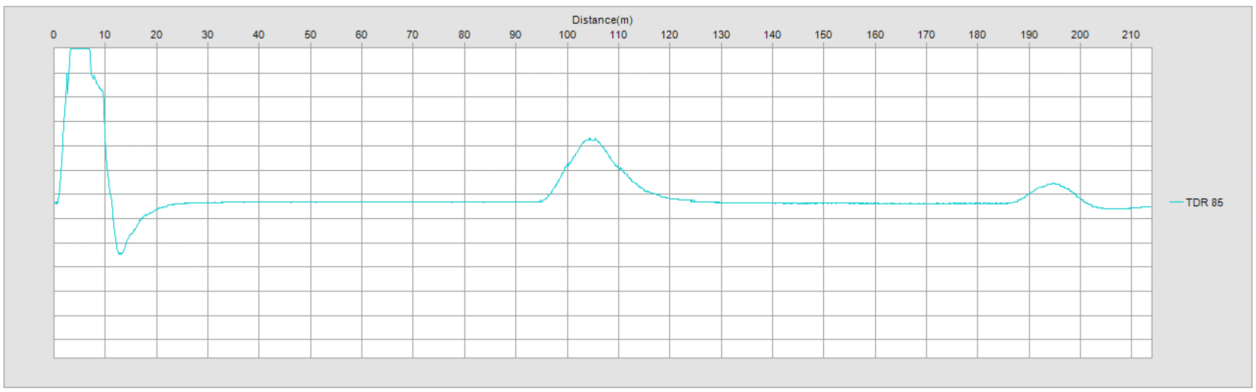


Figure 27: Sacks and Sandra Crescent - TX 5243 to TX 5245 – White Phase

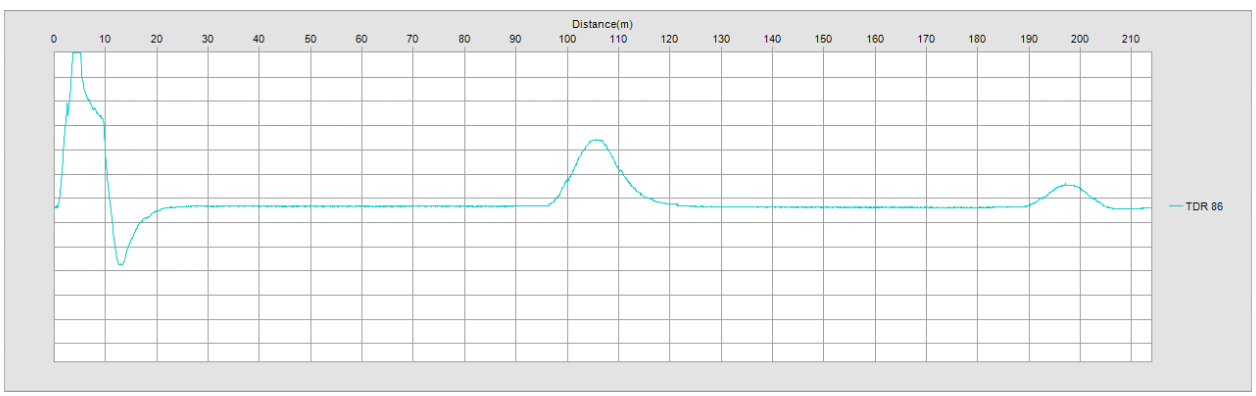


Figure 28: Bayview Drive - C009B to TX 5346 – Blue Phase

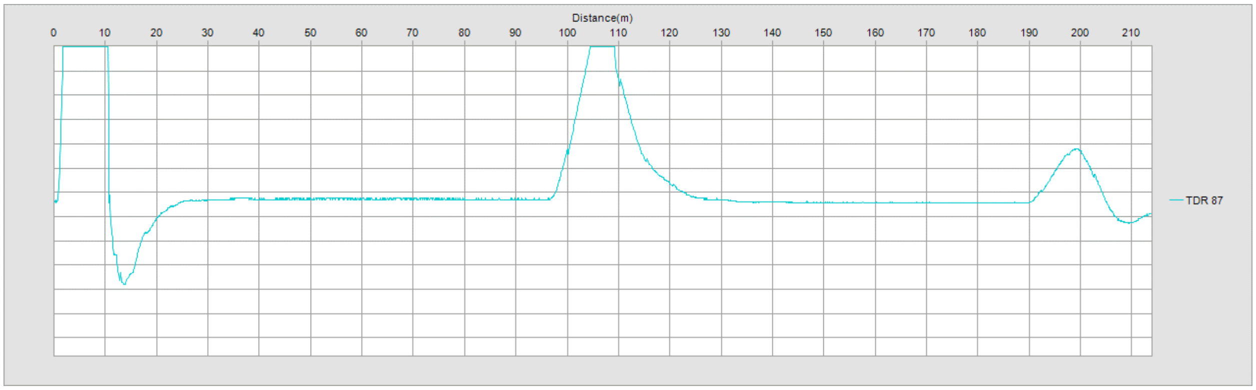


Figure 29: Bayview Drive - TX 5346 to TX 5345 – Blue Phase

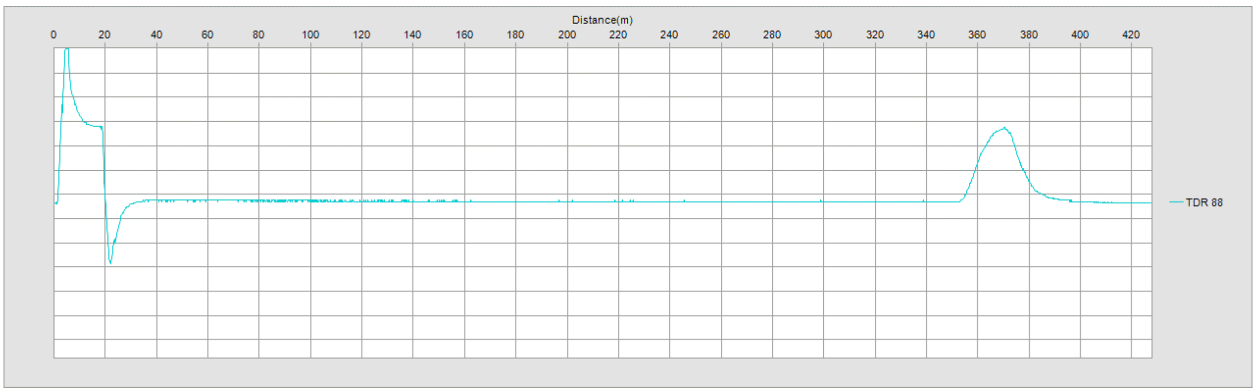


Figure 30: Bayview Drive - C010B to TX 5344 – Blue Phase

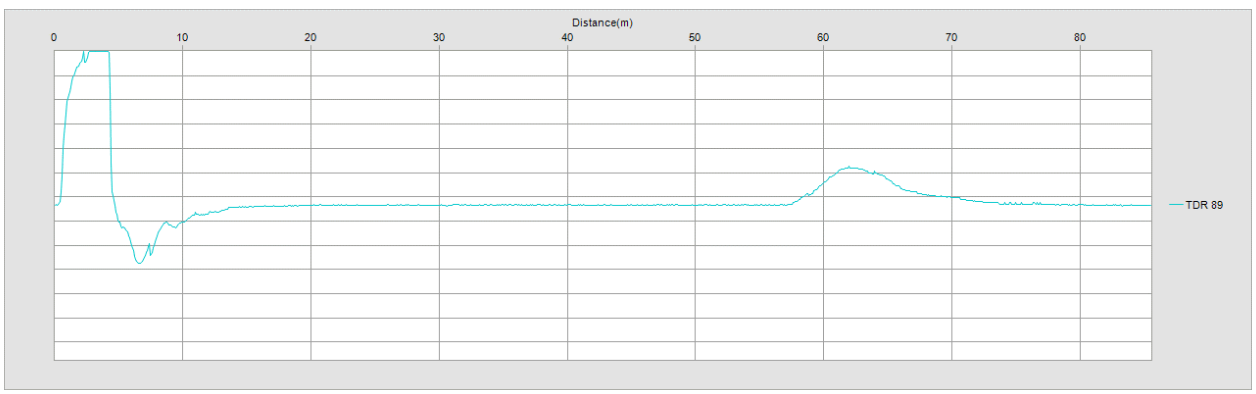


Figure 31: Bayview Drive - TX 5344 to TX 5345 – Blue Phase

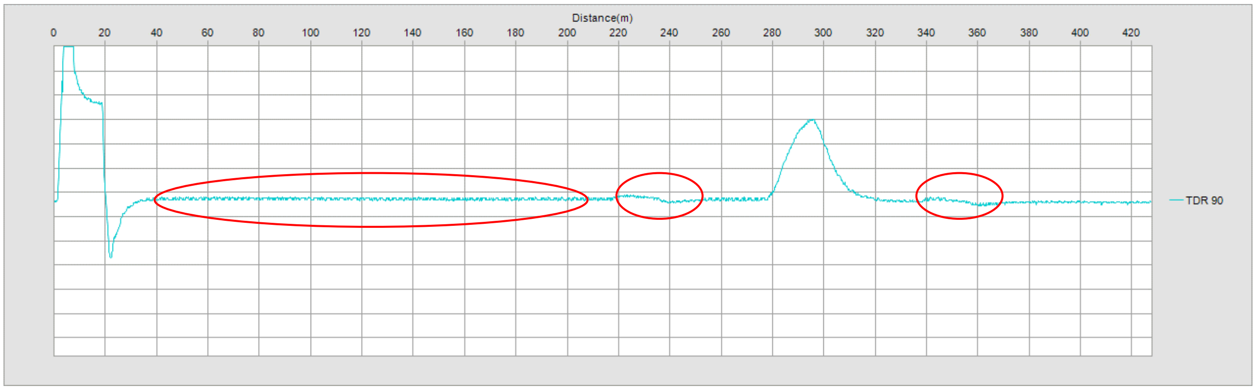


Figure 32: Bayview Drive – C009W to TX5343 – White Phase

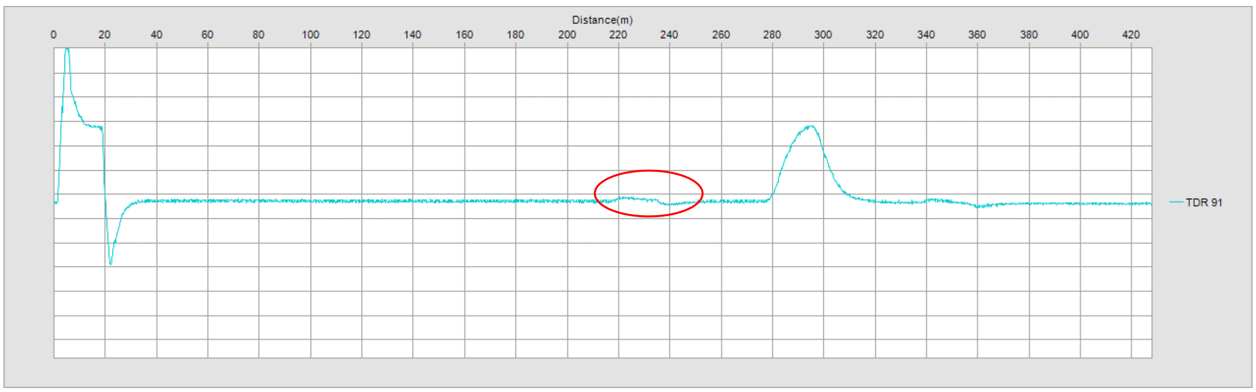


Figure 33: Bayview Drive - C009W to TX5343 – White Phase

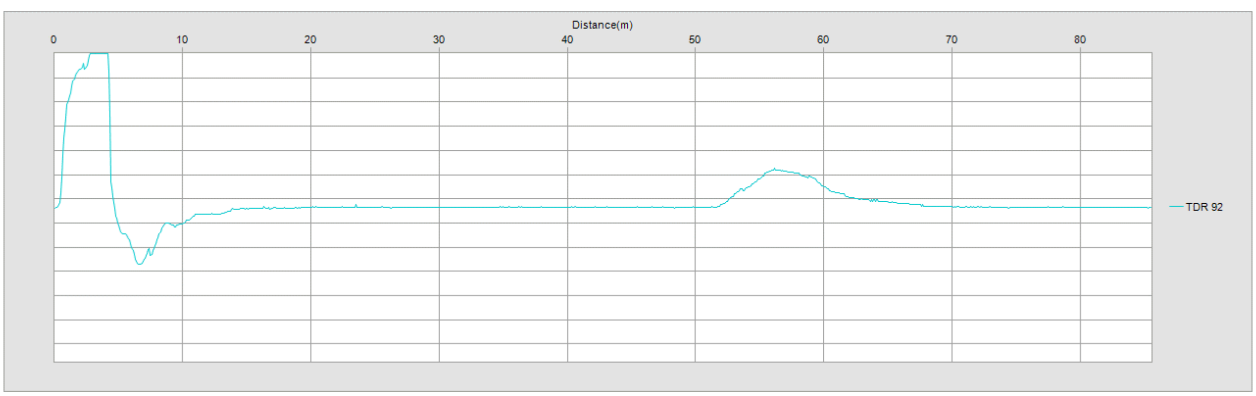


Figure 34: Bayview Drive- TX5343 to TX 5342 – White Phase

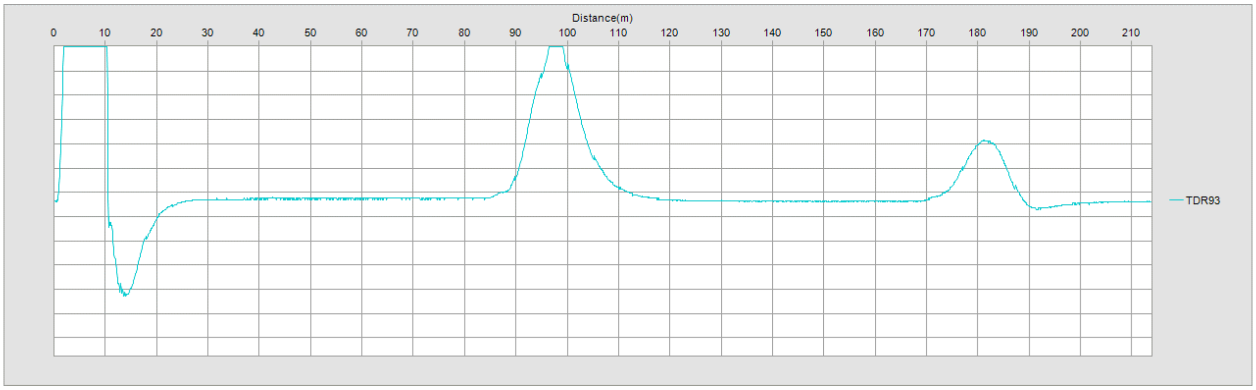


Figure 35: Tami Crescent - C068R to TX 5358 – Red Phase

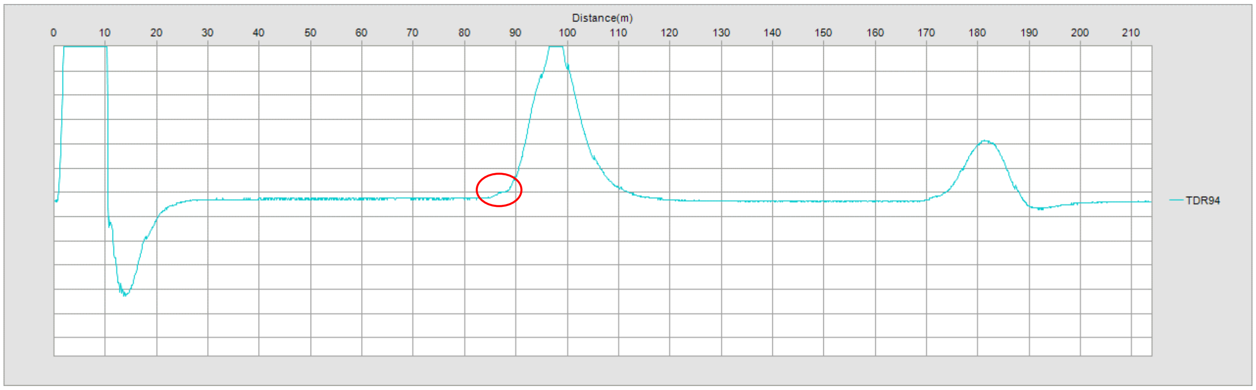


Figure 36: Tami Crescent - C068R to TX 5358 – Red Phase- splice at near far-end

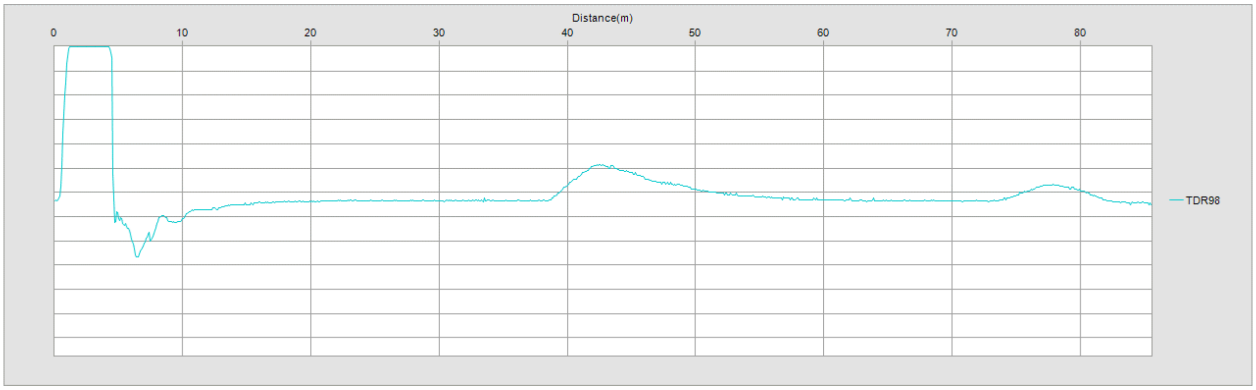


Figure 37: Tami Crescent - TX 5360 to TX 5359 – Red Phase

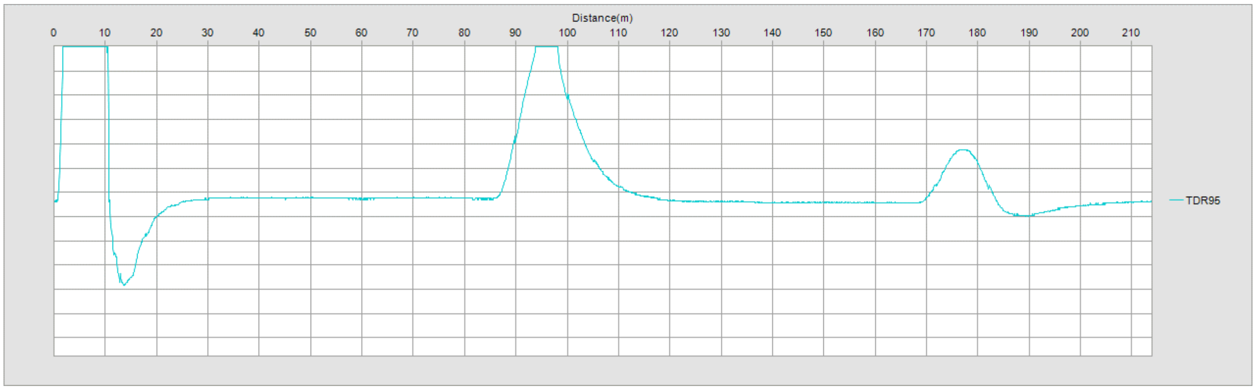


Figure 38: Tami Crescent- TX 5358 to TX 5359 – Red Phase

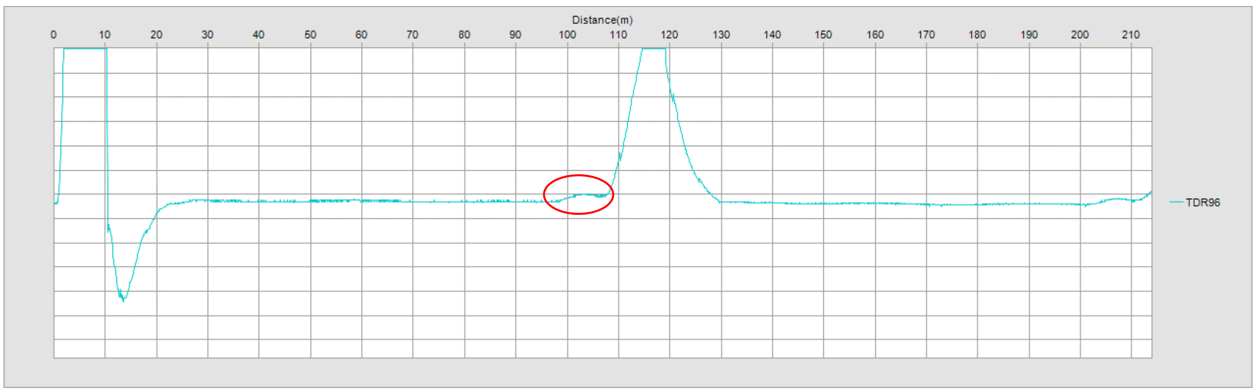


Figure 39: Tami Crescent - TX 5360 to C068R – Red Phase

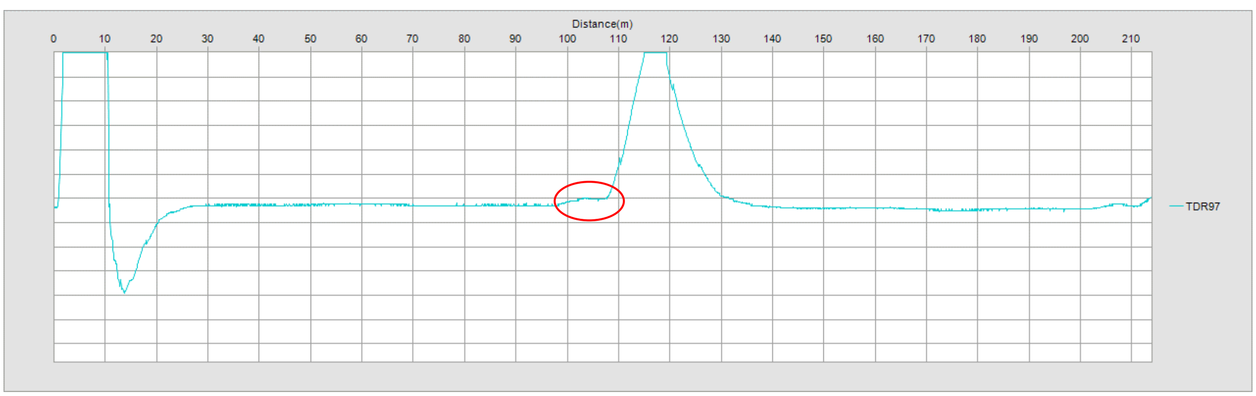


Figure 40: Tami Crescent - TX 5360 to C068R – Red Phase

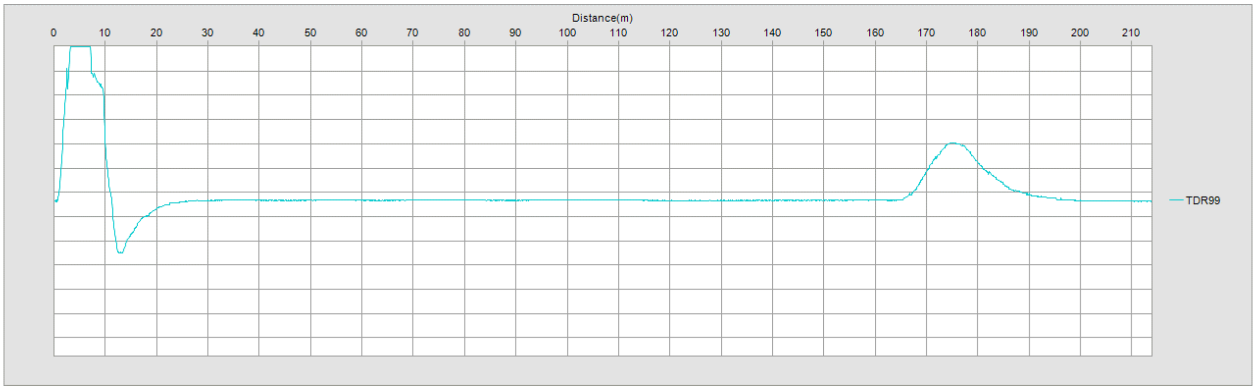


Figure 41:44 Livingston Avenue- East of Sobey's - TX 5422 to TX 6464 – Red Phase

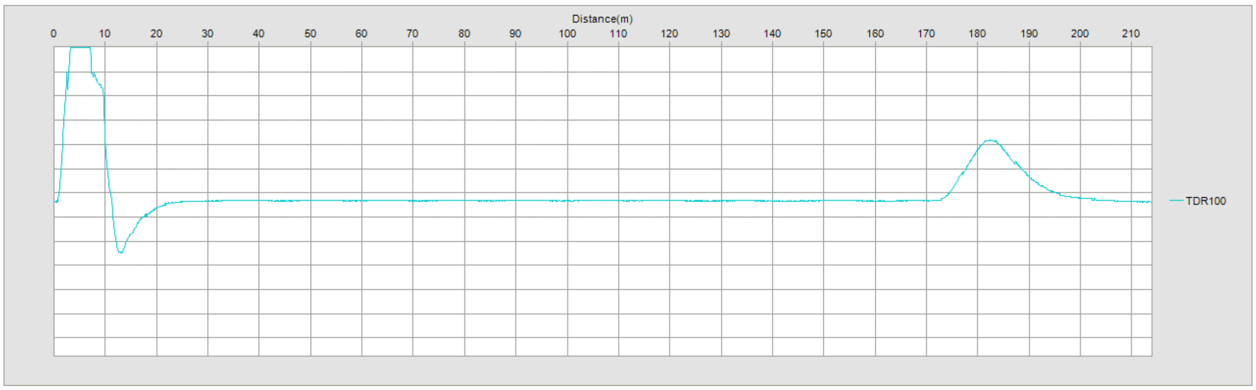


Figure 42: 44 Livingston Avenue- East of Sobey's - TX 5422 to TX 6464 – White Phase

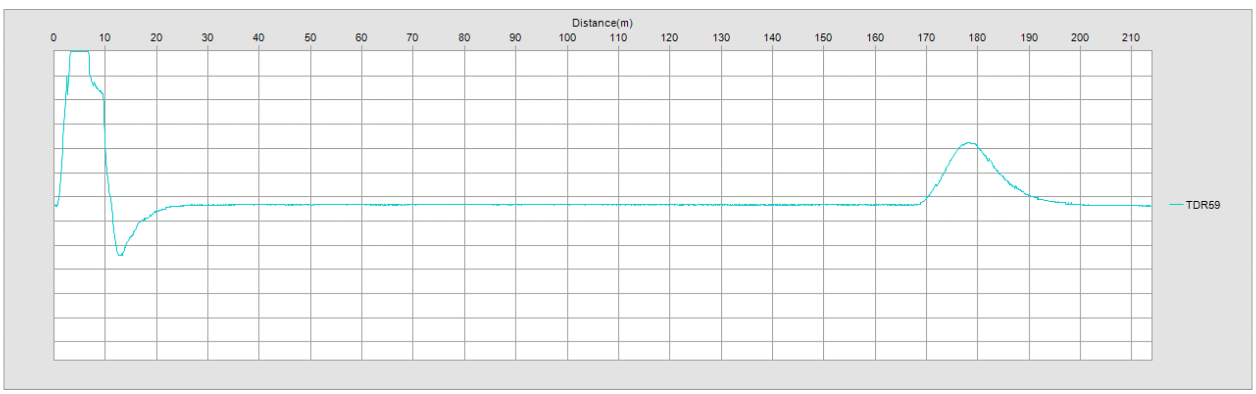


Figure 43: 44 Livingston Avenue- East of Sobey's - TX 5422 to TX 6464 – Blue Phase

Appendix B: VLF-Tan Delta Test Results

Cable circuit	Location Description	Phase	Mean TD at U_0 =16 kV [x10^{-3}]	16kV SD [x10^{-3}]	Mean TD at 23 kV [x10^{-3}]	Mean TD at 8 kV [x10^{-3}]	Differential TD 23kV (1.5U_0)- 8 kV (0.5U_0) [10^{-3}]	C-Capacitance; R – Resistance for 8kV	Condition Assessment
C032B to TX5279	Peach Tree Lane	B	3.7	0	3.6	3.7	0	C: 21.5nF; R: 20GΩ	No Action Required
TX5279 to TX5201	Peach Tree Lane	B	1.7	0	1.7	1.7	0	C: 55nF; R: 17GΩ	No Action Required
TX5201 to TX5200	Peach Tree Lane	B	6.2	0	6.2	6.2	-0.1	C: 12.8nF; R: 20GΩ	Further Study Advised
C021R to TX5290	Stonegate Drive	R	4.7	0	8.5	4.7	3.1	C: 16.8nF; R: 20GΩ	Further Study Advised
TX5290 to TX5289	Stonegate Drive	R	4.4	0	5.1	4.4	0.75	C: 18nF; R: 20GΩ	Further Study Advised
TX5289 to TX5288	Stonegate Drive	R	3.8	0	3.8	3.8	0	C: 20.8nF; R: 20GΩ	No Action Required; However, Tan Delta is close to IEEE criteria
C008B to TX 4730	Woodeden Road	B	3.5	0	3.5	0	3.5	C: 22.5nF; R: 20GΩ	No Action Required; However, Tan Delta is close to IEEE criteria

Cable circuit	Location Description	Phase	Mean TD at U_0 =16 kV [x10⁻³]	16kV SD [x10⁻³]	Mean TD at 23 kV [x10⁻³]	Mean TD at 8 kV [x10⁻³]	Differential TD 23kV ($1.5U_0$)- 8 kV ($0.5U_0$) [10⁻³]	C- Capacitance; R – Resistance for 8kV	Condition Assessment
TX 4730 to TX 4731	Woodeden Road	B	6.6	0	6.6	0	0	C: 12nF; R: 20GΩ	Further Study Advised
TX 4731 to 4732 to Vault	Woodeden Road	B	5.2	0	6.7	1.8	1.8	C: 16nF; R: 20GΩ	Further Study Advised
C124R to TX 4907	Highland Drive	R	3.7	0	5.0	3.5	1.5	C: 22.5nF; R: 20GΩ	No Action Required; However, Tan Delta is close to IEEE criteria
TX 4907 to TX 4799	Highland Drive	R	2.6	0	2.6	2.6	0	C: 29.8F; R: 20GΩ	No Action Required
TX 6223 to TX 5422	44 Livingston Avenue -West of Sobey's	R	2.3	0	2.3	2.3	0	C: 34.5nF; R: 20GΩ	No Action Required
		W	2.3	0	2.3	2.3	0	C: 34.4nF; R: 20GΩ	No Action Required
		B	2.3	0	2.3	2.3	0	C: 34.5nF; R: 20GΩ	No Action Required

Cable circuit	Location Description	Phase	Mean TD at U_0 =16	16kV SD [x10⁻	Mean TD at 23 kV	Mean TD at 8 kV	Differential TD 23kV ($1.5U_0$)- 8	C- Capacitance; R –	Condition Assessment

			kV [x10^{-3}]	3]	[x10- 3]	[x10- 3]	kV (0.5U$_0$) [10^{-3}]	Resistance for 8kV	
C471W to TX5244	Sacks and Sandra Crescent	R	1.8	0	1.8	1.8	0	C: 44nF; R: 20GΩ	No Action Required
TX5244 to TX5243	Sacks and Sandra Crescent	R	1.0	0	1.0	1.0	-0.1	C: 7.7nF; R: 20GΩ	No Action Required
TX5243 to TX5245	Sacks and Sandra Crescent	R	5.4	0	5.4	5.4	0	C: 14.5nF; R: 20GΩ	Further Study Required
C009B to TX5346	Bayview Drive	B	5.5	0	5.9	5.5	0.4	C: 14.4nF; R: 20GΩ	Further Study Required
TX5346 to TX5345	Bayview Drive	B	5.4	0	8.6	5.5	3.1	C: 14.5nF; R: 20GΩ	Further Study Required
C010B to TX5344	Bayview Drive	B	1.5	0	3.5	4.0	1.9	C: 52.4nF; R: 20GΩ	Further Study Required
TX5344 to TX5345	Bayview Drive	B	9.1	0	8.6	9.1	-0.5	C: 8.7nF; R: 20GΩ	Further Study Required

Cable circuit	Location Description	Phas e	Mean TD at U$_0$ =16 kV	16kV SD [x10- 3]	Mean TD at 23 kV [x10-	Mean TD at 8 kV [x10-	Differentia l TD 23kV (1.5U$_0$)- 8 kV (0.5U$_0$)	C-Capacitance; R – Resistance	Condition Assessment

			[x10^{-3}]		3]	3]	[10^{-3}]	for 8kV	
C009W to TX5343	Bayview Drive	W	1.9	0	3.5	1.9	1.5	C: 41nF; R: 20GΩ	No Action Required; However, Tan Delta is close to IEEE criteria
TX5343 to TX5342	Bayview Drive	W	10	0	9.9	10	-1.3x10^{-1}	C: 7.9nF; R: 20GΩ	Further Study Required
TX5343 to TX5342	Bayview Drive	W	10	0	9.9	10	-1.3x10^{-1}	C: 7.9nF; R: 20GΩ	Further Study Required
C068R to TX5358	Tami Crescent	R	7.1	0	14	5.7	8.2	C: 13.9nF; R: 20GΩ	Further Study Required
TX5360 to TX5359	Tami Crescent	R	13.3	0	13.3	13.3	0	C: 6nF; R: 20GΩ	Further Study Required
TX5358 to TX5359	Tami Crescent	R	5.8	0	5.8	5.8	0	C: 13.6nF; R: 20GΩ	Further Study Required
TX5360 to C068R	Tami Crescent	R	4.7	0	13.2	4.7	8.5	C: 16.9nF; R: 20GΩ	Further Study Required

Cable circuit	Location Description	Phase	Mean TD at U_0 =16 kV	16kV SD [x10-3]	Mean TD at 23 kV [x10-	Mean TD at 8 kV [x10-	Differential TD 23kV (1.5U_0)- 8 kV (0.5U_0)	C- Capacitance; R – Resistance	Condition Assessment

			[x10^{-3}]		^{3}]	^{3}]	[10^{-3}]	for 8kV	
TX5422 to TX 6464	44 Livingston Ave-East of Sobey's	R	3.1	0	3.1	3.1	1.2×10^{-1}	C: 25.7nF; R: 20GΩ	No Action Required; However, Tan Delta is close to IEEE criteria
		W	3.1	0	3.4	3.1	0.3	C: 25.7nF; R: 20GΩ	No Action Required; However, Tan Delta is close to IEEE criteria
		B	3.1	0	3.1	3.1	0	C: 25.3nF; R: 20GΩ	No Action Required; However, Tan Delta is close to IEEE criteria

Appendix C: Partial Discharge Test Results

Cable Circuit	Location Description	Phase	Background Power ON	PD at U0=8 kV	PD at 1.5 Uo=12 kV	Assessment
C032B to TX 5279	Peach Tree Lane	B	8.04 pC	9.2 pC	8.5 to 20 pC	No PD
TX 5279 to TX 5201	Peach Tree Lane	B	45.8 pC	47.4 pC	48 pC	No PD
TX 5201 to TX 5200	Peach Tree Lane	B	31 pC	31.5 pC	32.1 pC	No PD
C021R to TX 5290	Stonegate Drive	R	16.5 pC	16.5 pC	20 pC	No PD
TX 5290 to TX 5289	Stonegate Drive	R	45.8 pC	47.38 pC	48 pC	No PD
TX 5289 to TX 5288	Stonegate Drive	R	2.7 pC	5.5 pC	31.6 pC	Minor PD
C008B to TX 4730	Woodeden Road	B	8.4 pC	9.2 pC	20 pC	Minor PD
TX 4730 to TX 4731	Woodeden Road	B	26.5 pC	27.11 pC	42 pC	Minor PD
TX 4731 to 4732 to Vault	Woodeden Road	B	29 pC	29.2 to 30.0 pC	29.2 to 30.9 pC	No PD

Cable Circuit	Location Description	Phase	Background Power ON	PD at U0=16 kV	PD at 1.5 Uo=23 kV	Assessment
C124R to TX 4907	Highland Drive	R	62 pC	70.7 pC	76.6 pC	No PD
TX 4907 to TX 4799	Highland Drive	R	15.9 pC	311 pC	364 pC	PD concern- PD from near end elbow – sign of corrosion on the elbow – plan to replace the elbow
TX 6223 to TX 5422	44 Livingston Avenue -West of Sobey's	R	8.0 pC	9.2 pC	20 pC	Minor PD
TX 6223 to TX 5422	44 Livingston Avenue -West of Sobey's	W	8.2 pC	96.6 pC	105.7 pC	Minor PD
TX 6223 to TX 5422	44 Livingston Avenue -West of Sobey's	B	8.2 pC	19.9 pC	109.6 pC	Minor PD
C471W to TX 5244	Sacks and Sandra Crescent	W	11pC	25 pC	130.9 pC	Minor PD
TX 5244 to TX 5243	Sacks and Sandra Crescent	W	8.8pC	8.5 to 51.9 pC	122.57 pC	Minor PD
TX 5243 to TX 5245	Sacks and Sandra Crescent	W	8.7 pC	47.49 pC	100.6 pC	Minor PD

Cable Circuit	Location Description	Phase	Background Power ON	PD at U0=16 kV	PD at 1.5 Uo=23 kV	Assessment
C009B to TX 5346	Bayview Dr	B	11.8 pC	12.5 pC	77.1 pC	Minor PD- monitor every 3-5 years
TX 5346 to TX 5345	Bayview Dr	B	13.5 pC	14.9 to 112.1 pC	52 pC	Minor PD- monitor every 3-5 years
C010B to TX 5344	Bayview Dr	B	0.6 pC	0.6 pC	0.6 pC	Acceptable
TX 5344 to TX5345	Bayview Dr	B	20 pC	20.7 pC	21 pC	No PD
C009W to TX5343	Bayview Dr	W	10.9 pC	13.4 pC	13.6 pC	No PD
TX 5343 to TX 5342	Bayview Dr	W	0.21 pC	21.5 pC	2.6 pC	No PD
C068R to TX 5358	Tami Crescent	R	N/A	N/A	N/A	N/A
TX5360 to TX 5359	Tami Crescent	R	N/A	N/A	N/A	N/A
TX5358 to TX 5359	Tami Crescent	R	N/A	N/A	N/A	N/A
TX5360 to C068R	Tami Crescent	R	N/A	N/A	N/A	N/A

Cable Circuit	Location Description	Phase	Background Power ON	PD at U0=16 kV	PD at 1.5 Uo=23 kV	Assessment
TX5422 to TX 6464	44 Livingston Ave-East of Sobey's	R	N/A	N/A	N/A	N/A
		W	N/A	N/A	N/A	N/A
		B	N/A	N/A	N/A	N/A

Appendix D: Summary of Cable Assessments

Test #	Cable circuit	Location Description	Phase	TDR	PD	VLF-TanD	Injected? Yes/No
1	C032B to TX5279	Peach Tree Lane	B	No Corrosion on Neutral.	No PD	No Action Required	Yes
2	TX5279 to TX5201	Peach Tree Lane	B	Minor Neutral Corrosion. Test TDR every 3-5 yrs.	No PD	No Action Required	No
3	TX5201 to TX5200	Peach Tree Lane	B	No Corrosion on Neutral.	No PD	Further Study Advised	No
4	C021R to TX5290	Stonegate Drive	R	No Corrosion on Neutral.	No PD	Further Study Advised	Yes
5	TX5290 to TX5289	Stonegate Drive	R	No Corrosion on Neutral.	No PD	Further Study Advised	Yes
6	TX5289 to TX5288	Stonegate Drive	R	Minor Neutral Corrosion. Test TDR every 3-5 yrs.	Minor PD- monitor every 3-5 years	No Action Required; However, Tan Delta is close to IEEE criteria	Yes
7	C008B to TX 4730	Woodeden Road	B	Minor Neutral Corrosion. Test TDR every 3-5 yrs.	Minor PD- monitor every 3-5 years	No Action Required; However, Tan Delta is close to IEEE criteria	Yes
8	TX 4730 to TX 4731	Woodeden Road	B	No Corrosion on Neutral.	Minor PD- monitor every 3-5 years	Further Study Advised	No
9	TX 4731 to 4732 to Vault	Woodeden Road	B	No Corrosion on Neutral.	No PD	Further Study Advised	No
10	C124R to TX 4907	Highland Drive	R	Minor Neutral Corrosion. Test TDR every 3-5 yrs.	No PD	No Action Required; However, Tan Delta is close to IEEE criteria	No

Test #	Cable circuit	Location Description	Phase	TDR	PD	VLF-TanD	Injected? Yes/No
11	TX 4907 to TX 4799	Highland Drive	R	No Corrosion on Neutral.	PD concern- PD from near end elbow – sign of corrosion on the elbow – plan to replace the elbow	No Action Required	Yes
12	TX 6223 to TX 5422	44 Livingston Avenue	R	No Corrosion on Neutral.	Minor PD- monitor every 3-5 years	No Action Required	Yes
			W	No Corrosion on Neutral.	Minor PD- monitor every 3-5 years	No Action Required	Yes
			B	No Corrosion on Neutral.	Minor PD- monitor every 3-5 years	No Action Required	Yes
13	C471W to TX5244	Sacks and Sandra Cres	R	Minor Neutral Corrosion. Test TDR every 3-5 yrs.	Minor PD- monitor every 3-5 years	No Action Required	No
14	TX5244 to TX5243	Sacks and Sandra Cres	R	No Corrosion on Neutral.	Minor PD- monitor every 3-5 years	No Action Required	No
15	TX5243 to TX5245	Sacks and Sandra Cres	R	No Corrosion on Neutral.	Minor PD- monitor every 3-5 years	Further Study Required	No
16	C009B to TX5346	Bayview Drive	B	Minor Neutral Corrosion. Test TDR every 3-5 yrs.	Minor PD- monitor every 3-5 years	Further Study Required	No
17	TX5346 to TX5345	Bayview Drive	B	No Corrosion on Neutral.	Minor PD- monitor every 3-5 years	Further Study Required	No
18	C010B to TX5344	Bayview Drive	B	No Corrosion on Neutral.	Acceptable	Further Study Required	Yes
19	TX5344 to TX5345	Bayview Drive	B	No Corrosion on Neutral.	No PD	Further Study Required	No
20	C009W to TX5343	Bayview Drive	W	Corrosion on Neutral. re-test this cable	No PD	No Action Required; However, Tan Delta is close to IEEE criteria 2nd	No

Test #	Cable circuit	Location Description	Phase	TDR	PD	VLF-TanD	Injected? Yes/No
				within 1-2 years and investigate if the cable has a splice at 220m from TX 5343. If more corrosion is detected, it is recommended to look into a replacement in 3-5 years.		level	
21	TX5343 to TX5342	Bayview Drive	W	No Corrosion on Neutral.	No PD	Further Study Required	Yes
22	C068R to TX5358	Tami Crescent	R	No Corrosion on Neutral. Splice located at 84m.	N/A	Further Study Required	Yes
23	TX5360 to TX5359	Tami Crescent	R	No Corrosion on Neutral.	N/A	Further Study Required	Yes
24	TX5358 to TX5359	Tami Crescent	R	No Corrosion on Neutral.	N/A	Further Study Required	No
25	TX5360 to C068R	Tami Crescent	R	No Corrosion on Neutral.	N/A	Further Study Required	Yes
26	TX5422 to TX6464	44 Livingston Ave-East of Sobey's	R	No Corrosion on Neutral.	N/A	No Action Required; However, Tan Delta is close to 2nd IEEE criteria 2nd level	No
			W	No Corrosion on Neutral.	N/A	No Action Required; However, Tan Delta is close to IEEE criteria 2nd level	No
			B	No Corrosion on Neutral.	N/A	No Action Required; However, Tan Delta is close to IEEE criteria 2nd level	No

APPENDIX H

Niagara Regional Infrastructure Plan

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Niagara
Regional Infrastructure Plan ("RIP")

March 28th 2017

Canadian Niagara Power Inc.
Grimsby Power Inc.
Alectra Utilities
Hydro One Networks Inc. (Distribution)
Niagara Peninsula Energy Inc.
Niagara-On-the-Lake Hydro Inc.
Welland Hydro-Electric System Corporation

The Niagara Region includes the municipalities of City of Port Colborne, City of Welland, City of Thorold, City of Niagara Falls, Town of Niagara-On-The-Lake, City of St. Catharines, Town of Fort Erie, Town of Lincoln, Township of West Lincoln, Town of Grimsby, Township of Wainfleet, and Town of Pelham.

The Needs Assessment ("NA") report for the Niagara Region was completed on April 30th, 2016 (see attached). The report concluded that there were only two needs in the Region and that they should be addressed as follows:

- Thermal overloading of 115kV circuit Q4N: Addressed in a Local Plan ("LP") report.

The loading constraints on 115kV circuit Q4N was addressed in a LP report led by Hydro One Networks Inc. and published on November 11th, 2016. The report concluded that Hydro One already has plans to replace the existing section of conductor between Sir Adam Beck SS #1 and Portal JCT with a 910A continuous rating conductor at 93°C as part of their Beck #1 SS Refurbishment project. The expected in-service date for this conduction section upgrade is December 2019.

Consistent with a process established by an industry working group[1] created by the OEB the Regional Infrastructure Plan ("RIP") is the last phase of the planning process. In view that no further regional coordination was required, the attached NA and LP reports will be deemed to form the RIP for the Niagara Region.

The next planning cycle for the region will take place within five years of the start of this cycle (2021) or earlier, should there be a new need identified in the region.

Sincerely,

Ajay Garg | Manager, Regional Planning Co-ordination
Hydro One Networks Inc.

[1] Planning Process Working Group (PPWG) Report to the Ontario Energy Board available at the OEB website www.ontarioenergyboard.ca

Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

NEEDS ASSESSMENT REPORT

Region: Niagara

Date: April 30th 2016

Prepared by: Niagara Region Study Team

Niagara Study Team
Hydro One Networks Inc. (Lead Transmitter)
Independent Electricity System Operator
Hydro One Networks Inc. (Distribution)
Canadian Niagara Power Inc.
Grimsby Power Inc.
Haldimand County Hydro Inc.
Horizon Utilities Corp.
Niagara Peninsula Energy Inc.
Niagara on the Lake Hydro Inc.
Welland Hydro Electric System Corp.

DISCLAIMER

This Needs Assessment Report was prepared for the purpose of identifying potential needs in the Niagara region and to assess whether those needs require further coordinated regional planning. The potential needs that have been identified through this Needs Assessment Report may be studied further through subsequent regional planning processes and may be reevaluated based on the findings of further analysis. The load forecast and results reported in this Needs Assessment Report are based on the information and assumptions provided by study team participants.

Study team participants, their respective affiliated organizations, and Hydro One Networks Inc. (collectively, "the Authors") make no representations or warranties (express, implied, statutory or otherwise) as to the Needs Assessment Report or its contents, including, without limitation, the accuracy or completeness of the information therein and shall not, under any circumstances whatsoever, be liable to each other, or to any third party for whom the Needs Assessment Report was prepared ("the Intended Third Parties"), or to any other third party reading or receiving the Needs Assessment Report ("the Other Third Parties"), for any direct, indirect or consequential loss or damages or for any punitive, incidental or special damages or any loss of profit, loss of contract, loss of opportunity or loss of goodwill resulting from or in any way related to the reliance on, acceptance or use of the Needs Assessment Report or its contents by any person or entity, including, but not limited to, the aforementioned persons and entities.

NEEDS ASSESSMENT EXECUTIVE SUMMARY

<table>
<tr><td>Region</td><td colspan="3">Niagara (the “Region”)</td></tr>
<tr><td>Lead</td><td colspan="3">Hydro One Networks Inc. (“Hydro One”)</td></tr>
<tr><td>Start Date</td><td>October 15, 2015</td><td>End Date</td><td>April 30th 2016</td></tr>
<tr><td colspan="4">1. INTRODUCTION</td></tr>
<tr><td colspan="4">The purpose of this Needs Assessment (NA) report is to undertake an assessment of the Niagara Region and determine if there are regional needs that require coordinated regional planning. Where regional coordination is not required, and a “localized” wires solution is necessary, such needs will be addressed between relevant Local Distribution Companies (LDCs) and Hydro One and other parties as required.

For needs that require further regional planning and coordination, IESO will initiate the Scoping Assessment (SA) process to determine whether an IESO-led Integrated Regional Resource Planning (IRRP) process, or the transmitter-led Regional Infrastructure Plan (RIP) process (wires solution), or whether both are required.</td></tr>
<tr><td colspan="4">2. REGIONAL ISSUE / TRIGGER</td></tr>
<tr><td colspan="4">The NA for the Niagara Region was triggered in response to the Ontario Energy Board’s (OEB) Regional Infrastructure Planning process approved in August 2013. To prioritize and manage the regional planning process, Ontario’s 21 regions were assigned to one of three groups. The NA for Group 1 and 2 regions is complete and has been initiated for Group 3 Regions. The Niagara Region belongs to Group 3. The NA for this Region was triggered on October 15, 2015 and was completed on April 30th 2016</td></tr>
</table>

3. SCOPE OF NEEDS ASSESSMENT

The scope of the NA study was limited to 10 years as per the recommendations of the Planning Process Working Group (PPWG) Report to the Board. As such, relevant data and information was collected up to the year 2025. Needs emerging over the next 10 years and requiring coordinated regional planning may be further assessed as part of the IESO-led SA, which will determine the appropriate regional planning approach: IRRP, RIP, and/or local planning. This NA included a study of transmission system connection facilities capability, which covers station loading, thermal and voltage analysis as well as a review of system reliability, operational issues such as load restoration, and assets approaching end-of-useful-life.

4. INPUTS/DATA

Study team participants, including representatives from LDCs, the Independent Electricity System Operator (IESO), and Hydro One transmission provided information for the Niagara Region. The information included: historical load, load forecast, conservation and demand management (CDM) and distributed generation (DG) information, load restoration data, and performance information including major equipment approaching end-of-useful life.

5. NEEDS ASSESSMENT METHODOLOGY

The assessment's primary objective was to identify the electrical infrastructure needs and system performance issues in the Region over the study period (2015 to 2024). The assessment reviewed available information, load forecasts and included single contingency analysis to confirm needs, if and when required. See Section 5 for further details.

6. RESULTS

Transmission Needs

A. Transmission Lines & Ratings

The 230kV and 115kV lines are adequate over the study period with a section of 115kV circuit Q4N being the exception.

B. 230 kV and 115 kV Connection Facilities

The 230kV and 115kV connection facilities in this region are adequate over the study period.

System Reliability, Operation and Restoration Review

There are no known issues with system reliability, operation and restoration in the Niagara region.

Aging Infrastructure / Replacement Plan

Within the regional planning time horizon, the following sustainment work is currently planned by Hydro One in the region:

- DeCew Falls SS: Circuit Breaker Replacement (2017)
- Sir Adam Beck SS #1: 115kV Refurbishment Project (2018)
- 115kV Q11/Q12S Line Refurbishment from Glendale TS to Beck SS #1 (2019)
- Carlton TS: Switchgear Replacement (2020)
- Sir Adam Beck SS #2: 230kV Circuit Breakers Replacement (2020)
- Glendale TS: Station Refurbishment and Reconfiguration (2021)
- Stanley TS: Station Refurbishment (2021)
- Thorold TS: Transformer Replacement (2021)
- Crowland TS: Transformer Replacement (2021)

Based on the findings of the Needs Assessment, the study team recommends that thethermal overloading of 115kV circuit Q4N shouldbe further assessed as part of a Local Plan. No further regional coordination or planning is required.

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1 Introduction

This Needs Assessment (NA) report provides a summary of needs that are emerging in the Niagara Region ("Region") over the next ten years. The development of the NA report is in accordance with the regional planning process as set out in the Ontario Energy Board's (OEB) Transmission System Code (TSC) and Distribution System Code (DSC) requirements and the "Planning Process Working Group (PPWG) Report to the Board".

The purpose of this NA is to undertake an assessment of the Niagara Region to identify any near term and/or emerging needs in the area and determine if these needs require a "localized" wires only solution(s) in the near-term and/or a coordinated regional planning assessment. Where a local wires only solution is necessary to address the needs, Hydro One, as transmitter, with Local Distribution Companies (LDC) or other connecting customer(s), will further undertake planning assessments to develop options and recommend a solution(s). For needs that require further regional planning and coordination, the Independent Electricity System Operator (IESO) will initiate the Scoping Assessment (SA) process to determine whether an IESO-led Integrated Regional Resource Planning (IRRP) process, or the transmitter-led Regional Infrastructure Plan (RIP) process (wires solution), or both are required. The SA may also recommend that local planning between the transmitter and affected LDCs be undertaken to address certain local type of needs if straight forward wires solutions can address a need. Ultimately, assessment and findings of the local plans are incorporated in the RIP for the region.

This report was prepared by the Niagara Region NA study team (Table 1) and led by the transmitter, Hydro One Networks Inc. The report captures the results of the assessment based on information provided by LDCs, and the Independent Electricity System Operator (IESO).

Table 1: Study Team Participants for Niagara Region

No.	Company
1	Hydro One Networks Inc. (Lead Transmitter)
2	Independent Electricity System Operator
3	Canadian Niagara Power Inc.
4	Grimsby Power Inc.
5	Haldimand County Hydro Inc
6	Horizon Utilities Corp.
7	Hydro One Networks Inc. (Distribution)
8	Niagara Peninsula Energy Inc.
9	Niagara on the Lake Hydro Inc.
10	Welland Hydro Electric System Corp.

2 Regional Issue / Trigger

The NA for the Niagara Region was triggered in response to the OEB's Regional Infrastructure Planning process approved in August 2013. To prioritize and manage the regional planning process, Ontario's 21 regions were assigned to one of three groups. The NA for Group 1 Regions is complete and has been initiated for Group 2 Regions. The Niagara Region belongs to Group 3.

3 Scope of Needs Assessment

This NA covers the Niagara Region over an assessment period of 2015 to 2024. The scope of the NA includes a review of transmission system connection facility capability which covers transformer station capacity, thermal capacity, and voltage performance. System reliability, operational issues such as load restoration, and asset replacement plans were also briefly reviewed as part of this NA.

3.1 Niagara Region Description and Connection Configuration

For regional planning purposes, the Niagara region includes the City of Port Colborne, City of Welland, City of Thorold, City of Niagara Falls, Town of Niagara-on-the-Lake, City of St. Catharines, Town of Fort Erie, Town of Lincoln, Township of West Lincoln, Town of Grimsby, Township of Wainfleet, and Town of Pelham. Haldimand County has also been included in the regional infrastructure planning needs assessment for Niagara region. A map of the region is shown below in Figure 1.

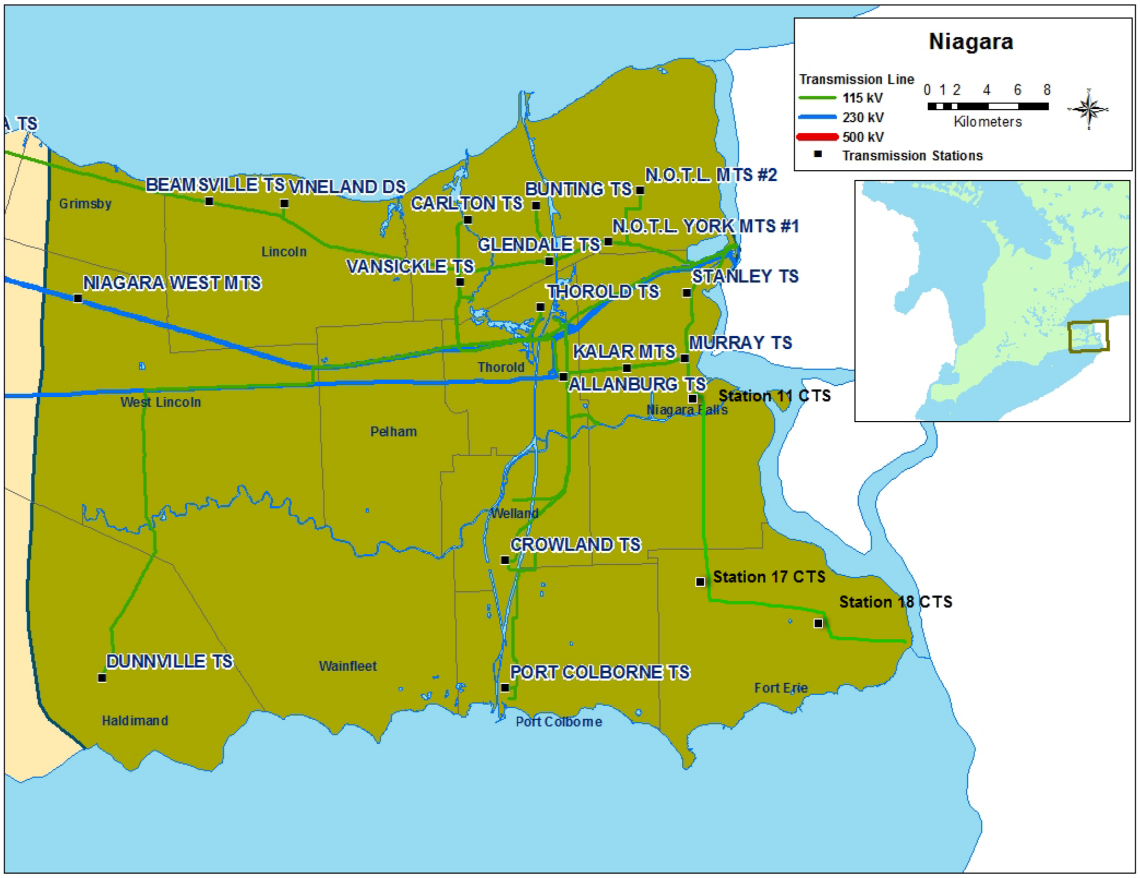

Figure 1: Niagara Region Map

Electrical supply for this region is provided through a network of 230kV and 115kV transmission circuits supplied mainly by the local generation from Sir Adam Beck #1, Sir Adam Beck #2, Decew Falls GS, Thorold GS and the autotransformers at Allanburg TS.

Bulk supply is provided through the 230kV circuits (Q23BM, Q24HM, Q25BM, Q26M, Q28A, Q29HM, Q30M, and Q35M) from Sir Adam Beck #2 SS. These circuits connect this region to Hamilton/Burlington.

The Niagara Region has the following local distribution companies (LDC):

- Canadian Niagara Power Inc.
- Grimsby Power Inc.
- Haldimand County Hydro Inc.
- Horizon Utilities
- Hydro One Distribution Inc.
- Niagara Peninsula Energy Inc.
- Niagara on the Lake Hydro Inc.
- Welland Hydro Electric System Corporation

Large transmission connected customers in the area will not actively participate in the regional planning process, however their load forecasts will used in determining regional supply needs.

Table 2: Transmission Lines and Stations in Niagara Region

115kV circuits	230kV circuits	Hydro One Transformer Stations	Customer Transformer Stations
Q3N, Q4N, Q11S, Q12S, Q2AH, A36N, A37N, D9HS, D10S, D1A, D3A, A6C, A7C,C1P, C2P	Q23BM, Q24HM, Q25BM, Q26M, Q28A, Q29HM, Q30M, Q35M, Q21P, Q22P	Allanburg TS*, Stanley TS, Niagara Murray TS, Thorold TS, Vansickle TS, Carlton TS, Glendale TS, Bunting TS, Dunville TS, Vineland TS, Beamsville TS, Sir Adam Beck SS #1, Sir Adam Beck SS #2, Crowland TS, Port Colborne TS	Niagara on the Lake #1 and #2 MTS, CNPI Station 11 , CNPI Station 17, CNPI Station 18, Kalar MTS, Niagara West MTS

Stations with Autotransformers installed

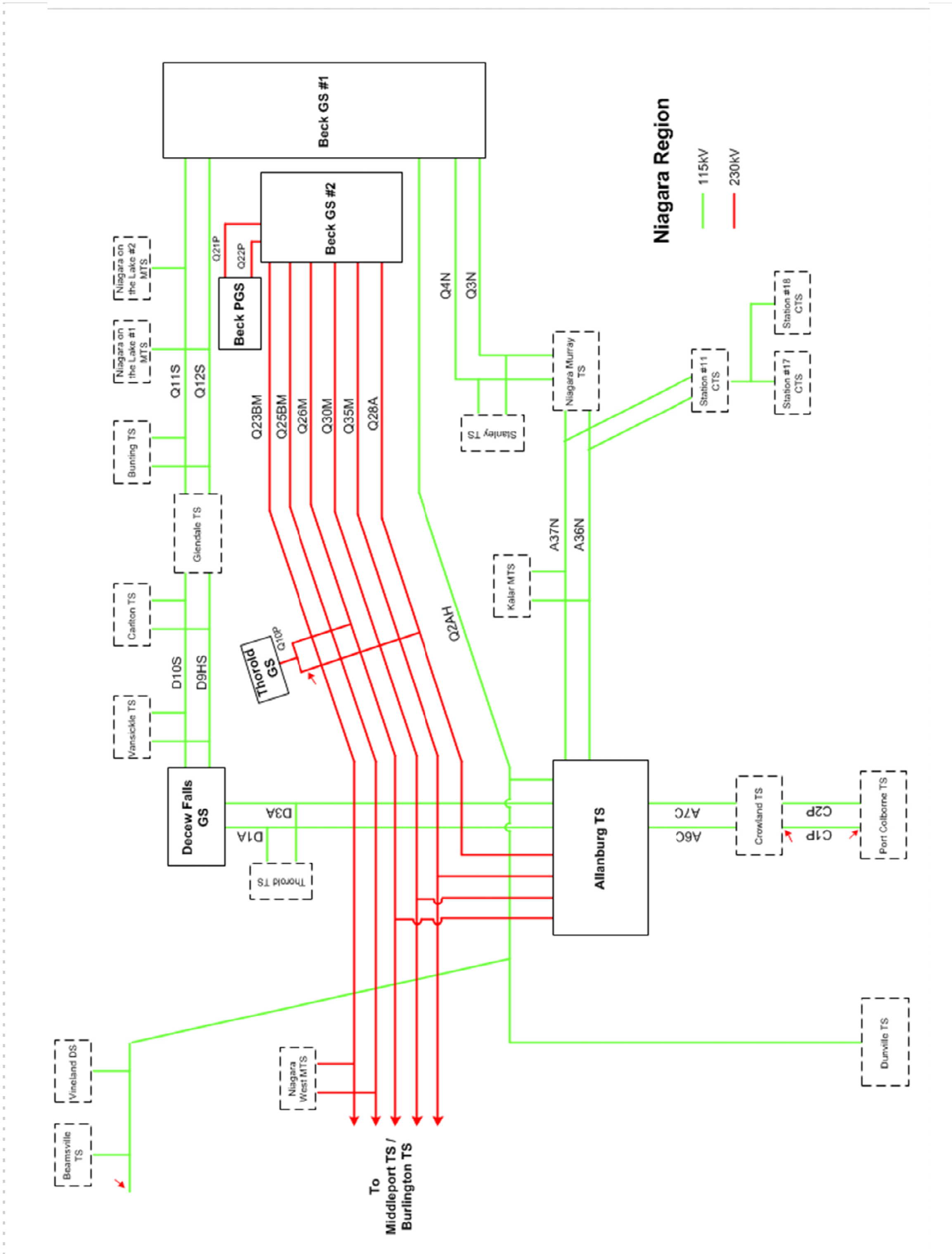

Figure 2: Simplified Niagara Regional Planning Electrical Diagram

4 Inputs and Data

In order to conduct this Needs Assessment, study team participants provided the following information and data to Hydro One:

- Actual 2013 regional coincident peak load and station non-coincident peak load provided by IESO;
- Historical (2012-2014) net load and gross load forecast (2015-2024 provided by LDCs and other Transmission connected customers;
- Conservation and Demand Management (CDM) and Distributed Generation (DG) data provided by IESO;
- Any known reliability and/or operating issues conditions identified by LDCs or the IESO;
- Planned transmission and distribution investments provided by the transmitter and LDCs, etc.

4.1 Load Forecast

As per the data provided by the study team, the gross load in region is expected to grow at an average rate of approximately 0.61% annually from 2015-2024.

The net load forecast takes the gross load forecast and applies the planned CDM targets and DG contributions. With these factors in place, the total regional load is expected to decrease at an average rate of approximately 0.26% annually from 2015-2024.

5 Needs Assessment Methodology

The following methodology and assumptions are made in this Needs Assessment:

1. The Region is summer peaking so this assessment is based on summer peak loads.
2. Forecast loads are provided by the Region's LDCs.
3. Load data for the industrial customers in the region were assumed to be consistent with historical loads.
4. Accounting for (2), (3), above, the gross load forecast and a net load forecast were developed. The gross load forecast is used to develop a worst case scenario to identify needs. Where there are issues, the net load forecast which accounts for CDM and DG are analyzed to determine if the needs can be deferred. A gross and net non-coincident peak load forecast was used to perform the analysis for this report.

5. Review impact of any on-going and/or planned development projects in the Region during the study period.
6. Review and assess impact of any critical/major elements planned/identified to be replaced at the end of their useful life such as autotransformers, cables, and stations.
7. Station capacity adequacy is assessed by comparing the non-coincident peak load with the station's normal planning supply capacity assuming a 90% lagging power factor for stations having no low-voltage capacitor banks or the historical low voltage power factor, whichever is more conservative. For stations having low-voltage capacitor banks, a 95% lagging power factor was assumed or the historical low-voltage power factor, whichever is more conservative. Normal planning supply capacity for transformer stations in this Region is determined by the summer 10-Day Limited Time Rating (LTR). Summer LTR ratings were reviewed to assess the worst possible loading scenario from a ratings perspective.
8. Extreme weather scenario factor at 1.037 was also assessed for capacity planning over the study term.
9. To identify emerging needs in the Region and determine whether or not further coordinated regional planning should be undertaken, the study was performed observing all elements in service and only one element out of service.
10. Transmission adequacy assessment is primarily based on, but is not limited to, the following criteria:
    - With all elements in service, the system is to be capable of supplying forecast demand with equipment loading within continuous ratings and voltages within normal range.
    - With one element out of service, the system is to be capable of supplying forecast demand with circuit loading within their summer long-term emergency (LTE) ratings. Thermal limits for transformers are acceptable using summer loading with summer 10-day LTR.
    - All voltages must be within pre and post contingency ranges as per Ontario Resource and Transmission Assessment Criteria (ORTAC) criteria.
    - With one element out of service, no more than 150 MW of load is lost by configuration. With two elements out of service, no more than 600 MW of load is lost by configuration.

- With two elements out of service, the system is capable of meeting the load restoration time limits as per ORTAC criteria.

6 Results

6.1 Transmission Capacity Needs

230/115 kV Autotransformers

The 230/115kV transformers supplying the region are adequate for loss of single unit.

Transmission Lines & Ratings

The 230 kV circuits supplying the Region are adequate over the study period for the loss of a single 230 kV circuit in the Region.

The 115 kV circuits supplying the Region are adequate over the study period with Q4N as an exception between Sir Adam Beck SS #1 x Portal Junction.

230 kV and 115 kV Connection Facilities

A station capacity assessment was performed over the study period for the 230 kV and 115 kV transformer stations in the Region using the station summer peak load forecast provided by the study team. All stations in the area have adequate supply capacity for the study period even in the event of extreme weather scenario.

6.2 System Reliability, Operation and Restoration

6.2.1 Load Restoration

Load restoration is adequate in the area and meet the ORTAC load restoration criteria.

The needs assessment did not identify any additional issues with meeting load restoration as per the ORTAC load restoration criteria.

6.2.2 Thermal Overloading on Q4N Section

Under high generation scenarios at Sir Adam Beck GS #1, the loading on the *Beck SS #1 x Portal Junction* section (egress out from the GS) of 115kV circuit Q4N can exceed circuit ratings. Hydro One already has plans to address this issue as part of the Beck SS #1 Refurbishment Project.

6.2.3 Power Factor at Thorold TS

A few instances (<54 hours / year) of power factor below 0.9 (between 0.89 - 0.9) were observed at the HV side of Thorold TS. Hydro One Distribution will investigate these instances and work with Distribution customers to address.

7 Aging Infrastructure and Replacement Plan of Major Equipment

Hydro One reviewed the sustainment initiatives that are currently planned for the replacement of any autotransformers and power transformers during the study period. At this time, the following sustainment work is planned at the following stations:

- DeCew Falls SS Circuit Breaker Replacement (2017)
- Sir Adam Beck SS #1 115kV Refurbishment Project (2018)
- 115kV Q11/Q12S Line Refurbishment from Glendale TS to Beck SS #1 (2019)
- Carlton TS; Switchgear Replacement (2020)
- Sir Adam Beck SS #2 230kV Circuit Breakers Replacement (2020)
- Glendale TS; Station Refurbishment and Reconfiguration (2021)
- Stanley TS; Station Refurbishment (2021)
- Thorold TS; Transformer Replacement (2021)
- Crowland TS; Transformer Replacement (2021)

8 Recommendations

Based on the findings and discussion in Section 6 and 7 of this report, the study team recommends that no further regional coordination or further planning is required. The region will be reassessed within five years as part of the next planning cycle.

9 Next Steps

No further Regional Planning is required at this time. The Niagara Region Regional Planning will be reassessed during the next planning cycle or at any time should unforeseen conditions or needs warrant to initiate the regional planning for the region.

10 References

i) Planning Process Working Group (PPWG) Report to the Board: The Process for Regional Infrastructure Planning in Ontario – May 17, 2013

ii) IESO 18-Month Outlook: March 2014 – August 2015

iii) IESO Ontario Resource and Transmission Assessment Criteria (ORTAC) – Issue 5.0

Appendix A: Non-Coincident Winter Peak Load Forecast

Transformer Station Name	Customer Data (MW)	Historical Data (MW)			Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Allanburg TS	Net Load Forecast	33.4	35.4	29.6										
Hydro One	Gross Peak Load				31.1	31.3	31.4	31.6	32.0	32.4	32.6	32.7	32.9	33.1
NPEI - Embedded	Gross Peak Load - DG - CDM				30.8	30.7	30.6	30.4	30.4	30.5	30.5	30.5	30.5	30.5
Beamsville TS	Net Load Forecast	53.6	55.9	49.0										
Hydro One	Gross Peak Load				54.9	55.6	56.8	58.0	59.2	59.4	59.6	59.8	60.0	60.2
Grimsby Power, NPEI - Embedded	Gross Peak Load - DG - CDM				54.1	54.2	55.0	55.5	56.1	55.8	55.6	55.5	55.4	55.3
Bunting TS	Net Load Forecast	58.3	55.9	49.6										
Horizion Utilities	Gross Peak Load				53.1	53.3	53.4	53.5	53.7	53.8	53.9	54.1	54.2	54.3
	Gross Peak Load - DG - CDM				52.5	52.1	51.8	51.4	51.0	50.7	50.5	50.3	50.2	50.1
Carlton TS	Net Load Forecast	100.1	98.3	76.7										
Horizion Utilities	Gross Peak Load				78.4	79.5	79.7	79.9	80.1	80.3	80.5	80.7	80.9	81.1
	Gross Peak Load - DG - CDM				77.6	77.8	77.5	76.8	76.1	75.7	75.4	71.6	71.4	71.2
Crowland TS	Net Load Forecast	89.1	93.6	74.6										
Welland Hydro	Gross Peak Load				75.2	77.5	78.5	80.0	81.0	82.0	83.0	84.0	85.0	86.0
Hydro One, CNPI - Embedded	Gross Peak Load - DG - CDM				70.4	71.9	72.3	72.9	73.0	73.3	73.8	74.2	74.8	75.3
Dunnville TS	Net Load Forecast	25.3	27.0	24.1										
Haldimand County Hydro	Gross Peak Load				24.1	24.3	24.4	24.5	24.7	24.9	25.0	25.1	25.2	25.4
Hydro One - Embedded	Gross Peak Load - DG - CDM				19.8	19.7	19.6	19.4	19.4	19.3	19.3	19.3	19.3	19.3
Glendale TS	Net Load Forecast	61.5	59.1	60.1										
Horizion Utilities	Gross Peak Load				66.5	62.5	62.6	62.8	62.9	63.1	63.2	63.4	63.5	63.7
	Gross Peak Load - DG - CDM				65.7	61.0	60.7	60.2	59.7	59.3	59.1	58.9	58.8	58.6
Kalar MTS	Net Load Forecast	39.5	38.6	33.9										
NPEI	Gross Peak Load				39.8	40.0	40.2	40.4	40.6	40.8	41.0	41.2	41.4	41.6
	Gross Peak Load - DG - CDM				39.4	39.2	39.1	38.8	38.6	38.5	38.4	38.4	38.4	38.4

Transformer Station Name	Customer Data (MW)	Historical Data (MW)			Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Niagara Murray TS	Net Load Forecast	97.0	101.7	90.2										
Hydro One	Gross Peak Load				89.7	90.0	90.4	90.7	91.0	91.4	91.7	92.0	92.4	92.7
NPEI - Embedded	Gross Peak Load - DG - CDM				88.9	88.3	88.0	87.4	86.9	86.5	86.3	86.2	86.1	86.0
Niagara On the Lake #1 MTS	Net Load Forecast	23.8	22.3	22.3										
Niagara On the Lake	Gross Peak Load				24.9	25.3	25.7	26.1	26.5	26.9	27.3	27.7	28.1	28.5
	Gross Peak Load - DG - CDM				24.7	24.8	25.0	25.1	25.2	25.3	25.6	25.8	26.1	26.3
Niagara On the Lake #2 MTS	Net Load Forecast	20.7	22.6	18.3										
Niagara On the Lake	Gross Peak Load				18.9	19.2	19.5	19.8	20.1	20.4	20.7	21.0	21.3	21.7
	Gross Peak Load - DG - CDM				18.8	18.8	19.0	19.0	19.1	19.2	19.4	19.6	19.8	20.0
Niagara West MTS	Net Load Forecast	47.5	43.5	35.7										
Grimsby Power	Gross Peak Load				35.8	35.9	36.1	36.5	36.7	37.0	37.2	37.6	37.8	38.1
NPEI Embedded	Gross Peak Load - DG - CDM				34.4	34.2	34.0	34.0	33.8	31.2	31.2	31.4	31.4	31.5
Stanley TS	Net Load Forecast	59.8	58.9	52.4										
NPEI	Gross Peak Load				52.7	52.9	53.1	53.3	53.5	53.7	53.9	54.1	54.3	54.5
	Gross Peak Load - DG - CDM				52.1	51.7	51.5	51.1	50.8	50.5	50.4	50.3	50.3	50.2
Station 17 TS	Net Load Forecast		16.1	16.6										
CNP	Gross Peak Load				16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
	Gross Peak Load - DG - CDM				16.4	16.2	16.1	15.9	15.8	15.6	15.5	15.5	15.4	15.3
Station 18 TS	Net Load Forecast		32.3	35.2										
CNP	Gross Peak Load				35.2	37.7	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2
	Gross Peak Load - DG - CDM				34.8	36.9	39.1	38.6	38.2	37.9	37.7	37.4	37.3	37.1
Port Colborne TS	Net Load Forecast		40.2	35.7										
CNP	Gross Peak Load				30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8
	Gross Peak Load - DG - CDM				30.3	30.0	29.8	29.4	29.1	28.9	28.7	28.5	28.4	28.2

Transformer Station Name	Customer Data (MW)	Historical Data (MW)			Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Thorold TS	Net Load Forecast	20.1	21.3	18.4										
Hydro One	Gross Peak Load				21.3	21.5	21.6	21.7	22.0	22.2	22.4	22.5	22.6	22.7
	Gross Peak Load - DG - CDM				21.1	21.1	20.9	20.8	20.9	20.9	20.9	20.9	20.9	20.9
Vansickle TS	Net Load Forecast	46.3	53.3	43.7										
Horizion Utilities	Gross Peak Load				44.1	44.5	44.6	44.8	44.9	45.0	45.1	45.2	45.3	45.4
	Gross Peak Load - DG - CDM				43.7	43.6	43.4	43.0	42.7	42.4	42.2	42.1	42.0	41.9
Vineland TS	Net Load Forecast	17.4	17.0	17.0										
Hydro One	Gross Peak Load				21.9	22.3	22.4	22.7	23.1	23.5	23.8	24.0	24.3	24.5
NPEI - Embedded	Gross Peak Load - DG - CDM				21.7	21.8	21.8	21.8	22.0	22.2	22.3	22.4	22.5	22.6

Appendix B: Acronyms

BES	Bulk Electric System
BPS	Bulk Power System
CDM	Conservation and Demand Management
CIA	Customer Impact Assessment
CGS	Customer Generating Station
CTS	Customer Transformer Station
DESN	Dual Element Spot Network
DG	Distributed Generation
DSC	Distribution System Code
GS	Generating Station
HVDS	High Voltage Distribution Station
IESO	Independent Electricity System Operator
IRRP	Integrated Regional Resource Planning
kV	Kilovolt
LDC	Local Distribution Company
LTE	Long Term Emergency
LTR	Limited Time Rating
LV	Low-voltage
MW	Megawatt
MVA	Mega Volt-Ampere
NERC	North American Electric Reliability Corporation
NGS	Nuclear Generating Station
NPCC	Northeast Power Coordinating Council Inc.
NA	Needs Assessment
OEB	Ontario Energy Board
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PF	Power Factor
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RIP	Regional Infrastructure Planning
SIA	System Impact Assessment
SS	Switching Station
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TSC	Transmission System Code
ULTC	Under Load Tap Changer

Hydro One Networks Inc.
483 Bay Street
Toronto, Ontario
M5G 2P5

LOCAL PLANNING REPORT

Q4N THERMAL OVERLOAD

Region: Niagara

Revision: Final
Date: November 11th 2016

Prepared by: Niagara Region Study Team

Niagara Region Local Planning Study Team
Hydro One Networks Inc. (Lead Transmitter)
Hydro One Networks Inc. (Distribution)
Canadian Niagara Power Inc.
Grimsby Power Inc.
Haldimand County Hydro Inc.
Horizon Utilities Corp.
Niagara Peninsula Energy Inc.
Niagara on the Lake Hydro Inc.
Welland Hydro Electric System Corp.

Disclaimer

This Local Planning Report was prepared for the purpose of developing wires options and recommending a preferred solution(s) to address the local needs identified in the Needs Assessment (NA) report for the Niagara Region that do not require further coordinated regional planning. The preferred solution(s) that have been identified through this Local Planning Report may be reevaluated based on the findings of further analysis. The load forecast and results reported in this Local Planning Report are based on the information and assumptions provided by study team participants.

Study team participants, their respective affiliated organizations, and Hydro One Networks Inc. (collectively, "the Authors") make no representations or warranties (express, implied, statutory or otherwise) as to the Local Planning Report or its contents, including, without limitation, the accuracy or completeness of the information therein and shall not, under any circumstances whatsoever, be liable to each other, or to any third party for whom the Local Planning Report was prepared ("the Intended Third Parties"), or to any other third party reading or receiving the Local Planning Report ("the Other Third Parties"), for any direct, indirect or consequential loss or damages or for any punitive, incidental or special damages or any loss of profit, loss of contract, loss of opportunity or loss of goodwill resulting from or in any way related to the reliance on, acceptance or use of the Local Planning Report or its contents by any person or entity, including, but not limited to, the aforementioned persons and entities.

LOCAL PLANNING EXECUTIVE SUMMARY

REGION	Niagara Region ("Region")		
LEAD	Hydro One Networks Inc. ("Hydro One")		
START DATE	16 May 2016	**END DATE**	1 November 2016

1. INTRODUCTION

The purpose of this Local Planning ("LP") report is to develop and recommend a preferred wires solution that will address the local needs identified in the Needs Assessment (NA) report for the Niagara Region. The development of the LP report is in accordance with the regional planning process as set out in the Planning Process Working Group ("PPWG") Report to the Ontario Energy Board's ("OEB") and mandated by the Transmission System Code ("TSC") and Distribution System Code ("DSC").

2. LOCAL NEEDS REVIEWED IN THIS REPORT

This report reviewed the potential thermal rating violation for the Beck SS #1 x Portal Junction section of the 115kV Q4N circuit (egress out from Sir Adam Beck GS #1).

3. OPTIONS CONSIDERED

The following options were considered:

- Option 1: Status Quo
- Option 2: Uprate Circuit Section

4. PREFERRED SOLUTIONS

Option 2 is the preferred option. The uprating of limiting section of the circuit is included in Hydro One's Sustainment plan.

5. RECOMMENDATIONS

It is recommended that the circuit section upgrade proceed with current with an expected in-service date of December 2019.

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LIST OF FIGURES

1 Introduction

The Needs Assessment (NA) for the Niagara Region ("Region") was triggered in response to the Ontario Energy Board's (OEB) Regional Infrastructure Planning process approved in August 2013. The NA for the Niagara Region was prepared jointly by the study team, including LDCs, Independent Electric System Operator (IESO) and Hydro One. The NA report can be found on Hydro One's Regional Planning website. The study team identified needs that are emerging in the Region over the next ten years (2015 to 2024) and recommended that they should be further assessed through the transmitter-led Local Planning (LP) process.

As part of the NA report for the Niagara Region, it identified that under high generation scenarios at Sir Adam Beck GS #1, the loading on the Beck SS #1 x Portal Junction section (egress out from the GS) of 115kV circuit Q4N can exceed circuit ratings in IESO's System Impact Assessment for the Sir Adam Beck-1 GS – Conversion of units G1 and G2 to 60 Hz

This Local Planning report was prepared by Hydro One Networks Inc. ("HONI"). This report captures the results of the assessment based on information provided by LDCs and HONI.

2 Regional Description and Circuit Q4N Description

Sir Adam Beck GS #1 is an 115kV hydroelectric generating station located on the Niagara Escarpment north of Niagara Falls in Queenston. Geographically, it roughly borders Highway 405 and the Canadian-American border via the Niagara River.

Electrical supply from Sir Adam Beck GS #1 is currently provided through eight (8) OPG generators connected to Hydro One's 115kV solid 'E' bus inside the station. Supply to the local 115kV area is delivered via five (5) Hydro One circuits (Q2AH, Q3N, Q4N, Q11S, Q12S) from 115kV 'E' bus within the power house. The 115 kV 'E' bus serves as a switching station for the Hydro One network as well as a connection facility for OPGI's generators. The generators, transformers and circuits on the 'E' bus are sectionalized via switches.

A single line diagram is shown of the 115 kV system originating from the 115kV Sir Adam Beck GS #1 in Figure 1.

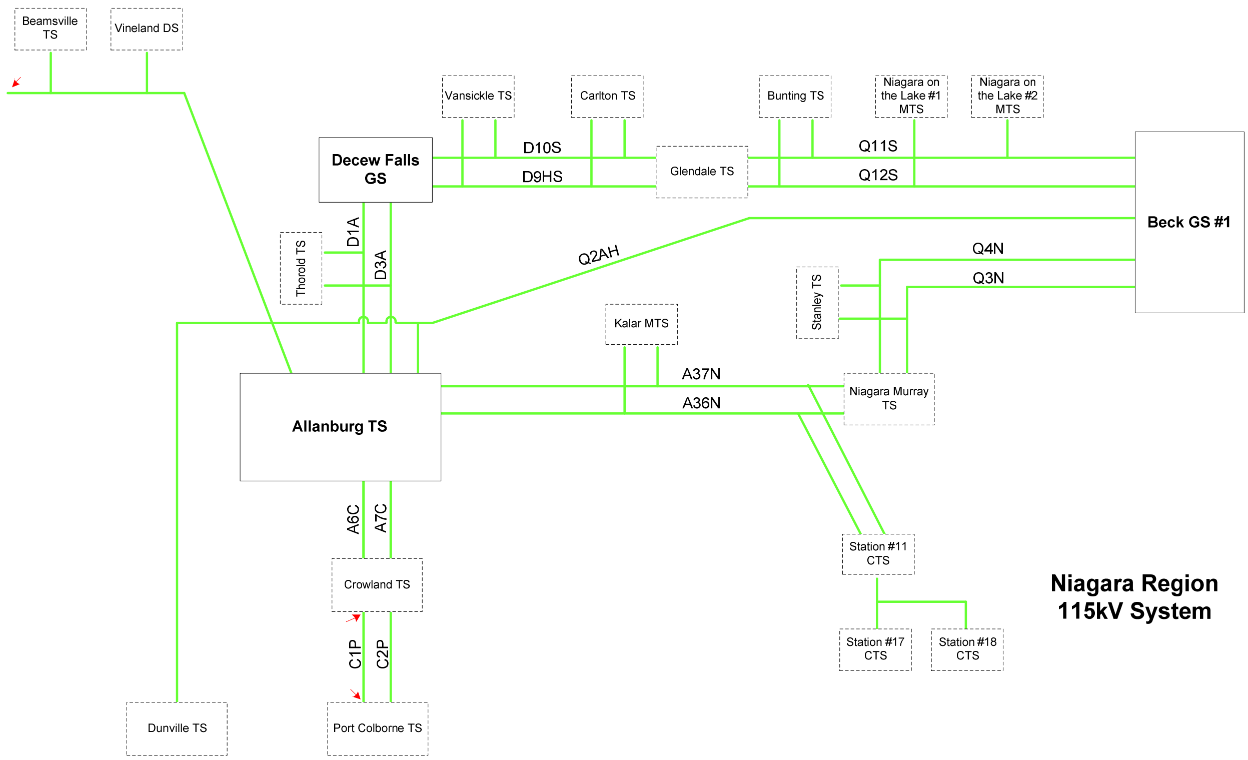

Figure 1: Single Line Diagram – Niagara Region 115kV System

From the NA report for the Niagara Region, a possible thermal limit issue on a section of the circuit Q4N was identified. Q4N is an approximately 9 km long, 115kV radial circuit from Sir Adam Beck GS #1, supplying Stanley TS and Niagara Murray TS.

The section of Q4N identified in the NA comprises of the section from Sir Adam Beck GS #1 to Portal Junction. This section of circuit is shown in Figure 2.

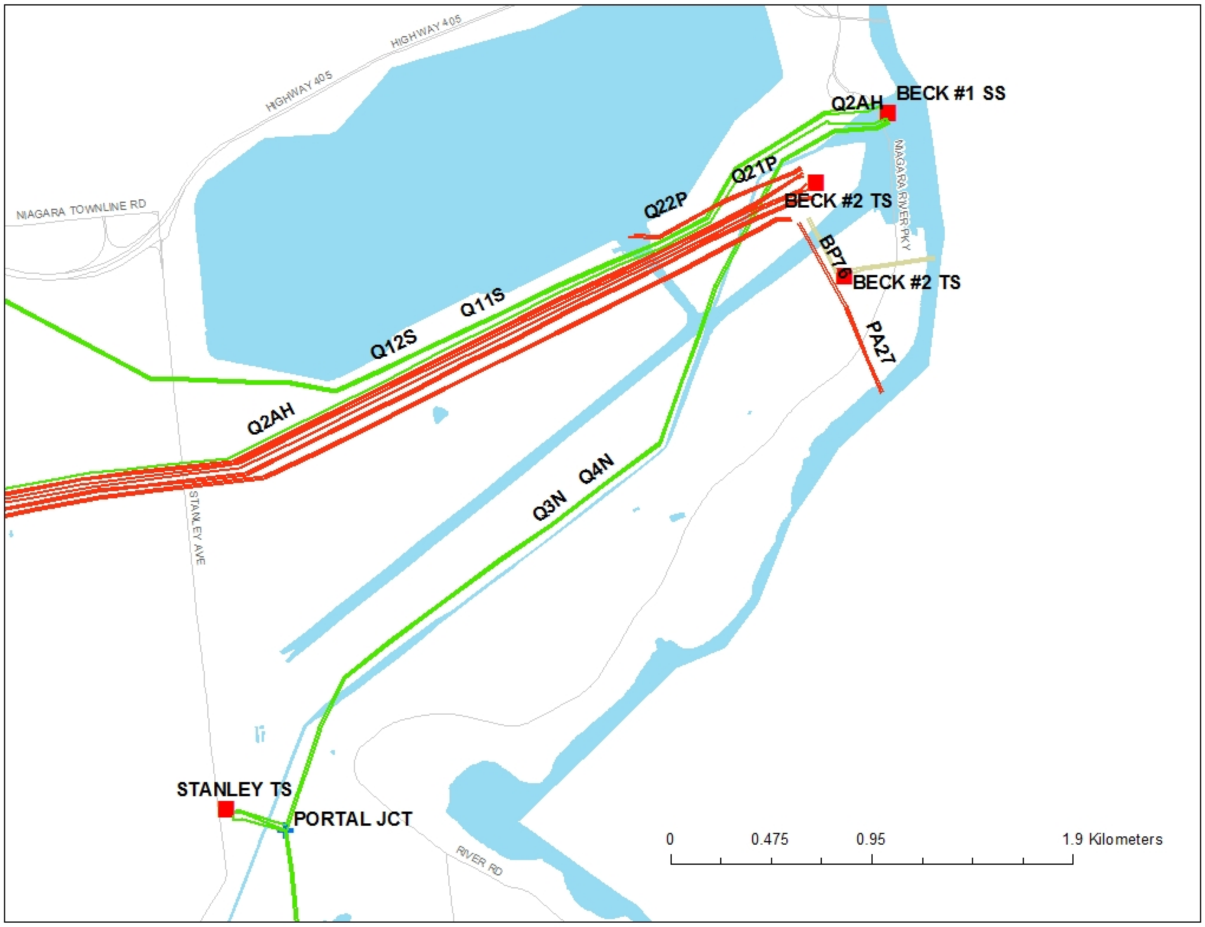

Figure 2: Single Line Diagram – Q4N from Beck #1 SS to Portal Junction

3 Local Niagara Need (Q4N)

In the past decade, OPG has been steadily increasing the power output of their generators with station upgrades.

In the IESO SIA for "Sir Adam Beck-1 GS – Conversion of units G1 and G2 to 60 Hz" it was identified that the thermal loading on circuit section Q4N from Beck #1 SS to Portal junction exceeds its continuous rating by 109.6% at total generation output of Sir Adam Beck #1 GS. This study was based on 2018 summer peak demand with high generation dispatch in the 115 kV transmission system in the vicinity with the existing 8 generators and 2 future generators (G1 and G2) at full output. This thermal loading is based on an ambient 35ºC temperature condition with 4 km/hr wind speed during daytime.

Reducing the generation output of Sir Adam Beck #1 GS from its maximum capacity of 556 MW to 509 MW reduces the loading on Q4N (Beck #1 SS by Portal Junction) to below its continuous rating.

4 Study Result / Options Considered

The conductor on a 64m section of the 115kV circuit Q4N between Sir Adam Beck SS #1 and Portal Jct. is comprised of 605.0 kcmil aluminum, 54/7 ACSR. The continuous rating for this type of conductor at 93°C is 680A. The options considered are outlined below.

4.1 Option 1: Status Quo

Status Quo is not an option because there is a risk that for maximum generation dispatch in extreme weather conditions. Under these conditions generation would have to be curtailed to meet line thermal rating requirements and thus causing financial losses to customer.

4.2 Option 2: Uprate Conductor Section

Hydro One has plans already in place to replace the existing section of conductor with a 910A continuous rated conductor at 93°C as part of their Beck #1 SS Refurbishment project. This will enable this section of circuit to meet all pre and post contingency thermal limits during max generation and under extreme weather conditions.

5 Recommendations

It is recommended that Hydro One continues with their sustainment plans (Option 2) on replacing the section of the 115kV circuit Q4N between Sir Adam Beck SS #1 and Portal Jct. with a larger ampacity conductor (increase of 680A to 910A).

The expected in-service date for this conduction section upgrade is December 2019.

6 References

i) Planning Process Working Group (PPWG) Report to the Board: The Process for Regional Infrastructure Planning in Ontario – May 17, 2013
ii) IESO Ontario Resource and Transmission Assessment Criteria (ORTAC) – Issue 5.0
iii) Needs Assessment Report Niagara Region

Appendix A: Load Forecast

Transformer Station Name	Customer Data (MW)	Historical Data (MW)			Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Allanburg TS	Net Load Forecast	33.4	35.4	29.6										
Hydro One, NPEI - Embedded	Gross Peak Load				31.1	31.3	31.4	31.6	32.0	32.4	32.6	32.7	32.9	33.1
	Gross Peak Load - DG - CDM				30.8	30.7	30.6	30.4	30.4	30.5	30.5	30.5	30.5	30.5
Beamsville TS	Net Load Forecast	53.6	55.9	49.0										
Hydro One & NPEI, Grimsby Power, NPEI - Embedded	Gross Peak Load				54.9	55.6	56.8	58.0	59.2	59.4	59.6	59.8	60.0	60.2
	Gross Peak Load - DG - CDM				54.1	54.2	55.0	55.5	56.1	55.8	55.6	55.5	55.4	55.3
Bunting TS	Net Load Forecast	58.3	55.9	49.6										
Horizion Utilities	Gross Peak Load				53.1	53.3	53.4	53.5	53.7	53.8	53.9	54.1	54.2	54.3
	Gross Peak Load - DG - CDM				52.5	52.1	51.8	51.4	51.0	50.7	50.5	50.3	50.2	50.1
Carlton TS	Net Load Forecast	100.1	98.3	76.7										
Horizion Utilities	Gross Peak Load				78.4	79.5	79.7	79.9	80.1	80.3	80.5	80.7	80.9	81.1
	Gross Peak Load - DG - CDM				77.6	77.8	77.5	76.8	76.1	75.7	75.4	71.6	71.4	71.2
Crowland TS	Net Load Forecast	89.1	93.6	74.6										
Welland Hydro & Hydro One, CNPI - Embedded	Gross Peak Load				75.2	77.5	78.5	80.0	81.0	82.0	83.0	84.0	85.0	86.0
	Gross Peak Load - DG - CDM				70.4	71.9	72.3	72.9	73.0	73.3	73.8	74.2	74.8	75.3
Dunnville TS	Net Load Forecast	25.3	27.0	24.1										
Hydro One	Gross Peak Load				24.1	24.3	24.4	24.5	24.7	24.9	25.0	25.1	25.2	25.4
	Gross Peak Load - DG - CDM				19.8	19.7	19.6	19.4	19.4	19.3	19.3	19.3	19.3	19.3

Transformer Station Name	Customer Data (MW)	Historical Data (MW)			Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Glendale TS	Net Load Forecast	61.5	59.1	60.1										
Horizion Utilities	Gross Peak Load				66.5	62.5	62.6	62.8	62.9	63.1	63.2	63.4	63.5	63.7
	Gross Peak Load - DG - CDM				65.7	61.0	60.7	60.2	59.7	59.3	59.1	58.9	58.8	58.6
Kalar MTS	Net Load Forecast	39.5	38.6	33.9										
NPEI	Gross Peak Load				39.8	40.0	40.2	40.4	40.6	40.8	41.0	41.2	41.4	41.6
	Gross Peak Load - DG - CDM				39.4	39.2	39.1	38.8	38.6	38.5	38.4	38.4	38.4	38.4
Niagara Murray TS	Net Load Forecast	97.0	101.7	90.2										
Hydro One & NPEI	Gross Peak Load				89.7	90.0	90.4	90.7	91.0	91.4	91.7	92.0	92.4	92.7
	Gross Peak Load - DG - CDM				88.9	88.3	88.0	87.4	86.9	86.5	86.3	86.2	86.1	86.0
Niagara On the Lake #1 MTS	Net Load Forecast	23.8	22.3	22.3										
Niagara On the Lake	Gross Peak Load				24.9	25.3	25.7	26.1	26.5	26.9	27.3	27.7	28.1	28.5
	Gross Peak Load - DG - CDM				24.7	24.8	25.0	25.1	25.2	25.3	25.6	25.8	26.1	26.3
Niagara On the Lake #2 MTS	Net Load Forecast	20.7	22.6	18.3										
Niagara On the Lake	Gross Peak Load				18.9	19.2	19.5	19.8	20.1	20.4	20.7	21.0	21.3	21.7
	Gross Peak Load - DG - CDM				18.8	18.8	19.0	19.0	19.1	19.2	19.4	19.6	19.8	20.0
Niagara West MTS	Net Load Forecast	47.5	43.5	35.7										
Grimsby Power, NPEI Embedded	Gross Peak Load				35.8	35.9	36.1	36.5	36.7	37.0	37.2	37.6	37.8	38.1
	Gross Peak Load - DG - CDM				34.4	34.2	34.0	34.0	33.8	31.2	31.2	31.4	31.4	31.5

Transformer Station Name	Customer Data (MW)	Historical Data (MW)			Near Term Forecast (MW)					Medium Term Forecast (MW)				
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Stanley TS	Net Load Forecast	59.8	58.9	52.4										
NPEI	Gross Peak Load				52.7	52.9	53.1	53.3	53.5	53.7	53.9	54.1	54.3	54.5
	Gross Peak Load - DG - CDM				52.1	51.7	51.5	51.1	50.8	50.5	50.4	50.3	50.3	50.2
Station 17 TS	Net Load Forecast		16.1	16.6										
CNP	Gross Peak Load				16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
	Gross Peak Load - DG - CDM				16.4	16.2	16.1	15.9	15.8	15.6	15.5	15.5	15.4	15.3
Station 18 TS	Net Load Forecast		32.3	35.2										
CNP	Gross Peak Load				35.2	37.7	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2
	Gross Peak Load - DG - CDM				34.8	36.9	39.1	38.6	38.2	37.9	37.7	37.4	37.3	37.1
Port Colborne TS	Net Load Forecast		40.2	35.7										
CNP	Gross Peak Load				30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8
	Gross Peak Load - DG - CDM				30.3	30.0	29.8	29.4	29.1	28.9	28.7	28.5	28.4	28.2
Thorold TS	Net Load Forecast	20.1	21.3	18.4										
Hydro One	Gross Peak Load				21.3	21.5	21.6	21.7	22.0	22.2	22.4	22.5	22.6	22.7
	Gross Peak Load - DG - CDM				21.1	21.1	20.9	20.8	20.9	20.9	20.9	20.9	20.9	20.9
Vansickle TS	Net Load Forecast	46.3	53.3	43.7										
Horizion Utilities	Gross Peak Load				44.1	44.5	44.6	44.8	44.9	45.0	45.1	45.2	45.3	45.4
	Gross Peak Load - DG - CDM				43.7	43.6	43.4	43.0	42.7	42.4	42.2	42.1	42.0	41.9
Vineland DS	Net Load Forecast	17.4	17.0	17.0										
Hydro One, NPEI - Embedded	Gross Peak Load				21.9	22.3	22.4	22.7	23.1	23.5	23.8	24.0	24.3	24.5
	Gross Peak Load - DG - CDM				21.7	21.8	21.8	21.8	22.0	22.2	22.3	22.4	22.5	22.6

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TSC	Transmission System Code
ULTC	Under Load Tap Changer

APPENDIX J

Grimsby Capacity Planning Study

Grimsby Capacity Planning Study

Prepared for

Grimsby Power Inc.

Rev 0

Revisions		
No.	Date	Description
A	March 31, 2021	Issued for client review
B	April 13, 2021	Issued for client review
0	July 22, 2021	Issued final

Prepared by

Mitchel Brown, EIT

Reviewed by

Andrew Durward, P.Eng.

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Appendices

1.0 **Executive Summary**

Grimsby Power Inc. (GPI) is the local distribution company responsible for the supply of electrical power to the Town of Grimsby, ON. This study was undertaken to review the existing supply capacity and anticipated load growth to determine what capital investments should be planned to ensure a reliable and efficient electrical supply to the town.

Implementation of the Niagara West M8 feeder is required by the summer of 2021 to provide adequate supply to customer load.

Additional supply facilities are required to provide reliable supply to peak loads under contingency conditions. Options include:

- Increase available capacity on Beamsville M3 & M4
- Niagara West M7 Feeder

2.0 Study Methodology

2.1. Purpose

The purpose of this study was to review the adequacy of electrical supply to the Town of Grimsby, develop a ten-year load forecast and determine the requirement for additional supply facilities.

2.2. Load Forecast

A ten-year load forecast was developed based on a combination of planned developments and percentage load growth. A high growth scenario and a low growth scenario were provided to address future uncertainty.

For the low growth scenario, the first five years of the load forecast consist of known planned developments. Growth in years six to ten were modelled as an annual percentage load increase.

For the high growth scenario, a percentage annual growth was added in the first five years to address unidentified projects, in addition to the known planned developments.

Actual loads will differ from the forecast, but the approach provides a suitable range for planning purposes. Final commitments for capital projects will be made closer to the time they are needed and based on updated information.

2.3. Capacity Planning

Capacity planning requires considering various contingencies of planned and unplanned equipment outages. Planned outages are required for equipment maintenance and construction. Unplanned outages can be caused by equipment failure, weather, animal contacts, motor vehicle accidents, and more unforeseen acts.

The following contingency analysis requirements were established for this study:

1.) The system should be able to supply current peak demand load for all single contingency outages.

2.) The system should be able to supply future peak demand load for all single contingency outages. Where existing supply facilities are not adequate, additional supply requirements should be identified including capacity and timing.

3.) Double contingency outages should be studied to determine the impact on customer supply. Where supply facilities are not adequate, additional supply and/or emergency plans should be developed to address the issue in a cost-effective manner.

4.) Feeder voltage should be maintained above 95% (26.2kV) under contingency conditions.

3.0 Load Forecast

A ten-year load forecast was created by adding planned developments and assumed load growth to existing peak demand load data.

3.1. Existing Peak Load

Peak demand remained relatively flat from 2006 to 2020, with minor annual variations likely attributable to weather conditions.

The 2020 GPI peak of 46.2MW occurred on July 27th, 2020 at 16:35. The feeder breakdown is shown in Table 1.

Feeder	Peak Load (MW)
18M3	9.7
18M4	12.2
2508M3	15.8
2508M4	8.5
Total	**46.2**

Table 1 - Feeder Loads at 2020 Peak

See attached graphs in Appendix A for additional detail.

3.2. Planned Developments

Planned developments in Grimsby include both residential and commercial.

Planned residential developments were modelled by assuming a peak demand value per housing unit and multiplying by the number of units projected to be connected in each year.

Development	Unit Load (kW demand)
Condominium	1.75kW
Subdivision	1.75kW

Table 2 - Residential Unit kW Demand

The load was modelled starting with the development in-service date, and building up to 100% over the following years. This distributed model matches the observed development patterns and also addresses potential changes in construction schedules. The following occupancy models were used.

Development	**Year 1**	**Year 2**	**Year 3**	**Year 4**
Condominium	33%	33%	33%	
Subdivision	25%	25%	25%	25%

Table 3 - Residential Development Occupancy Schedule

Commercial developments were included in the forecast using load data provided by the developers, and assuming 100% of their load connected on their projected in-service date.

3.3. Load Growth

The study recognized that future growth may occur from developments that have not been identified and are not yet part of the planning process. A percentage growth factor was used to illustrate this load, and high and low growth rates assumed to account for planning uncertainty.

Most of the planned developments will occur in years 1-5 so a lower rate was used in that time period, compared to years 6-10. In years 6-10 all of the growth in the forecast is from the percentage growth.

Scenario	**Years 1-5**	**Years 6-10**
Low Growth	0.0 %	1.0 %
High Growth	1.0 %	3.0 %

Table 4 - Load Growth Rates

3.4. Growth Areas

The majority of the load in the GPI service territory exists between the Niagara Escarpment and Lake Ontario along the QEW corridor. This area includes residential, commercial and light industrial developments and is mostly developed.

The Town of Grimsby Official Plan identifies two Major Intensification Areas:

- Winston Rd/GO Transit Station
- Downtown District

The Winston Rd and GO Transit Station development area centers around the Casablanca Blvd./QEW interchange and includes high and medium density mixed-use zoning. The majority of planned developments are in this area which is currently serviced by the 18M4 and 2508M3 feeders. Additional development loads are expected when the GO station is developed, but the project was halted in November 2018 due to funding changes.

In the Downtown District, there is one planned condo development and some smaller residential developments, but no major planned loads at this time.

The area above the escarpment is primarily zoned specialty crop, agricultural and environmentally protected and no significant load growth is expected.

3.5. Summary

There is currently 10.9 MW of planned load growth to be connected by the 2021 summer peak, primarily located in the north west corner of the service territory. The cannabis industry is the main component of this growth, including the following developments:

- 4.2 MW Aleafia development (already connected)
- 6.3MW cannabis brewery (under construction)

The remainder of the planned development is residential.

Under the low growth scenario, peak load is projected to increase to:

- 61.4 MW by 2025,
- 63.8 MW by 2030.

Under the high growth scenario, peak load is projected to increase to:

- 63.6 MW by 2025,
- 73.8 MW by 2030.

4.0 Existing Supply Facilities

Existing supply to the Town is via four (4) 27.6kV feeders from two (2) transformer stations.

4.1. Beamsville TS

Beamsville TS (NF18) is located in the Town of Beamsville approximately 3km east of Grimsby. The station is owned and operated by Hydro One.

GPI receives supply from two feeders, 18M3 and 18M4, which run west from the station to the Town of Grimsby.

The feeders are capable of supplying up to 400 amps each but are shared between Niagara Peninsula Energy Inc. and GPI. Existing capacity to GPI is approximately 21.6 MVA. There is no contractual arrangement for sharing the capacity between GPI and NPEI, and no documented limit of supply capability by Hydro One.

Beamsville TS Feeders	Amps	MVA
18M3	200*	9.6
18M4	250*	12.0
Total	**450**	**21.6**

Table 5 - Beamsville TS Feeder Capacity (Assumed)

Loads connected to the NPEI portion of these feeders may impact the capacity available to Grimsby Power.

4.2. Niagara West TS

Niagara West TS is located in the Township of West Lincoln approximately 2.5km south of Grimsby. The station is a 230/27.6kV dual transformer, dual bus, DESN style station owned by GPI. The station has a nominal capacity of 66.7 MVA (63.4 MW @ 0.95PF) based on the fully cooled rating of one transformer.

Station load peaked at 41.9 MW in 2020.

GPI receives supply from two feeders, 2508M3 and 2508M4, which run north from the station to the Town of Grimsby.

NPEI receives supply from feeders 2508M2 and 2508M5. NPEI load peaked at 19.2 MW in 2020.

The remaining positions M7 and M8 are spare feeder positions. Station egress is required.

There are plans to build the M8 feeder to the Grimsby service territory in 2021.

The feeders are rated for 600 amps nominal but operating capacity is limited to 480 amps, based on 80% of the phase relay pickup setting of 600 amps.

For planning purposes, and to limit voltage drop to the north end of the Grimsby service area, the feeders are considered capable of supplying 400 amps each for a total capacity of 38.2 MVA (36.3 MW @ 0.95PF). This approach provides a 20% operating contingency above the planning capacity.

Niagara West TS Feeders	Amps	MVA
2508M3	400	19.1
2508M4	400	19.1
2508M8	400	19.1
Total	**1200**	**57.3**

Table 6 - Niagara West TS Feeder Capacity

4.3. Embedded Generation

GPI has connected approximately 2.3MW of embedded generation, consisting of:

- 1.13 MW of solar photo-voltaic
- 1.00 MW of biogas fuel
- 0.13 MW of natural gas fuel

Embedded generation improves system capacity but is not a reliable source for meeting peak demand. System peak demand is typically achieved between 4:00-6:00pm on a weekday and embedded generation may not be operating at full capacity at that time. Solar PV generation peaks between 12:00-1:00pm and drops to 50% of peak by 5:00pm. Solar production is also weather dependent and output is reduced by cloud cover. The biogas fuelled project has been operating at reduced output for some time.

GPI is not aware of any planned embedded generation to be connected in the future, and the FIT programs have been discontinued by the Provincial Government.

For the purposes of this planning study, it was decided to ignore embedded generation as a capacity source due to the low amount available and uncertainty of output during system peak. If conditions change in the future this should be revisited.

4.4. Total Existing Supply Capacity

The total existing supply capacity for 2021 is 78.9 MVA (74.9 MW @0.95PF), including the committed feeder 2508M8.

4.5. Total Existing Supply Capacity Under Contingency

When contingency conditions are considered, available capacity is reduced by the loss of the largest unit. The supply capacity with the largest feeder out of service is 59.8MVA (56.8 MW @ 0.95PF). Specific values are listed in Table 7.

Feeder	**Feeder Capacity (MVA)**					
18M3	9.6	**X**	9.6	9.6	9.6	9.6
18M4	12.0	12.0	**X**	12.0	12.0	12.0
2508M3	19.1	19.1	19.1	**X**	19.1	19.1
2508M4	19.1	19.1	19.1	19.1	**X**	19.1
2508M8	19.1	19.1	19.1	19.1	19.1	**X**
Total	**78.9**	**69.3**	**66.9**	**59.8**	**59.8**	**59.8**

Table 7 - Total Feeder Capacity

X = Out of Service

5.0 Adequacy of Existing Facilities

5.1. Supply Stations

The adequacy of the existing facilities to supply existing and forecast load is shown in Table 8.

Facility	Year Inadequate
Beamsville TS	2025[1]
Niagara West TS	2027[2] (high growth) beyond 2030 (low growth)

Table 8 - Adequacy of Existing Stations

Hydro One has initiated a needs assessment process for capacity relief at Beamsville TS, based on forecast load.

Niagara West TS can supply all forecast load until 2027 under high load growth, and until beyond 2030 under low load growth.

5.2. Supply Feeders

Existing feeders are forecast to reach their planning limits by the summer of 2021.

Additional feeders are required to provide capacity relief and ensure supply during single contingency conditions.

Total # of Feeders	Year Inadequate
4	2021

Table 9 - Adequacy of Existing Feeders

[1] Hydro One Niagara region Needs Assessment Presentation, March 2021.
[2] 206006 Niagara West TS Capacity Planning Study, Rev A, October 2020.

6.0 Additional Supply Options

There are several options for additional supply to Grimsby. There are three transformer stations within suitable feeder distance.

- Niagara West TS
- Hydro One Beamsville TS
- Hydro One Winona TS

6.1. Niagara West TS

Niagara West TS is utility owned and there are two spare breaker positions.

Suitable feeder routes from the station to the Grimsby boundary through NPEI territory would be required. Due to existing agreements, the construction of a new feeder through NPEI territory needs to be negotiated with NPEI.

6.2. Beamsville TS

Beamsville TS is owned and operated by Hydro One and is located in the Town of Beamsville approximately 3.0km east of Grimsby. The station is located within the service territory of Niagara Peninsula Energy Inc.

Hydro One has completed a capacity review and has identified that capacity expansion at Beamsville TS is required by 2025.

A new feeder from Beamsville TS would require discussions with Hydro One to determine the feasibility, scope and capital contribution.

A new feeder would require a suitable route from the station to the Grimsby boundary through NPEI service territory. The existing 18M4 runs west between the CN tracks and the 115kV right-of-way and requires relocation due to conflict. There are limited options for another east-west route. The relocated 18M4 could be constructed as double circuit to make provision for a future feeder.

Additional capacity on the existing 18M3 and 18M4 may be available. Hydro One has not completed a Capacity Allocation study for the station.

6.3. Winona TS

Winona TS is owned and operated by Hydro One and is located in the City of Hamilton approximately 6km west of Grimsby. The station is located within the service territory of Alectra Utilities.

Preliminary discussions for a 10MW supply from Alectra took place in 2019, but were not implemented. Capacity from this source would require restarting discussions with Alectra and likely also involving Hydro One.

6.4. New 115/27.6kV Station

The Hydro One 115kV transmission line runs through the center of Grimsby, providing a ready source of supply for a new 115/27.6kV station.

A 15/20/25 MVA single transformer station is likely the smallest feasible station size to consider. This would provide up to 523 amps at 27.6kV which could be handled by two feeders. It would be prudent to plan for future twinning of the station with a second transformer and two additional feeders.

The station should be located as close as practical to the 115kV transmission line to limit connection costs. Suitable vacant land is available in the western end of the service territory which is close to the future load growth area. Property procurement of approximately 50m x 50m would be required for a dual transformer station with a PCT house and metal clad switchgear.

Property procurement, approvals, and construction would take approximately 2-3 years, making this option better suited to long term capacity supply.

6.5. Generation

Additional capacity could come from a new generation station or stations. However, constructing and operating generating stations is not a core competency of GPI and is not likely to be cost competitive with other capacity options.

6.6. Battery Energy Storage Systems (BESS)

Distribution connected battery storage systems are a maturing technology that can provide peak shifting to help meet peak demand loads.

BESS installations can be located anywhere suitable on the distribution system where zoning permits, including stand alone stations or co-located with primary customers.

Battery storage projects below 10 MW are currently being connected to the Ontario grid.

To provide capacity support to the Town of Grimsby, a BESS installation would need to be located below the Niagara Escarpment and preferably close to the future load. Partnering with a developer should be considered since BESS systems are typically low voltage and could be connected to a customer low voltage system, avoiding transformation costs and losses.

Due to its developing nature, this option should be considered for a pilot project while developing capacity relief from traditional methods.

7.0 Capacity Relief Requirements

Timing requirements have been determined based on projected load during peak demand with loss of one feeder.

Capacity relief is required by summer of 2021. GPI has already committed capital funds to construct the Niagara West TS M8 feeder in 2021, increasing the number of feeders to 5.

Table 10 shows that a sixth feeder is required by summer of 2021 to provide adequate supply during single contingency conditions.

	Total Load (MW)		Number of Feeders Required	
Year	**Low Load Growth**	**High Load Growth**	**Normal Supply**	**Single Contingency**
2021	57.1	57.6	**5**	**6**
2022	58.6	59.7	**5**	**6**
2023	59.8	61.4	**5**	**6**
2024	60.7	63.0	**5**	**6**
2025	60.7	63.6	**5**	**6**
2026	61.4	65.5	**5**	**6**
2027	62.0	67.5	**5**	**6**
2028	62.6	69.5	**5**	**6**
2029	63.2	71.6	**5**	**6**
2030	63.8	73.8	**5**	**6**

Table 10 - Required Timing for Additional Feeders (Option A)

The need for the sixth feeder can be deferred until 2024 by acquiring 6.5 MW (143 amps at 0.95pf) of additional capacity from Hydro One Beamsville TS.

	Total Load (MW)		Number of Feeders Required	
Year	**Low Load Growth**	**High Load Growth**	**Normal Supply**	**Single Contingency**
2021	57.1	57.6	**5**	**5+**
2022	58.6	59.7	**5**	**5+**
2023	59.8	61.4	**5**	**5+**
2024	60.7	63.0	**5**	**6**
2025	60.7	63.6	**5**	**6**
2026	61.4	65.5	**5**	**6**
2027	62.0	67.5	**5**	**6**
2028	62.6	69.5	**5**	**6**
2029	63.2	71.6	**5**	**6**
2030	63.8	73.8	**5**	**6**

Table 11 - Required Timing for Additional Feeders (Option B)

Note: “5+” refers to 5 feeders plus an additional 6.5 MW of capacity from Beamsville TS.

8.0 Recommended Capital Projects

8.1. Niagara West 2508M8 Feeder

The 2508M8 feeder to Grimsby should be constructed as soon as possible to meet the projected load forecast.

Adequate feeder tie switches should be included in the plan, including:

- A tie switch between the 2508M8 and either the 2508M3 or M4
- Provision for a future tie switch between the 2508M8 and the future M7

8.2. Niagara West 2508M7 Feeder

Planning should be initiated for implementing the 2508M7 feeder to ensure a reliable supply to GPI under contingency conditions.

It has been projected that this new feeder could be in service for Q3 of 2024.

The M7 feeder is also the recommended supply option for when the proposed development associated with the future GO Station at Casablanca Boulevard.

Double circuit construction will be required, in particular down the escarpment along Woolverton Rd.

8.3. Beamsville TS – Additional Capacity

Additional capacity from Beamsville TS will be needed to supply peak loads during single contingency outages until the M7 is in-service.

Based on the load forecast and a 2024 in-service schedule for the M7 feeder, a capacity increase of 6.5 MW would be required. Note that is only required during single contingency outages during summer peak load.

This information should be provided to Hydro One since they are in the process of reviewing Beamsville TS capacity requirements.

9.0 Additional Observations

The following issues were noted during the study. These should be reviewed by GPI Engineering and resolved where required.

9.1. Load Recording for Planning

Accurate historical data is essential for capacity planning. Existing SCADA and revenue metering systems can provide suitable source data for planning purposes.

Annual recording of the following data is recommended:

a.) Niagara West TS – GPI load

b.) Niagara West TS – NPEI load

c.) Beamsville TS – GPI load

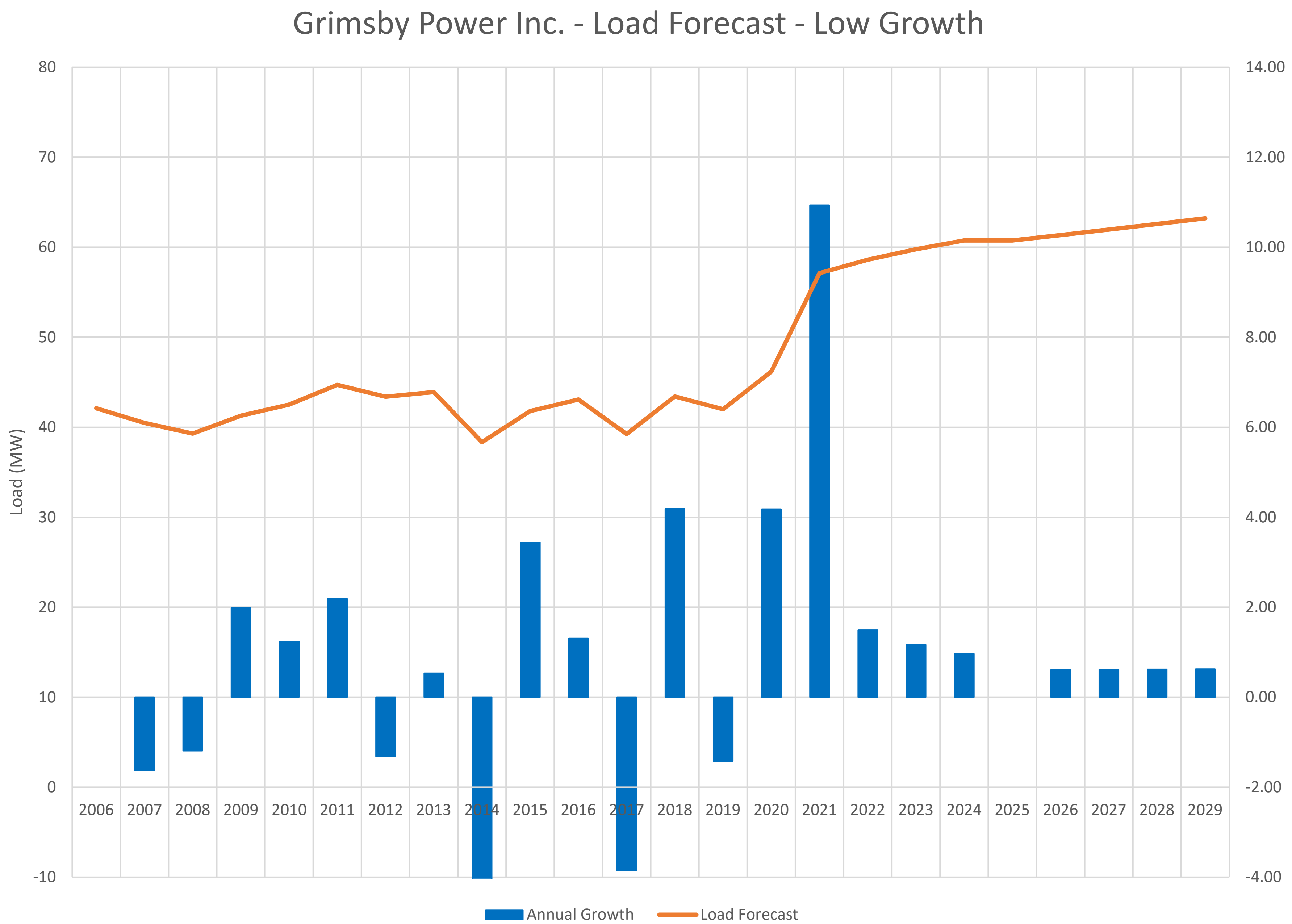
Appendix A - **Graphs**

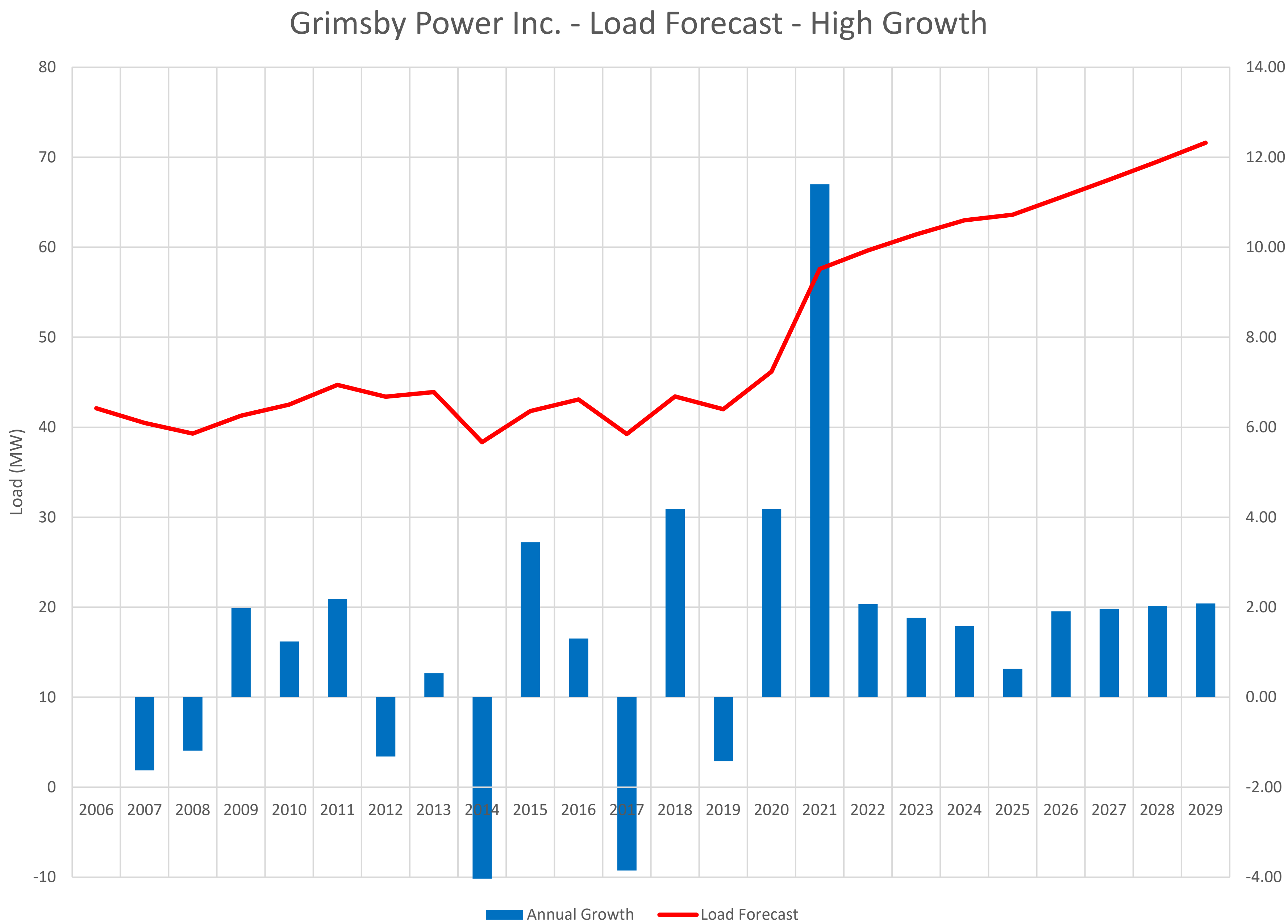
A1 – Grimsby Power Inc. – Load Forecast – Low Growth

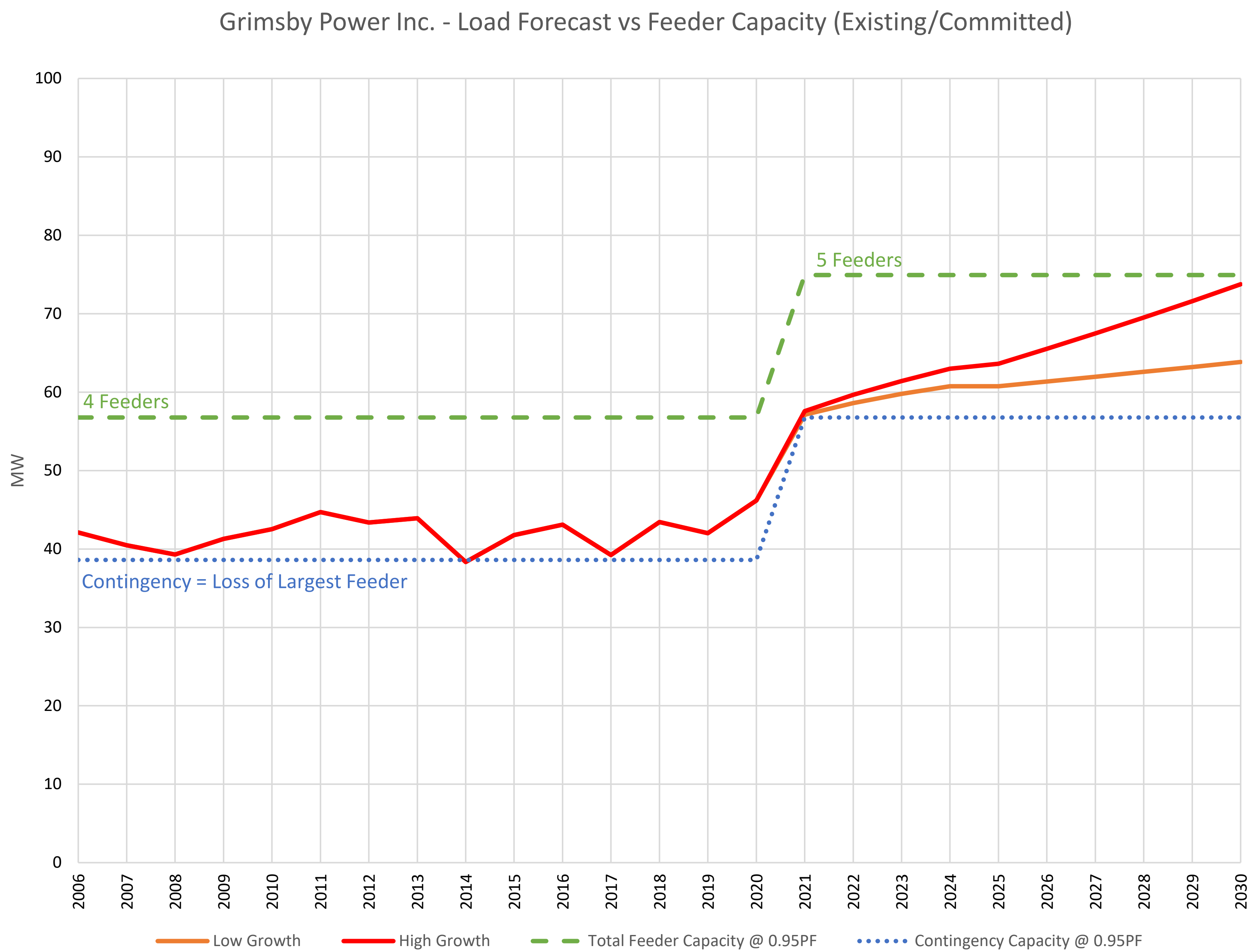
A2 – Grimsby Power Inc. – Load Forecast – High Growth

A3 – Grimsby Power Inc. – Load Forecast vs Feeder Capacity (Existing/Committed)

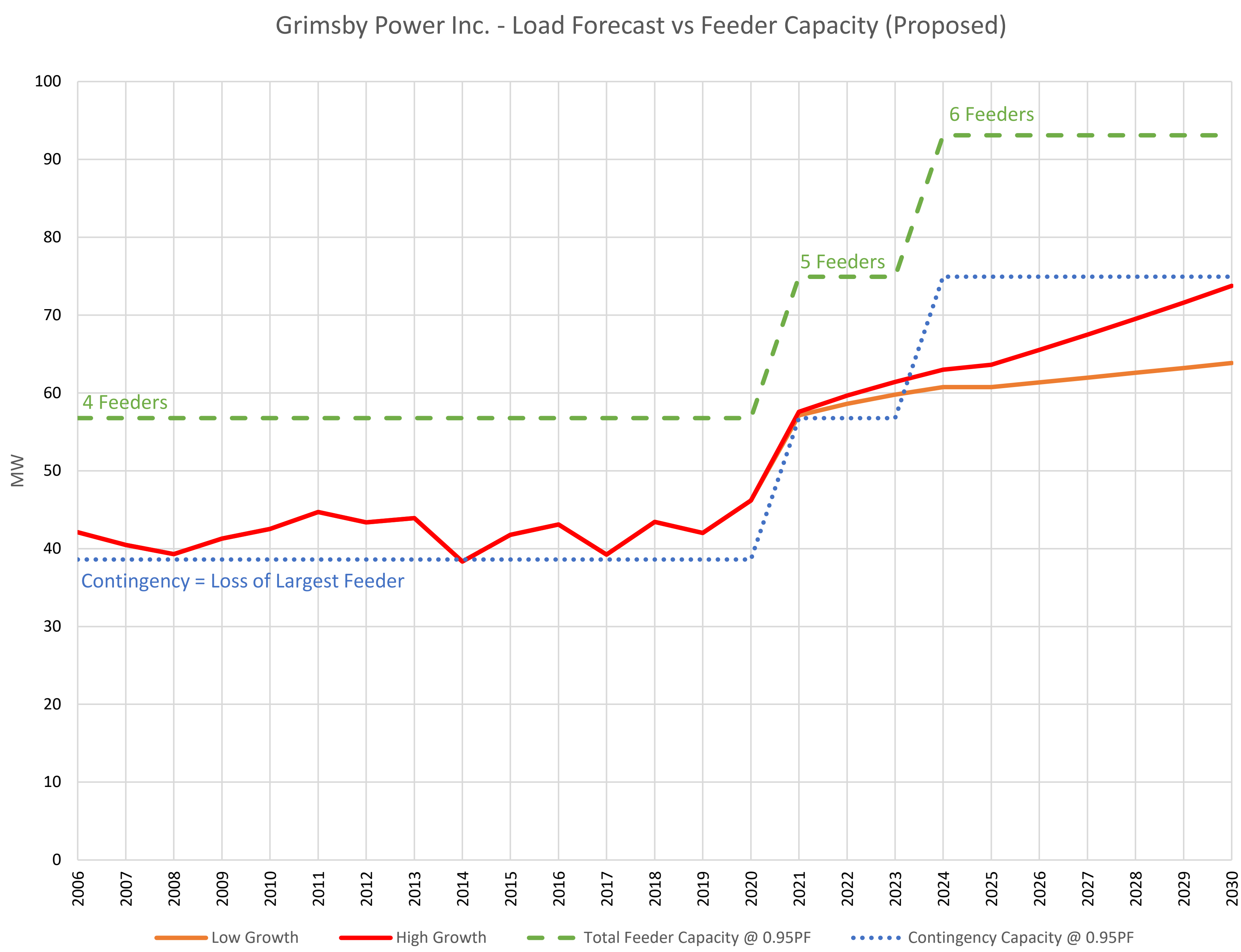
A4 – Grimsby Power Inc. – Load Forecast vs Feeder Capacity (Proposed)


Grimsby Power Inc. - Load Forecast - Low Growth
Load (MW)
80
70
60
50
40
30
20
10
0
-10
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029
Annual Growth
Load Forecast


Grimsby Power Inc. - Load Forecast - High Growth
Load (MW)
80
70
60
50
40
30
20
10
0
-10
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029
Annual Growth
Load Forecast



216001 Grimsby Load Forecast - Rev B.xlsx



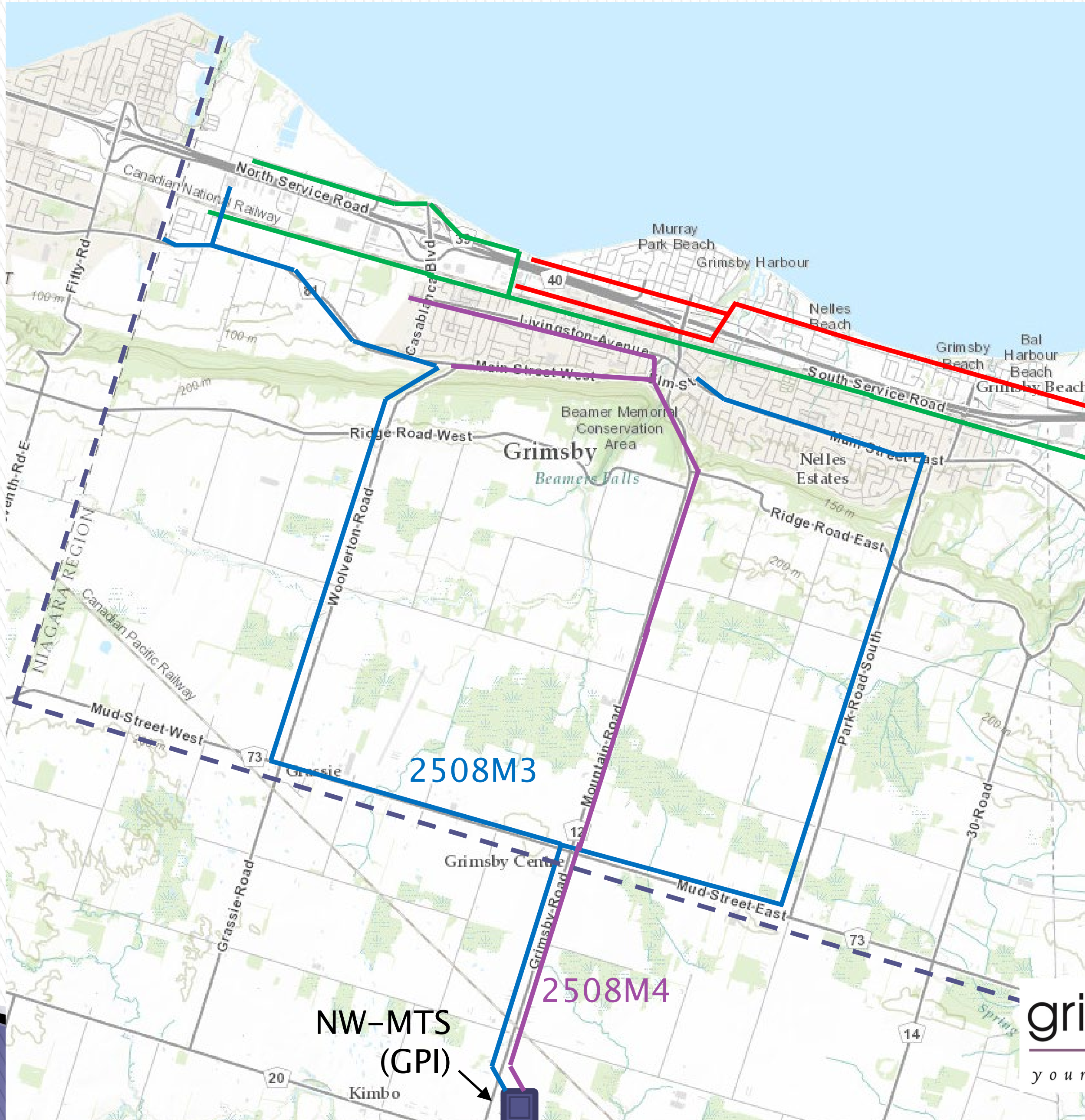
216001 Grimsby Load Forecast - Rev B.xlsx

Appendix B - **Feeder Maps**

B1 – Supply Feeders – Existing (4 Feeders)

B2 – Supply Feeders – New 2508M8

B3 – Supply Feeders – New 2508M7



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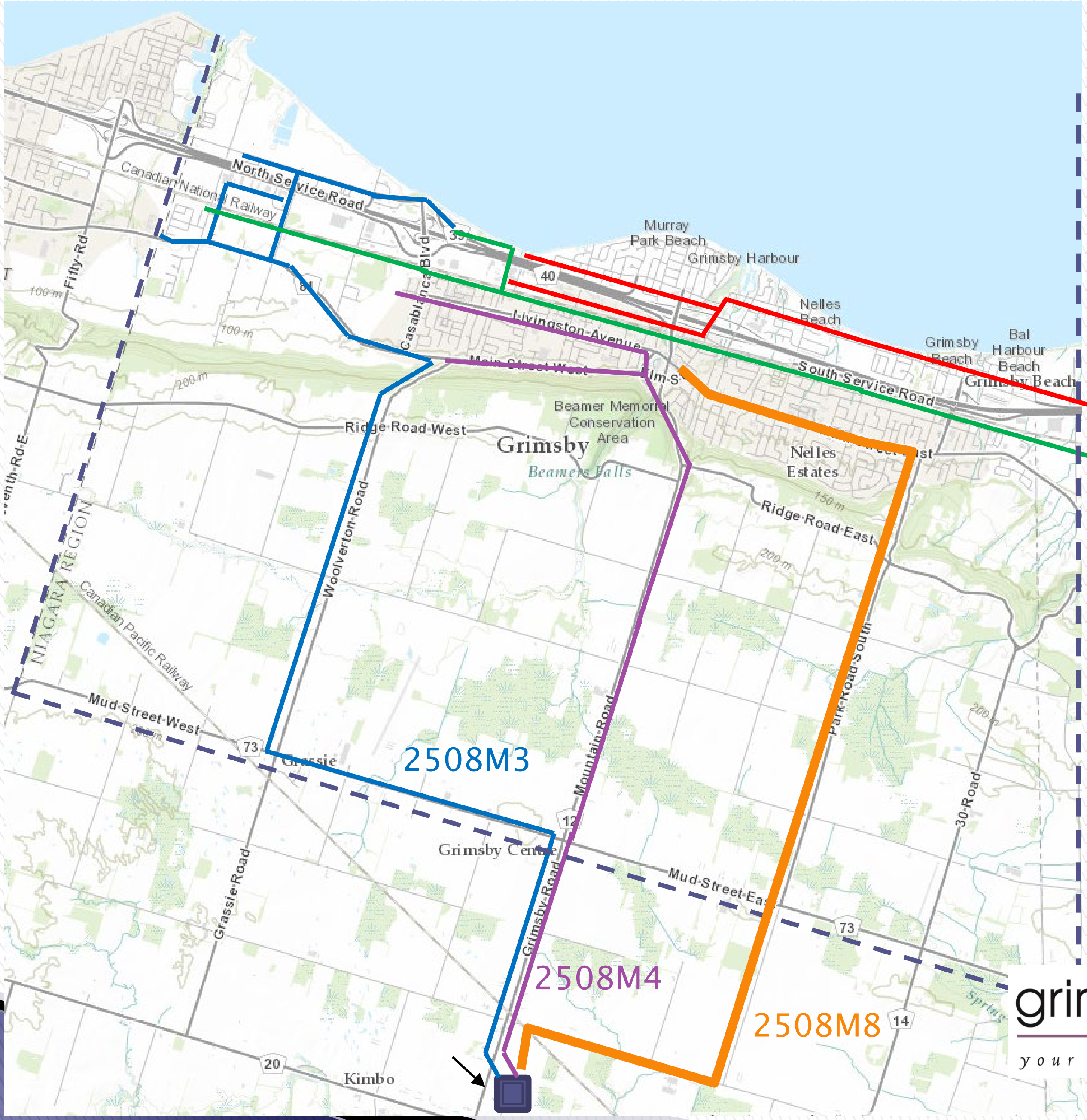
Supply Feeders – New 2508M8



From Beamsville TS (Hydro One)

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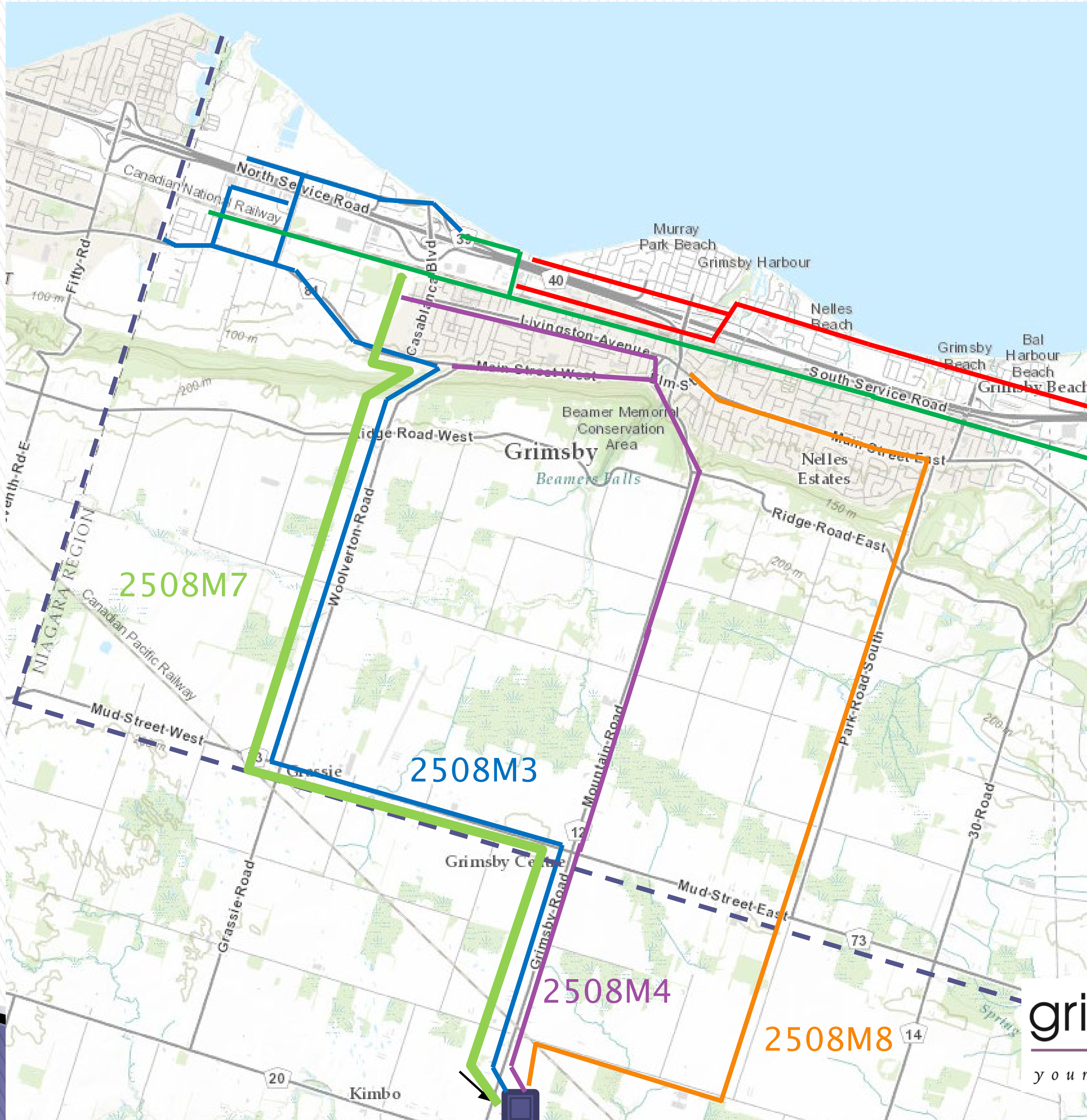
Supply Feeders – New 2508M7



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APPENDIX K

GPI Emergency Plan

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EMERGENCY PLAN

APPROVED BY: Remy Fernandes, MBA.

SIGNATURE: ____________________

Date: February, 16, 2021

Revision: 9.0

Table of Contents

SECTION 1 INTRODUCTION

Severe electric utility infrastructure damage can occur due to many factors such as weather, equipment failure, vehicular damage, train derailment, acts of sabotage, etc. The overhead distribution system is most at risk from severe weather related conditions and may be significantly comprised from storm related outages. This guide has been developed to assist Grimsby Power Incorporated (herein after referred to as GPI) staff in the event of major disruptions in the provision of electric service to its customers. The key ingredients of this guide apply to disruptions in the Bulk Electric System and to disruptions in the distribution system of GPI.

From time to time GPI is called upon to respond to critical situations that are under the control of other response agencies. GPI personnel responding to these situations are required to follow the instructions of the Site Commander to ensure a safe and effective work area. Examples of these agencies are Ontario Provincial Police, Niagara Regional Police, Grimsby Fire Department, Ministry of the Environment, Ministry of Labour, etc. When responding to an emergent situation from these agencies, GPI personnel are required to comply with the on-site authority's safety requirements.

Administration of the Plan

Holder of the Plan

This Emergency Plan will reside in the Operating Control area and by the President/CEO. It will be the responsibility of the Director of Engineering and Operations to review this plan involving all stakeholders on an annual basis at the end of each calendaryear.

Assessment of the Plan

A risk assessment will be done on an annual basis to determine if additional planned responses need to be developed to deal with other emergencies not currently part of the plan.

Testing & Exercising the Plan

The plan will be tested and exercised annually after it has been reviewed. This procedure will consist of contacting all individuals listed in the plan and making sure all resources are available and up to date, and physically testing backup equipment.

Distribution

The Grimsby Power Inc. Emergency Plan will be copied and distributed to the following organizations, upon revision:

- The IESO
  emergency.preparedness@ieso.ca
- The Region Emergency Planning Committee
  ATTN: Regional Chair
  chairman@regional.niagara.on.ca
- The Town of Grimsby Community Emergency Management Coordinator
  ATTN: Acting Fire Chief (Bill Thomson)
  bthomson@town.grimsby.on.ca

SECTION 2 DEFINITIONS

For the purpose of this guide:

The Bulk Electric System is defined as:

> "The Electric system from Ontario Power Generation and the Hydro One network, transmission and transformation facilities to the interfaces with the Grimsby Power Incorporated-Electric System".

A contingency is defined as:

> "A power disruption and/or a probable impeding power shortage on the electric system which threatens human life, public property, or the social and economic well being of the community".

A major emergency can be defined as:

> "A situation, which exists when a power interruption to customers can be restored by a concentrated effort of local forces within approximately 24 hours"

A disaster will be defined as:

> "A major emergency of more than 24 hours duration, requiring the early organization and assistance of outside help. These may be more widespread in nature and extend beyond municipal boundaries, as would be the case during i.e.: storms, hurricanes, or other similar severe situations including acts of sabotage".

SECTION 3 AGREEMENTS

Municipal Emergency Plans

There are several plans within the Regional Municipality of Niagara, which deal with Emergency situations. They are:

A. Regional Municipality of Niagara Standing Operations Procedure for Peacetime Disasters 1994.

B. The Corporation of the Town of Grimsby Emergency Plan. (Refer to Chapter 6 of the Town of Grimsby Emergency Response Plan for required action by Grimsby Power- Appendix-L).

C. The Grimsby Power Incorporated Emergency Plan.

The document, "The Grimsby Power Incorporated Emergency Plan" takes precedence over the other listed plans: "A", "B", however the utility could be subject to involvement in all of them at the same time.

Other Disaster/Emergency Plans

There are other plans beyond the Regional Municipality of Niagara, which deal with disaster/emergency situations. They are:

A. The EDA district emergency plan

B. The Ontario Electricity emergency plan and the Ontario Power System Restoration plan.

These plans may have to be used/activated based on the nature and extent of the emergency.

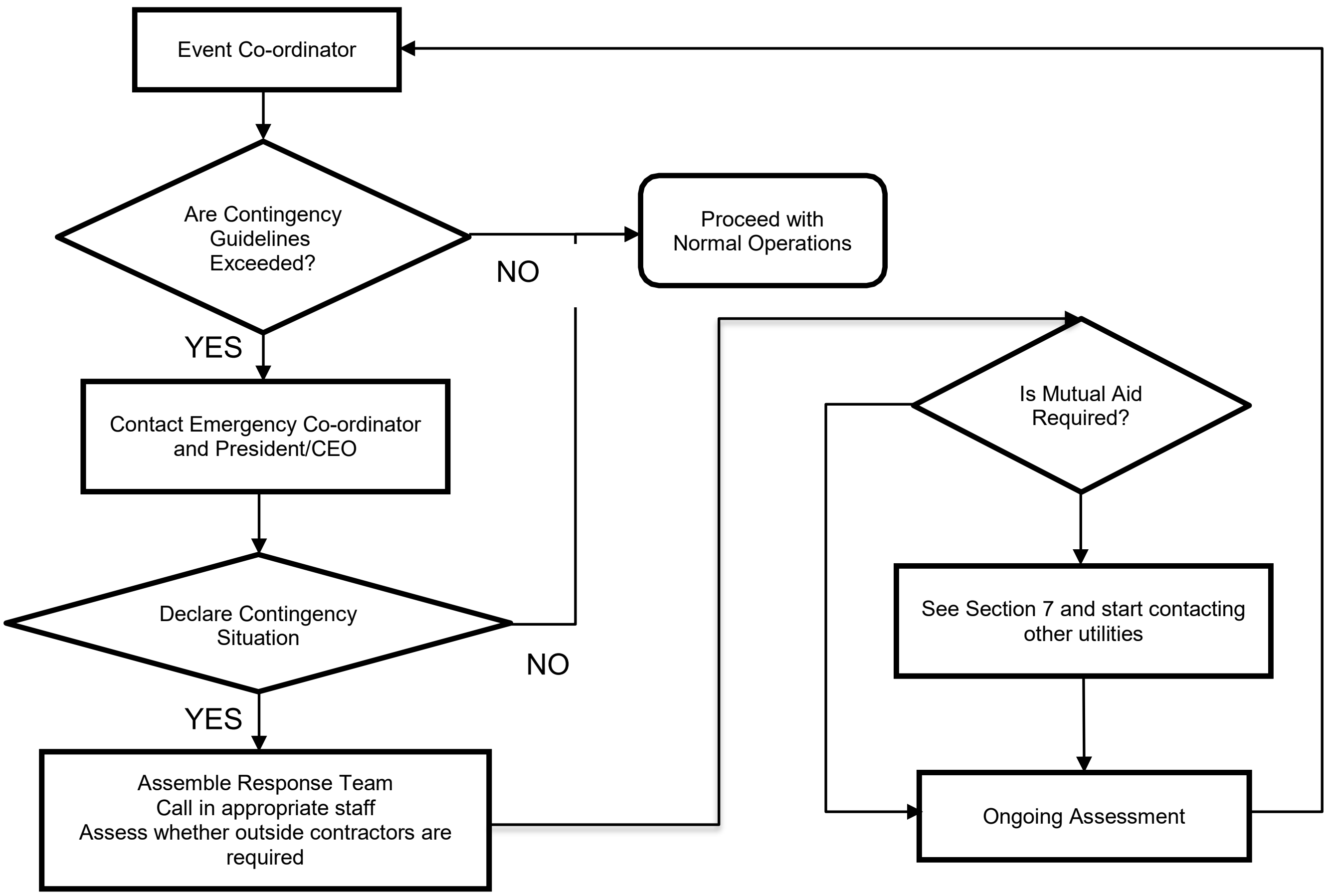
Note: At present, there is no district emergency plan. However in the past local regional utilities have co-operated in restoring power during emergencies.

SECTION 4 CONTINGENCY DECISION TREE

There are many causes that could result in a contingency on the Electric Power System. Elements that enter into the "contingency equation" include the timing of the contingency (e.g. the duration, the season), the severity (e.g. local vs. province-wide) and the amount of advance warning (e.g. planned outages vs. unforeseen events).

The following contingency decision tree attempts to capture these elements and to guide the user through the decision-making process

GRIMSBY POWER INCORPORATED
CONTINGENCY DECISION TREE



Pandemic Contingency

An influenza pandemic could affect up to 20% to 40% of GPI employees over a three to four week period. If the above condition would not allow GPI to maintain adequate workforces to respond in a safe and timely manner as situations arise they will call in for mutual aid, see Section – 7.

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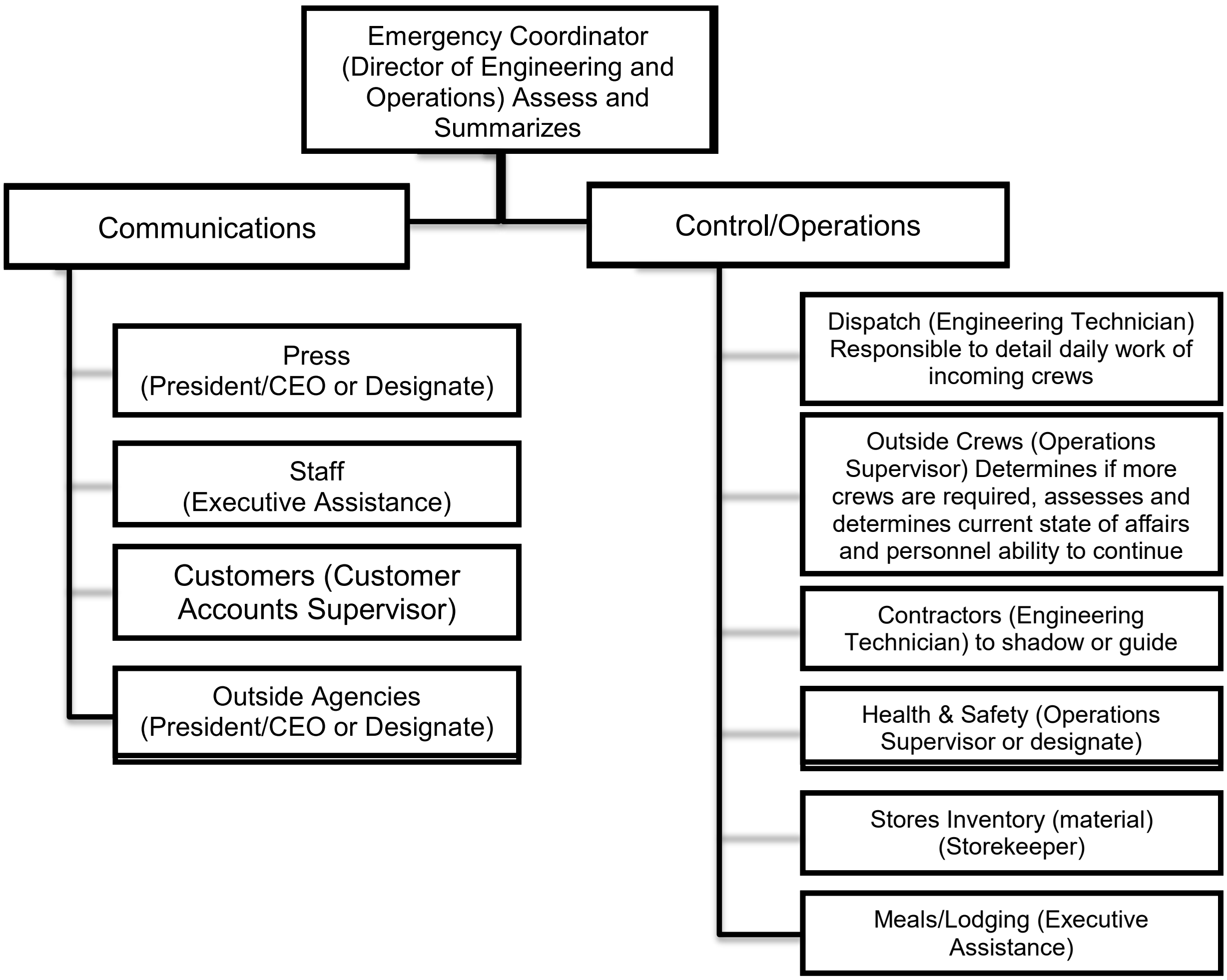
SECTION 5 EMERGENCY ORGANIZATION

In the event of an emergency, all efforts of the Grimsby Power Incorporated staff will deal with the emergency as quickly and as efficiently as possible, with the end result of a return to normal operations. In the event of a disaster situation our Utility, at the discretion of the President/Chief Executive Officer (CEO), will restructure itself to better handle the emergency. The following organizational chart suggests such an emergency organization structure.



The organizational structure shows two basic but distinct functions being Communications and Control/Operations.

The Emergency Co-coordinator acts as the key position to co-ordinate emergency efforts and acts as an information interface between Communications and Control/Operations. All communications should be channeled through the Emergency Coordinator.

A Customer Accounts Representative will be selected as a point person to communicate directly with the Emergency Coordinator. The point person will be responsible for relaying the status and extent of the emergency and advise the incoming point person during a shift change.

The Emergency Coordinator may communicate directly with the Customer Accounts Representative at any time to update information, maps or notations.

SECTION 6 ELECTRICAL CONTINGENCY PLAN

The Electrical Contingency Plan has been developed to assist GPI staff in the event of major disruptions in the provision of electric service to its customers. The key ingredients of this guide apply to disruptions in the Bulk Electric System and to disruptions in the distribution system of GPI.

- For the purpose of GPI the following criteria has been established as the minimally acceptable standard of distribution system performance. These criteria will be part of the decision process to determine whether a contingency exists:

- Cause of outage (i.e. storm situation causing widespread outage and likely of long duration versus a problem that can be sectionalized and restored in a few hours);

- Number of customers affected, time of day, temperature, weather conditions;

- Critical nature of customers or operations affected (for instance, hospitals, customers on life support, nursing homes, water pumping stations, sewage treatment plants, transportation authorities, or airports);

- Potential of economic loss to customers who are sensitive to outages of a particular duration (for instance customers in process industries such as steel, glass, paint or automotive, or in sensitive agricultural operations).

Loss of load and estimated duration of outage.

The following load loss and outage duration listing will act as a guide in determining contingencies:

- less than 50 kW — 8 hours
- more than 50 less than 500 kW — 4 hours
- more than 500 less than 2500 kW — 2 hours
- more than 2500 kW less than 10,000 kW — 1 hour
- more than 10,000 kW less than 25,000 kW — 30 minutes
- more than 25,000 kW less than 100,000 kW — 15 minutes
- more than 100,000 kW — 5 minutes

This indicates that an outage of 50 kW or less has an acceptable outage time of 8 hours maximum (ex. A broken transformer pole could take up to 8 hours to replace). An outage of over 8 hours for a 50 kW load is unacceptable and should be addressed by the contingency plan.

If any of the preceding objectives cannot be met, our local contingency plan may come into play.

If the linemen on call (after hours) or office staff (during regular hours) feel that we may exceed the acceptable outage limits one of the following people must be notified:

1. OPERATIONS SUPERVISOR
2. DIRECTOR OF ENGINEERING AND OPERATIONS
3. PRESIDENT/CHIEF EXECUTIVE OFFICER or designate

This person responding will act as the Emergency Co-ordinator and will decide if a contingency should be declared. If neither of these people are available then a member from the Engineering Dept. will be designated as the Emergency Co-ordinator, until one of the above people become available.

Once a contingency is declared, the Emergency Co-ordinator will need to constantly assess the situation to determine if we need to escalate our plan.

Under circumstances where GPI is able to deal with the contingency thought needs to be given to the following areas:

1. Call in office staff to take the phones back from the answering service (if outside of regular hours).
2. Where wires down calls are numerous, consider Engineering Technicians for field assessment.
3. Crews may require food and drinks to be brought to them by office staff – the nature of the emergency may determine where the food is to be obtained (e.g. what restaurants have power, weather conditions may dictate hot or cold food and beverages).
4. If the outages are ongoing (example: a series of electrical storms) work breaks may be required (men should not work over 16 hours but we may require 24 hour coverage).
5. Arrangements to deliver material to job sites may be required.
6. Alternate fuel arrangements may be required. See Appendix-“F”.
7. For truck repairs see Appendix –“F”.
8. We may wish to communicate with the Town of Grimsby. Services they may be able to offer could include traffic control, assistance with trees or debris, material deliveries, etc.

Timely and Periodic Assessment of Contingency Duration

It is critical that the emergency co-ordinator frequently assess the contingency to determine whether a situation is improving or deteriorating, and that this information be relayed to the system and communications teams. It is important that the right amount of staff be deployed for a contingency of long duration. An outage lasting more than 24 hours will be difficult to manage if all of the staff has been deployed in the first 12 hours and no one is available to relieve them.

In circumstance where the contingency escalates, the following items require consideration:

1. Media notification and regular updates may be required.

2. The Town of Grimsby depending on the areas affected should be notified. Municipal Emergency Response Plan may require to be implemented. The respective Municipality may have concerns that we need to be aware of, such as buildings being used for emergency shelters that need to be raised on our priority list.

3. Establish priorities and co-ordinate the overall restoration effort.

4. Communications with workers and the public must be maintained.

5. Police may be required (road blocks or directing traffic).

6. Senior Management and Board Directors should be notified.

7. Any GPI staff that have not been called in, should now be called. Assistance with communications for out of town crews, coffee runs, material delivery, etc.

8. Crews from other Utilities or contractors should have a GPI employee assigned to them.

9. IHSA and/or the Electrical Safety Authority may need to be notified.

10. The Public Works Department will require GPI's assistance to handle fallen wires across roadways and or moving wires prior to any removal of downed trees.

11. Motel rooms may be required for travelling crews.

12. A communications network should be established with the families of crews to ensure their needs are being met.

13. Check "Critical Customer" listings.

As staff members become available the Emergency Coordinator should designate many of the above duties.

Activation of the Plan

The Emergency Co-ordinator will determine the time frames to complete distribution repairs and estimate the time to completion taking into account crew work schedules and the pace of repairs in the first 16 hours of the storm relief. If crews are not able to effectively deal with the existing contingency and / or it appears that the 24-hour outage limit is going to be exceeded, the request for mutual aid assistance is to be forwarded to the required mutual aid partners.

Utilities called upon for assistance must make sure adequate resources are left behind to serve the needs of its community and customers.

SECTION 7 MUTUAL AID UTILITY RESPONSE

Work Procedure Purpose

The purpose of this Mutual Aid Utility Emergency Plan is to preplan a protocol to acquire assistance from neighboring electric utilities when GPI forces cannot restore all customers within a 24 hour time period. Mutual aid means an agreement between two or more participating electric utilities, which allows for assistance to be provided as the need arises. See NEPA Services Agreement (Appendix K of this plan) dated October 31, 2006 for contractual details.

This plan is an extension of GPI's Emergency Plan.

Items for Consideration

Some of the items that must be addressed with Mutual Aid workers are:

1. Provide the employee with adequate information on what is expected of him/her and what will the nature of the work required.
2. Provide a brief description of the nature of our system and known hazards in the affected area.
3. What will be provided, by way of lodging, food, rest periods, etc...
4. An orientation session will be provided by the Emergency Coordinator or alternate person. A contact person will be designated during this orientation to answer any questions or concerns that may come up during the restoration period.
5. Name and introduction to the Supervisor, to whom he/she will be reporting.
6. Other responsibilities and policies that must be followed.
7. Provide each employee with an information kit that will be reviewed during an orientation session prior to any work being performed. This kit will contain information touched on verbally, as well as other data such as an area map, forms to be completed, time sheet, GPI telephone numbers, locations of accommodations, and name of Supervisor for family to contact in the event of family emergencies.

Notification to Senior Staff and Board Members

The type of assistance necessary will be determined by consensus between the President/CEO, Director of Engineering and Operations & Operations Supervisor.

This response will be dependent on the known conditions at the time the decision is made. A continuous effort must be made to access the current state of affairs by the President/CEO, Director of Engineering and Operations or Operations Supervisor and determine if more help is needed.

Resources Available

Many resources are available and are noted in the GPI Emergency Plan. Refer to Appendix "C" - Equipment List for Mutual Aid Partners & Appendix "D" - Emergency Contact Numbers for Mutual Aid Partners.

Contact Telephone List

For Emergency contact names and numbers refer to Appendix "D" - Emergency Contact Numbers for Mutual Aid Partners.

Communication System Internally

Internal communication between emergency relief parties can be made in one of five ways as follows:

i. Telephone System
ii. Facsimile System
iii. GPI two way/portable radios
iv. Cellular phones

Reporting Location, Setup and Structure

Crews from mutual aid partners are to report to GPI at 231 Roberts Road, Grimsby. The contact at this location will be the Operations Supervisor. Once initial orientation is complete, crews will be made up consisting of at least one GPI Employee who will act as a contract monitor. All crews will report to the Operations Supervisor.

The Operations Supervisor must ensure that outside crews are effectively deployed and that the needed support services and materials are available during the contingency.

Resource Management

Information to Send When Requesting Assistance

When requesting assistance from other mutual aid partners the form titled Request/Supplied Mutual Aid Assistance is to be used. Refer to Appendix "E". In addition the Request/Supplied Mutual Aid Assistance form will be returned as confirmation. The mutual assistance partner will be requested to use this form for its reply and will be requested to send correspondence by a specified time and day.

Dispatching Crews to Utilities Needing Assistance

The mutual aid partner will not dispatch crews to the requesting utility until telephone contact is made between the Director of Asset Management or Operations Supervisor and the contact person of the mutual aid utility.

It will be the responsibility of the mutual aid partner to ready their crews to be dispatched to the requesting utility. These crews should be outfitted with the requested equipment, material, and tools. They should then be dispatched in order to reach the requesting utility at a pre-determined time, date, and place. A checklist should be used to make sure the necessary equipment is on board at the time of departure.

Crew Orientation and Instruction Packages for Incoming Crews

Upon arrival at the requesting utility all incoming crews will check in with the Operations Supervisor. An orientation package will be delivered to the whole crew. This package will consist of the following documents:

- Maps
- GPI Employee and Board Members Contact List, Appendix "A"
- How Do I Get Fed, Appendix "G"
- Where Do I Sleep, Appendix "G"
- Mayday Procedure, Appendix "J"
- Tailboard Forms, Appendix "I"

Meals and Accommodations for Incoming Crews

GPI will arrange to house and feed all incoming crews. This information will be passed on to each incoming crew as they receive their orientation package.

Local hotels/motels & restaurants have been identified and listed. Refer to Appendix "G".

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Telephone and Radio Communications

All incoming mutual aid crews are to establish how they will communicate with GPI. This could be by cellular phone provided by the mutual aid partner if available. GPI may be able to provide a portable two way radio or cellular phone if available. This information must be confirmed at the time of request for assistance.

Work Practices, Work Protection Code, and Hours of Work

Work practices will be centered on working equipment in an isolated and de-energized state or working live apparatus using Protective Cover and Rubber Gloves.

GPI Operations Supervisor will ensure outside staff are competent and will follow approved work practices. At no time will a crew be working alone without a GPI contract monitor. The contract monitor in direct contact with the Operating Department will apply for all work protection. Hours of work will be considered to be periods of 16 hours of work with 8 hours of sleep time in between shifts.

Receiving and Issuing Materials

GPI will supply all materials. Normal stores operating procedures will apply to requisitioning of material from stores.

Material provided by the mutual aid partner, at the request of GPI, will be received into Stores upon arrival at 231 Roberts Road Grimsby using normal incoming stock procedures. A copy of this transaction will be given to the supervisor releasing the material.

Security of Vehicles, Equipment, and Fuel

Vehicles and equipment can be stored on-site at GPI, 231 Roberts Road Grimsby. Vehicles parked outside should be locked and keys left with the Operations Supervisor. Keys will be posted to the keyboard in the office.

GPI has access to a fuelling station located at the Town of Grimsby Operations Centre located at 2 Clarke Street, Grimsby and will provide fuel for all mutual aid partners. The storekeeper will provide access to the pumps.

Safety Measures

It is the policy of GPI to perform all work in the safest and most efficient manner possible, and will follow the requirements of the Occupational Health & Safety Act and Regulations, the IHSA Rule Book and Safe Practices Guides.

Under storm conditions tailboard meetings remain a priority in order to allow time for the crew to plan work and identify hazards before engaging in the work process. Information about the tailboard program will be introduced in the crew orientation process. All mutual aid partners will be expected to participate in this vital process. Tailboard sheets are to be submitted to the Operations Supervisor at the end of each shift.

Non – IHSA Firms

GPI's policy will be to use IHSA member firms for the mutual aid program. Non-IHSA firms will only be used in extreme circumstances where member firms cannot keep pace with the restoration effort or are not available to participate in the restoration effort. Non – IHSA Firms must take part in an IHSA orientation package prior to participating in the restoration effort.

Conditions of Participation

Responsibility of Utilities Requesting Aid to Accept Costs

GPI will bear the costs incurred by the mutual aid partner in rendering assistance. Some costs as outlined in this plan may be paid directly by GPI and may include the costs of lodging, and meals. It is the responsibility of the mutual aid partner to invoice its costs incurred in rendering assistance including labour, equipment costs, materials, and overheads associated with each as per the NEPA Services Agreement.

Working Hours

Working hours will be as far as practical be scheduled as 16 hours of work with 8 hours off. This is a 24 hour workday and will rotate around the clock until the restoration is complete.

Meals & Lodging

GPI will reimburse its mutual aid partners for all costs incurred by their workers on the storm relief effort which are not directly paid for by GPI.

Fuel

It is expected that a mutual aid partner will leave home with a full tank of fuel and when the restoration effort is complete GPI will fill the vehicle for the trip home. GPI at one of our sites will provide all fuelling and fluids for vehicles. Fuelling at private retail outlets may be required in extreme conditions.

Alternative fuels such as natural gas and propane are not available at GPI fuel depots. Arrangements will be required for the fueling of this type of vehicle. Costs associated with this will be directly invoiced to GPI.

Permits, Approvals, Clearances

Each mutual aid partner should ascertain and record whether or not special permits for their vehicles are necessary from the Ministry of Transportation and Communications when traveling outside of their municipality.

Servicing Equipment

Repairs to aerial devices, hydraulic systems, lifting equipment, etc. will require specialized garages and may not be available.

Costs incurred for repair to the mutual aid partner will not be reimbursed by GPI.

Supervision from the Assisting Utility

All mutual aid crews will be assigned a Journeyman Lineman or other GPI employees who will guide the progress of the work as a contract monitor. The mutual aid partner will be responsible for designating a supervisor to supervise their workers.

Record of Hours Worked

In order to account for the time spent in the restoration effort accurate records must be kept with regard to hours worked. In order to accomplish this it will be necessary for the supervisor of the mutual aid crew to check in with the Operations Supervisor or his designate both at the start and end of the shift. A work report must be filled out for each shift detailing start and finish times as well as detailed description about where the crew worked during the day.

Invoicing

The mutual aid partner should be prepared to send an itemized statement outlining total costs incurred to GPI as soon as possible after the restoration effort is complete. Labour charges should list total regular hours and total overtime hours. A break down on the invoice identifying overhead, underground, transformers, etc., will assist GPI with cost allocation.

Details of requirements are listed. Refer to Appendix "K".

Debriefing Following Return to Normal Conditions

Declaration of End of Emergency

The utility should not request that the enactment of the plan be terminated until such time that they are confident that:

- all primary lines have been returned to service
- the remainder of clean-up can be completed with local resources
- the majority of customers are back in service
- the initial cause has been identified and mitigated. For example, in the event of an ice storm, weather forecasters are convinced that the storm front has passed.

Once the conditions have been met for the "return to normal", the termination of the emergency is issued to all emergency workers, to the public via the media, to the provincial government through the Ministry of the Solicitor General, and to any other provincial or federal agencies involved.

Debriefing

A debriefing exercise will be the responsibility of the CEO. This will be initiated and completed within a 6 month time period following the emergency. The following items will be addressed in the debriefing report:

- Report by (individual and organization)
- Positive experiences
- Issues/problems/concerns
- Recommendations/actions required
- Follow-up actions assigned to (individual and organization)
- Summary and conclusions

Post Emergency Report

Once all debriefing reports have been received, a compilation of these reports needs to be created by the Operations Supervisor. A follow-up meeting with key individuals will be held to discuss the post emergency report for action in areas that need to be addressed. Revision to the emergency plan may be required as a result of the debriefings. Formal thanks are to be issued to all participants and customers for their co-operation and patience.

SECTION 8 COMMUNICATIONS

This section focuses on communications by GPI with people and/or organizations external to the Utility.

There are three elements that must form the basis of GPI communications when an interruption occurs. They are:

1. The most accurate information must be provided to the public as quickly and as completely as possible.

2. Radio, television and internet media should be used as the primary sources for communication with the public.

3. The needs of the media to inform customers of impending and/or existing service interruptions and how customers can deal with them, must be recognized and exploited as much as possible.

Communications with Customers

The better educated and prepared customers are when a power interruption occurs, the easier it will be for GPI to deal with the situation. Therefore, it is in the utility's interest to ensure that its customers are informed of, and are prepared for, power interruptions.

All information should be specific to GPI. The following Do's and Don'ts do not necessarily have to be discussed but may be helpful when communicating to customers:

DO'S

1. Flashlight with good batteries.

2. Battery-powered radio tuned to a local station. Ensure batteries are in good condition.

3. A pitcher of fresh water in the refrigerator.

4. Turn off all appliances - oven, refrigerator, freezer, television, computer, iron, etc.

5. If it is winter and the house has electric heating, lower the temperature setting of the thermostats. If its summer and the house has central air-conditioning, raise the temperature setting of the thermostat.

6. Unplug or switch off the water supply to dishwashers and automatic washers.

7. Keep one small light switched on so that you will know when the power is back on.

8. Make sure the back-up power supply for any life-support equipment (dialysis machines, respirators, etc.) is working and/or procedures are known for what to do in the event of a lengthy power interruption.

9. Have a safe plan to keep at least one room warm.

10. Be extra cautious if driving since traffic signals, street lighting, and warning signals and gates at level crossings may not be operating.

11. Make sure that equipment that was turned off is back on, but wait for 10 to 15 minutes after the power is restored.

DON'TS

1. Do not open the doors of refrigerators or freezers unless absolutely necessary - an open door allows warm air to replace cold air.

2. Do not plug portable generators into household wiring systems - it could hazardous or even fatal to those in and beyond the premises.

3. Do not turn on any appliances until 10 or 15 minutes after the power is restored and then turn them on only one at a time. Failure to wait may lead to overloading, which will result in further power disruptions.

Communications with the IESO

Communications with the IESO with respect to impending or existing major service interruptions are likely to be as a result of a serious power shortage because of a problem associated with the Bulk Electric System; widespread storm damage to the transmission and/or distribution systems; or as a result of some other localized catastrophe.

However, the majority of customers in Ontario are customers of the LDC and expect to receive information from them, particularly when they call the LDC with questions. Also, if load is to be reduced, it is very likely that the LDC may be called on by IESO to implement load reduction. It is most important then, that GPI obtain from the IESO the most up-to-date plan for co-operating with the utility in the event of such an occurrence.

Communications with Politicians and Governments

Depending on the size of the area affected by the interruption and its anticipated duration, it may be that the municipality's Peacetime Emergency Plan may be actuated, in which case its procedures should provide for keeping politicians and the public informed.

Notwithstanding and prior to the implementation of the Peacetime Emergency Plan, it is essential that the local politicians and agencies be kept informed of the extent of the interruption and the plan for restoration of power and its status.

- Local police and fire services should be kept informed as many people call them in cases of all types of emergency. Police and Fire Departments often have dedicated lines for contact by special groups, such as Utilities.
- All members of the Board of Directors should be kept abreast of the status of the interruption.
- Y The local Member of Parliament and Member of the Provincial Parliament, or if not available, their local constituency office, should be informed of major interruptions.

Communications with Media

Successful communication with the media is largely dependent on the development of good, continuing and respectful relations.

During a Contingency

- The President/CEO will prepare a news release as soon as possible.
- The President/CEO will be the single media spokesperson.
- The President/CEO will take the initiative to contact the targeted media and issue the news release.
- The President/CEO will issue timely statements throughout the contingency.
- Speculation on crisis events will be absolutely avoided by all staff.

Communication with Answering Service

Communication with the answering service may or may not be possible. Our answering service makes use of a UPS System in the event of power failure. However Bell Communication lines may not be available.

Contacts

The following list includes the media (newspapers, radio, and television) politicians and officials, police communications, IMO, OHNC, emergency staff and "critical" customers. The President/CEO is the sole contact with the media. Please refer to Appendix “B” the External Contact List and the Utility Staff responsible for making contacts. And Appendix “A” for GPI Employee and Board Members Contact list.

The following Web sites may be useful in obtaining information:

EMERGENCY AGENCY INTERNET WEB SITES

ORGANIZATION	WEB SITE
Emergency Measures Ontario	http://www.mpss.jus.gov.on.ca
Independent Electricity Market Operator	http://www.ieso.ca/
Risk Assessment and Natural Hazards	http://www.essa.com/
Canadian Centre for Emergency Preparedness	http://www.ccep.ca/
Public Safety & Emergency Preparedness Canada	http://ocipep.gc.ca

WEATHER INFORMATION WEB SITES

ORGANIZATION	WEB SITE
Environment Canada	http://www.weatheroffice.ec.gc.ca/canada_e.html
The Weather Network	http://www.TheWeatherNetwork.com
The Weather Channel	http://www.weather.com/

SECTION 9 CONTROL/OPERATIONS

Control and Operations will be directed from the Operations Department and the Control Room. Under the Direction of the Emergency Co-ordinator specific responsibilities will be assigned as follows:

Priority

The return to service of GPI Distribution plant will be prioritized as follows:

1. 27.6kV System. The four feeders 2508M3, 2508M4, 18M3 and 18M4 feeding the Town of Grimsby will be attended to first.

2. 27.6kV and 16kV laterals

3. Individual customer services

At the Emergency Coordinators discretion a system map will be available in the Customer Service Area. As the system is put back in service, this map will be highlighted so that those answering customer calls will have an up-to-date knowledge -- One of the Technicians from the Engineering Department will be present.

Control/Operations

The Engineering Technician will be responsible for analyzing system integrity and co-coordinating system components return to service. They will act as the interface between customer service and all outside work staff under the jurisdiction of the Operations Supervisor. They will also advise and assist "stores" and "Purchasing" with material requirement.

Customer Service

Section–8 under Contacts outlines Specific Contacts and the Utility Staff responsible for making contact in case of an emergency. All other contacts with customers will be the responsibility of the Customer Accounts Supervisor and assigned staff. At Customer Accounts Supervisor discretion, will first call in the Customer Accounts Representatives, then other staff as appropriate. Return calls to make sure power is restored will follow normal procedures.

Outside Crews

Work by all outside crews will be co-coordinated by the Operations Supervisor in conjunction with Engineering. They will be responsible for prioritizing all work.

Contractors

The Operations Supervisor under direction from the Emergency Co-coordinator will be responsible for orientation of contractors and neighbouring utilities forces and, as required, provide whatever assistance they need to perform their work. Once a disaster has been declared he will also be responsible for all time sheets and ensuring that all individuals on work crews be required to take an eight (8) hours rest after working a maximum of sixteen (16) hours. As a minimum, a 12-hour shift would be standard within a 24-hour period. This rule may be relaxed at the discretion of the President/CEO.

See Appendix "H" for memory Jogger for Utilities seeking outside assistance.

Health and Safety

Short cuts will not be condoned. All protection codes, safe practice guides, safe operating practices and procedures, legislated regulations will be strictly adhered to. The Operations Supervisor will provide assistance as requested in this matter.

Operating Agreements

GPI has an Operating Agreement with Hydro One.

Stores and Inventory

Purchasing and Stores Staff will ensure the continuous availability of material. They will work closely with Engineering for specific requirements.

Meals and Lodging

This specific responsibility will be assigned to the Executive Assistant who will ensure that all outside forces are properly attended to for food and lodging.

APPENDIX L1

Cellular Device Policy

1. Purpose

This Policy defines guidelines, standards, and restrictions when utilizing Company owned cellular devices or related technology resources that are assigned to designated employees. This can include, but is not limited to, use of the following:

- All cellular approved devices such as phones, smartphones, tablets, wireless modems or wireless USB devices.
- GPS devices.
- Server or desktop management software.
- Any related components of network infrastructure used to provide connectivity to the above.
- Any third-party hardware, software, processes, or services used to provide connectivity to the above.

The objective of this Policy is to protect Grimsby Power's technology-based resources (such as corporate data, computer systems, networks, databases, etc.) from unauthorized use and/or malicious attack that could result in loss of information such as, breach of privacy, damage to critical applications, loss of revenue, or damage to the Company's public image. All users utilizing cellular or licensed technologies to access corporate resources must adhere to this Policy.

For the purposes of this policy, cell phones are understood to include any device that makes or receives phone calls, leaves messages, sends text messages, surfs the Internet, or downloads and allows for the reading of and responding to e-mail, whether the device is company supplied or personally owned.

2. Scope

This policy applies to all employees of Grimsby Power Inc. (also referred to as the "Company" or "GPI").

3. Issuance Policy

In support of fiscal responsibility and appropriate use of this technology, GPI has developed the following guidelines in defining the need for issuing a cellular device. All circumstances may not apply and final approval is made by the employee's manager and/or supervisor.

- The employee must be reachable immediately

- The employee does not work in the corporate office at all times and timely communication is required

Cellular phone services are provided to all employees deemed to require them based on demonstrated need and job function or to enhance company efficiency and provide safety and/or security. This includes but is not limited to management and safety advisors.

4. Usage Policy

Cellular networks and devices should not be considered a replacement for a wired network and considered extensions to the existing wired network. Cellular networks devices are to be used for Company specific activities that are not possible via the wired network.

Addition of new hardware, software, and/or related components to provide additional cellular services within corporate facilities will be managed by GPI's Engineering Department. Installations of cellular related hardware, software, and/or related components, to gain access to the Company's computing resources that have not been explicitly approved by the GPI's Engineering Supervisor and/or the Director of Engineering are strictly prohibited.

All cellular branded technology and usage shall be managed by GPI's Engineering Department utilizing approved security best practices. Users are expected to adhere to the same security standards as defined in the Corporate Internet Usage and Security Policy while utilizing cellular equipment.

Any cellular connection used to conduct GPI business shall be utilized appropriately, responsibly, and ethically. Failure to do so may result in immediate suspension of that cellular device.

The following rules shall be applied to cellular usage or related technology:

1. GPI supplied cell phones, like other means of communication, are to be used to support Company business.

2. Employees may use Grimsby Power Incorporated supplied cell phones to communicate with others inside and outside of the company when such communications are related to legitimate company activities and are within their job assignments or responsibilities, however, occasional personal calls are acceptable.

3. All communications using GPI supplied cell phones - verbal, written or other - must meet professional standards of conduct.

4. Employees shall not use GPI supplied cell phones for illegal, disruptive, unethical or unprofessional activities, or for personal gain, or for any purpose that would jeopardize the legitimate interests of GPI.

5. Use of cell phones while out of the country must be authorized by the employee's Manager and/or Supervisor and any additional personal costs incurred must be reimbursed to GPI.

6. The use of personal cell phones for personal reasons during working hours is discouraged and should be limited to matters requiring immediate attention. As with any personal matter, employees are encourage to use coffee and lunch breaks for these purposes.

7. Employees may use personal cell phones during work hours for any legitimate safety, security or emergency purposes.

8. All communications using personal cell phones during work hours, or conducted on GPI property, or while on GPI business - verbal, written or other - must meet professional standards of conduct.

9. Employees shall not use personal cell phones during work hours, on Company property, or while on Company business for illegal, disruptive, unethical or unprofessional activities, or for personal gain, or for any purpose that would jeopardize the legitimate interest of the Company.

10. Cell phones can be a distraction in the workplace. To ensure the effectiveness of meetings, employees are asked to turn their cell phones off, or at a minimum to 'vibrate' mode.

11. Typically each call from a cell phone incurs a cost, while land-line calls do not. Employees are encouraged to use land-line phones when they are available.

12. Employees should be aware that cell phone conversations are not secure and can on occasion be picked up on radio receivers. Employees should use discretion in discussing highly sensitive or confidential matters on the cell phone.

13. No employee may use another employee's cell phone without that person's permission.

14. Employees must be aware of and follow all current legislation and regulations regarding the use of cell phones while operating a motor vehicle.

15. GPI employees are required to exercise due diligence while operating a motor vehicle on Company business. To that end, employees are not permitted to use a cell phone either hand-held or hands-free to talk, text, e-mail, or surf the Internet.

16. A cell phone's voicemail feature should be activated to store incoming calls while driving. Employees are encouraged to check and return calls at safe opportunities (during a rest stop, before leaving, upon arrival). All business related calls and voicemail messages should be responded to within 24 hours.

17. Cellular branded devices will use secure remote access technologies. This will be enforced through public/private key encryption and strong passwords in accordance with GPI's Use of Computing Resources Policy.

18. GPI's Engineering Department will administer an "approved" vendor list of cellular or mobile devices. All nonstandard or personal cellular devices will be prohibited from connecting with Company resources and, if needed, will require the employee's Manager or Supervisor and the Engineering Supervisor and/or Director of Engineering approval.

19. No modifications of any kind to Company owned and installed cellular hardware or software shall be made without the express approval of GPI's Engineering Supervisor and/or the Director of Engineering.

20. All employees of cellular based devices will immediately report to their Manager and/or Supervisor, and GPI's Engineering Supervisor and/or the Director of Engineering any incident or suspected incidents of unauthorized network access, disclosure of Company resources, or when a GPI supplied cellular device is damaged, loss orstolen. GPI reserves the right to disable one or all cellular based devices at any time based on suspected incidents of unauthorized network access, loss, or breach of privacy.

21. All aspects of cellular usage may be monitored by the Company pursuant to the Corporate Internet Usage and Security Policy in order to identify unusual usage patterns or other improper use as outlined in the Use of Computing Resources Policy.

22. A detailed statement for each GPI supplied cell phone is received monthly from the service provider and the usage is reviewed and approved monthly by department managers and supervisors. Abuse or excessive usage over the predefined *Corporate Customer/Carrier Agreement* amounts may result in reimbursement by the employee or withdrawal in the privilege of using a cellular device or related technology at the discretion of the Company.

Conclusion:

1. The Company encourages its employees to utilize technology resources, where applicable, to improve operating efficiencies or workplace safety. The Company also requires that employees understand the responsibility that comes with the use of cellular devices or related technology.

Accordingly, compliance with this Policy and the other policies referenced herein shall be strictly enforced.

9. Employee Review

- The Cellular Device Issuance & Usage Policy was established to ensure that employees understand that all cellular devices are important assets of GPI. These assets need to be managed carefully by all employees.

- Copies of the Cellular Device Issuance & Usage Policy are available in the GPI Policies folder located within the Common Drive (M:) or can be requested to the Engineering Supervisor and/or the Director of Engineering.

- It is important that all employees understand the rules and guidelines in the Cellular Device Issuance & Usage Policy. Questions can be directed to the Engineering Supervisor and/or the Director of Engineering.

Policy and Procedure Check Sheet

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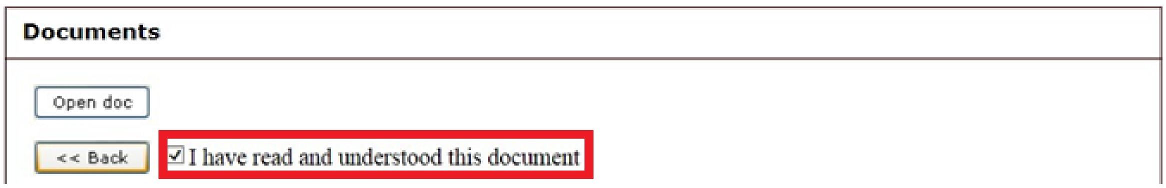

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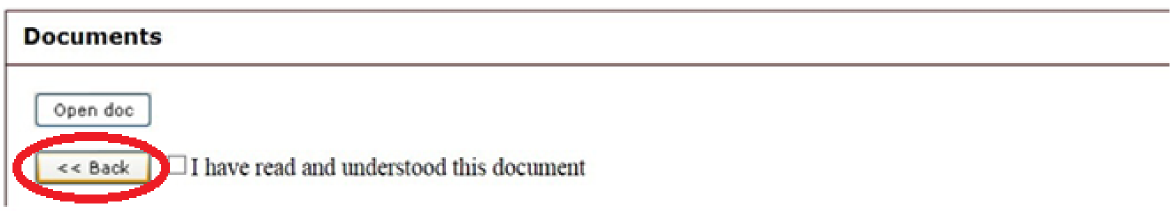

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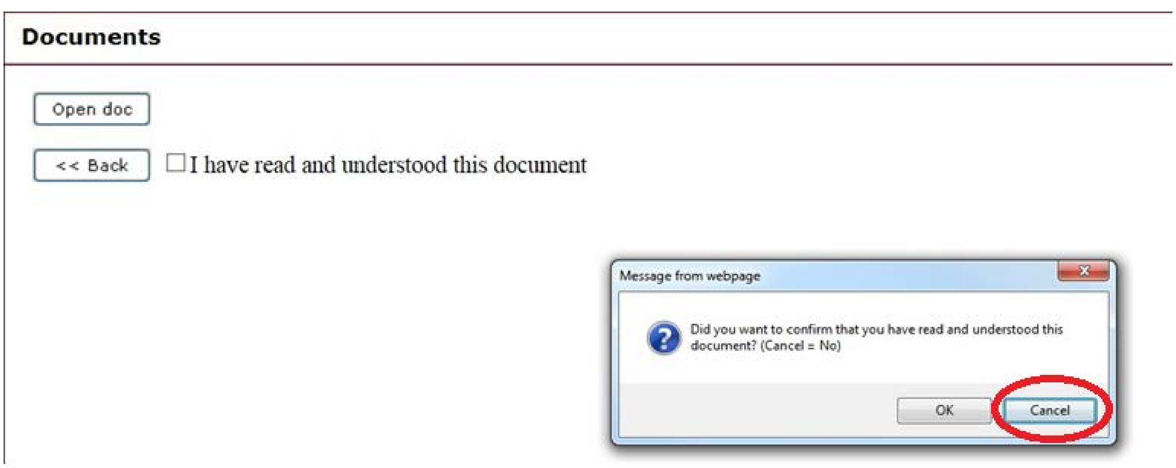

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APPENDIX L2

Internet Usage Policy

1. Purpose

This policy outline both appropriate and inappropriate use of Grimsby Power's Internet resources, including but not limited to, the World Wide Web (www), electronic mail, and FTP services. Use of these services is subject to the following conditions.

2. Scope

This policy applies to all employees of Grimsby Power Inc. (also referred to as the “Company” or "GPI"), company agents and contractors who use the Internet via GPI facilities.

3. Policy

Grimsby Power Inc. shall use the Internet as a tool and information resource to enhance service to customers, to remain competitive in the market, and to effectively and efficiently conduct business.

This policy is focused on the use of the Internet and any other local, national or global networks accessible via GPI facilities. The Internet offers opportunities for GPI to efficiently and effectively conduct business and to enhance service to customers. However, with the use of this resource new risks also arise, particularly related to information security, integrity, and accessibility. Although a general security policy normally covers all business tools, there is a tremendous potential for Internet security infringement and abuse. Therefore, special attention must be given to protect internal information.

This policy complements the existing "Use of Computing Resources" policy. In some cases, other policy and procedure statements may be repeated here with particular emphasis on application to the use of the Internet.

a) While exploring the potential of Internet usage, information security must be maintained.

b) The Company shall take all reasonable measures to prevent unauthorized access to Company information, computer hardware and/or software, and network infrastructure by external parties via the Internet.

c) The Company shall take all reasonable measures to ensure the privacy and integrity of Company information made available to other parties via the Internet.

d) The Company shall take all reasonable measures to ensure that the integrity of Company information, computer hardware and/or software, and network infrastructure is maintained whenever information is received from external parties via the Internet.

Accessibility:

The Company desires that all employees be able to effectively utilize the Internet to complete their job without compromising the integrity and privacy of the Company computer systems and information.

a) Access by an employee to the Internet will be provided by internal Engineering staff upon approval by both, the requesting employee's Manager and/or Supervisor and the Engineering Supervisor and/or the Director of Engineering.

b) Access by external parties to Company internal computers and network infrastructure via the Internet shall not be provided unless approved by both, a department Manager and/or Supervisor and the Engineering Supervisor and/or the Director of Engineering.

c) All Company employees wishing to establish a connection with GPI computers via the Internet (VPN connection) must be authenticated at the firewall before gaining access. VPN access will be provided by the internal Engineering staff upon approval by both, the requesting employee's Manager and/or Supervisor and the Engineering Supervisor and/or the Director of Engineering.

Integrity of Internal Information and Networks

All software and/or files downloaded from the Internet must be screened by virus detection software prior to being used on Company computers or copied across Company network infrastructure.

Quality control on the Internet it is still in its infancy. Therefore, any information retrieved should be confirmed by the originator or by separate information from another source.

"Testing the doors", "probing" or "hacking" security mechanisms at GPI or other Internet sites by employees is strictly forbidden.

Integrity of Information Sent Out on External Networks

The identity of individuals and organizations contacted must be confirmed prior to employees releasing any internal GPI information, entering into any contracts, or ordering any products via the Internet.

The Internet encourages the free flow of thoughts and ideas among companies, customers, employees and other stakeholders. Although open communication is encourage it must be realized that specific measures must be taken to ensure that information transmitted across the Internet cannot be viewed by the public. The Engineering Department will provide security mechanisms as required to allow employees to effectively use the Internet.

a) Confidential GPI information must not be sent over the Internet unless it has first been: encrypted; and secondly: password protected.

b) When submitting Company related information over the Internet, such as: login passwords, credit card numbers, and other Company specific parameters, it is the responsibility of the employee to ensure Websites are trusted and the information transmitted over the Internet is encrypted. If an employee is unsure of a trusted Website or if the information is being encrypted, the employee must ask for the assistance of a member of the Engineering Department.

c) Sending confidential information such as, but not limited to: network or application logon credentials and/or passwords, or credit card numbers using an unprotected mechanism such as, but not limited to, email is strictly prohibited.

d) Employees must not publicly disclose internal Company information via the Internet unless the approval of the employee's Manager and/or Supervisor has been obtained. Such information may include business prospects, electric power system performance, electricity use trends, internal software bugs, etc.

4. Acceptable Use

All personal use or non-Company related purposes on the Internet must be approved by the employee's Manager and/or Supervisor and also must be done on personal time or after working hours. Personal time is defined as the amount of time allocated for break and/or lunch periods. Use of GPI computing resources for these purposes is permissible so long as the activities are legal; the incremental cost of the usage is negligible; bandwidth allocation is not affected; business activity is not preempted by the use; is not considered offensive by means of graphical representation or in context; does not require the support of Engineering staff.

Use of Company computing facilities including access to the Internet for personal business activities is strictly prohibited.

Use of the Internet may not be used for any activity such as, but not limited to: copyright infringement; viewing offensive or inappropriate content - whether graphical or in text; directly or indirectly taking part in an activity considered illegal by local, provincial, federal, or international law.

The deliberate viewing, downloading, or forwarding of materials considered offensive such as, but not limited to: pornography, violence, racism, harassment, slander, defamation, which if coming under public scrutiny could reasonably damage the Company image, is strictly prohibited.

5. Security Administration

The Company respects employees' right to privacy and is committed to ensuring that personal directories, e-mail and other correspondence across the Internet are kept confidential. However, the Company may be required to investigate suspected security breaches or lack of compliance with security policies and procedures. In these cases, this information may be examined by a Manager and/or Supervisor without prior notice to the employee(s) involved. All such investigations must be approved by management to whom the affected employee(s) report.

Department Managers and/or Supervisors have the ability to review all Internet access of their respective reports. This information includes the web site, data and time.

6. External Security Access Points

To support maintenance of the firewall hardware and/or software and servers, internal and external audits of the effectiveness of security measures, investigations of potential security breaches and security relevant events must be securely logged for analysis and review. Security relevant events include activities such as, but not limited to: successful and unsuccessful remote login attempts from across the Internet to the firewalls; e-mail traffic; and access to Internet sites. Other than in the course of completing approve security investigations, the information contained in e-mail messages and the text of any correspondence (e.g. new group postings, Internet site contents, etc.) across the Internet will not be viewed by employees responsible for maintenance of security measures.

At any time, Internet services may be made unavailable to GPI employees when it is determined that the use of the service would make compliance with Company security policies impossible or impractical to achieve.

Miscellaneous

Any employee who has any reason to suspect a security breach or lack of compliance with this policy must notify the Engineering Supervisor or the Director of Engineering immediately.

Employees who notice any new Internet references to Company products or services or unofficial GPI, are requested to notify the Engineering Supervisor or the Director of Engineering immediately.

Approval from the Engineering Supervisor and/or the Director of Engineering must be obtained to establish Internet home pages, firewall connectivity, external network configurations with any new business partner (e.g. real-time communication or EDI arrangements with business partners, customers, suppliers, etc.) utilizing the Internet.

7. Enforcement

A Manager and/or Supervisor maintains the right to terminate employee Internet access and/or block specific Websites or external network traffic if it is deemed necessary. The Engineering Supervisor or the Director of Engineering will provide this service supported by the System Administrator(s).

Any employee found to have violated this policy may be subject to disciplinary action, up to and including termination of employment.

8. Definitions

Authentication
The method to determine if the person and/or device attempting access to a computer system is a valid authorized user of the system. The most common authentication method is a match of a user identification code and fixed length password.

EDI
Electronic Data Interchange, a standardized method for businesses to complete transactions with each other electronically.

Encryption
The process of using an algorithm to convert readable information into unreadable form. Encryption is a method commonly used to keep information private as it is being transferred to and from computers.

Extended Authentication
A method of authentication, which includes the use of, encrypted passwords, challenge response systems, and one-time passwords.

Firewall
A configuration of software and hardware design to protect a company's internal computers and computing networks from unwanted external access or attack. The firewall enables the implementation of security policies to provide a secure means for company employees to access and use external networks.

Internal Computers and Computer Networks
All GPI computers and computer networks used by employees to perform normal business activities. This includes, but not limited to, desktop computers and network servers.

Passwords
A mechanism to authenticate the identity of a potential computer system user to allow access to the system. it is usually a fixed length string of alphanumeric characters.

Virus
Any computer program design to disrupt or destroy other computer programs or to destroy or modify computer data. Software viruses usually are designed to propagate themselves by being embedded in computer programs and files, which may be copied to many computers and computer networks.

All Internet users are expected to comply with these policies and procedures. Questions should be directed to the Engineering Supervisor and/or the Director of Engineering. Violations of these policies may lead to revocation of system privileges and/or disciplinary action including termination.

9. Employee Review

- GPI wishes to ensure that all employees who make use of the INTERNET services through the Company are aware of all the rules and guidelines that accompany this privilege.

- The only way to accomplish this is by having all employees who are authorized to use the INTERNET read, acknowledge and understand the current and complete **Internet Usage and Security Policy**.

- Copies of the policy can be printed from the GPI Policies folder in the computer directory (Common Drive \M:) or can be requested to the Engineering Supervisor and/or Director of Engineering.

- It is important that all employees understand this policy. Please direct any questions on the policy to the Engineering Supervisor and/or Director of Engineering.

Policy and Procedure Check Sheet

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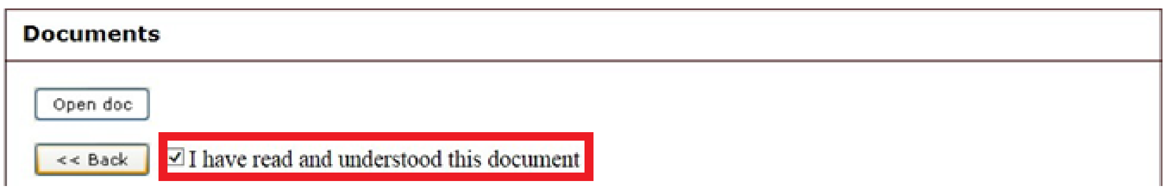

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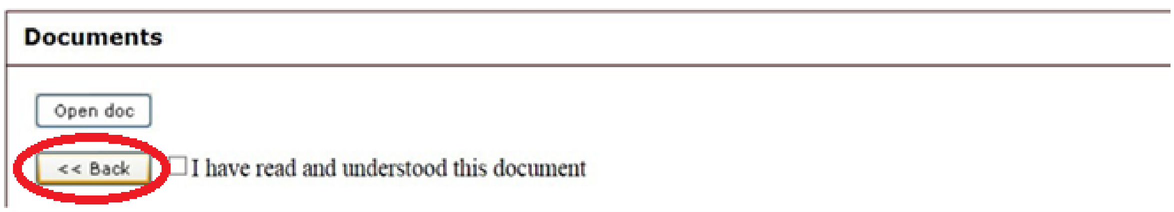

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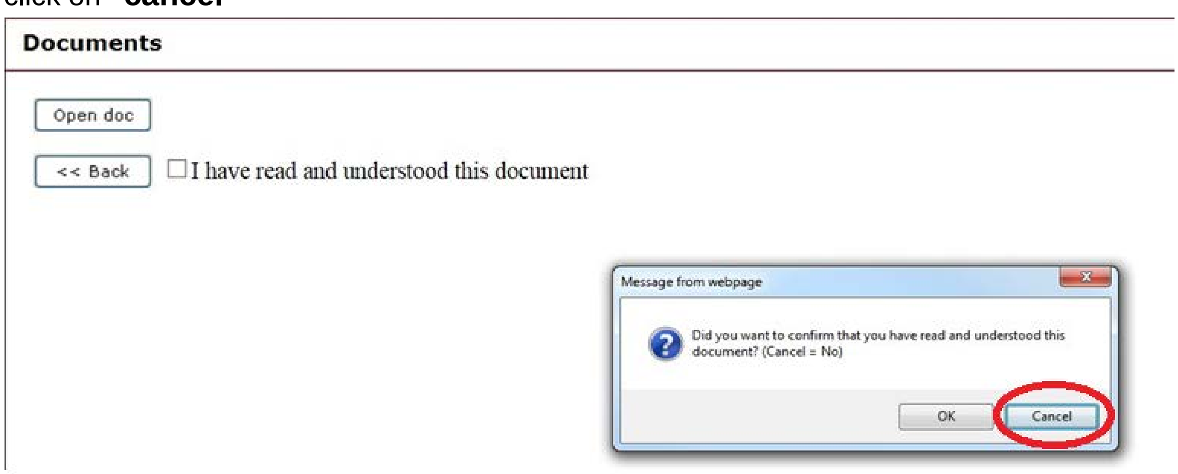

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APPENDIX L3

Use of Computing Resources

1. Purpose

The purpose of this policy is to ensure that all staff are fully aware of the proper use of computing resources provided by and available at Grimsby Power.

2. Scope

This policy applies to all employees of Grimsby Power Inc. (also referred to as the “Company” or "GPI").

3. Policy

Grimsby Power Inc. provides computing facilities to support its business activities. These facilities include servers, desktop computers, laptops, iPads and access to other computers through the network infrastructure. Employees of the Company are granted use of these resources with the understanding that they comply with the rules and guidelines listed in this policy.

The following policy governs the use of GPI computing facilities.

a) All software and systems developed using GPI computing facilities are the property of the Company.

b) Access to computing facilities or special permissions other than default, must be authorized by both the employee’s Manager and/or Supervisor, and the Engineering Supervisor and/or the Director of Engineering.

c) Any willful or deliberate act to jeopardize the integrity of the computing equipment, its programs or other stored information by an employee may lead to dismissal and legal prosecution. This may also apply if the employee grants access to our facilities to a third party by divulging their own, or other persons, login credentials defined as, but not limited to: any login credential that gains access to GPI network infrastructure, whether internal or external. Example: websites specific to the overall GPI operation.

d) Company owned computing facilities or stored information will not be used for personal gain.

e) Information gained through Company computing facilities may not be copied or disseminated by employees to personnel not directly employed by GPI unless authorized by the employee's Manager and/or Supervisor.

f) All software packages for use on Company computers developed by other companies must be acquired legally. Employees are reminded that most software packages are protected under copyright law and cannot be copied to a second personal computer.

g) Improper use of computing facilities may result in withdrawal of the employee's permission to use computing facilities or disciplinary action. It may also lead to legal action by the Company for damages or losses and claims to profits or patents on software or other products developed on GPI computers. Improper use includes, but is not limited to, the following:

- Violations as stated in items a) through f) of this document
- Unethical use of computing facilities
- Unauthorized access to stored information
- Attempts to bypass the security features of the system
- Interference with other users of the system
- Unethical or improper use of hardware or software
- Use of the Company computing resources for personally owned businesses.

h) Users of the facilities are expected to:

- Refrain from deliberately wasteful practices such as creation and retention of unnecessarily large files, files of personal use, printing large reports, or running time consuming jobs without consulting with the Engineering Supervisor and/or the Director of Engineering.
- Make every effort to keep passwords confidential (if at all possible, passwords should be memorized and never written down)
- Change their passwords every sixty (60) days using alphanumeric passwords that are a minimum of ten digits in length, using upper and lower case characters.
- Log off their terminal or computer if they plan to leave it unattended

Electronic Mail:

Employees are advised that the electronic mail system is neither confidential nor private. All information disseminated through electronic mail is the property of the Company. The Company reserves the right to view and utilize all information disseminated through electronic mail on Company systems or networks.

All messages sent through electronic mail must adhere to ethical business standards. The Company will not tolerate any harassment, obscene language or material being disseminated through electronic means. Any message in electronic mail or information in computer files may be read and used by the Company in any legal proceedings if required.

Internet:

The Company reserves the right to monitor and restrict access to material on the Internet or any other electronic service made while an employee is on Company premises or utilizing Company equipment or services to access the material.

Employees must not use the internet services for other than business purposes during working hours.

Internet users must read and acknowledge the Internet Usage and Security Policy document before gaining access to the Internet through Company facilities.

4. Enforcement

The Company encourages its employees to use the computer resources to further their training, to improve their understanding of software resources available and to improve work methods.

The Company also wants to ensure that employees understand the responsibility that comes with the privilege of using the computer systems.

Any employee found to have violated this policy may be subject to disciplinary action, up to and including termination of employment.

5. Employee Review

- The Use of Computing Resources Policy was established to ensure that employees understand that computer hardware, software and information are important assets of GPI. These assets need to be managed carefully by all employees.

- Copies of the Use of Computing Resources Policy are available in the GPI Policies folder within the Common Drive of the network (M:) or can be requested to the Engineering Supervisor and/or Director of Engineering.

- It is important that all employees understand the rules and guidelines in the Use of Computing Resources Policy. Questions can be directed to the Engineering Supervisor and/or Director of Engineering.

Policy and Procedure Check Sheet

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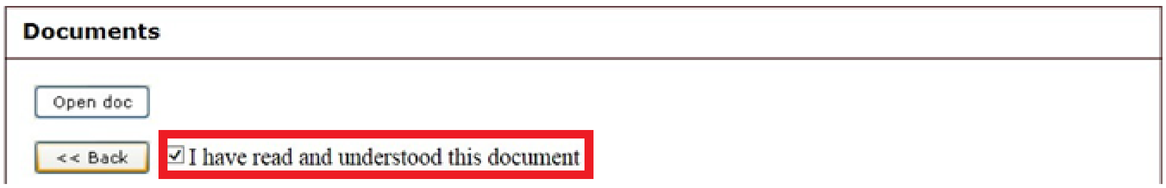

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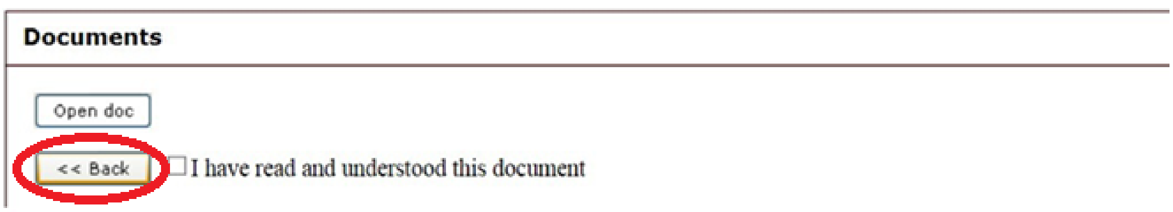

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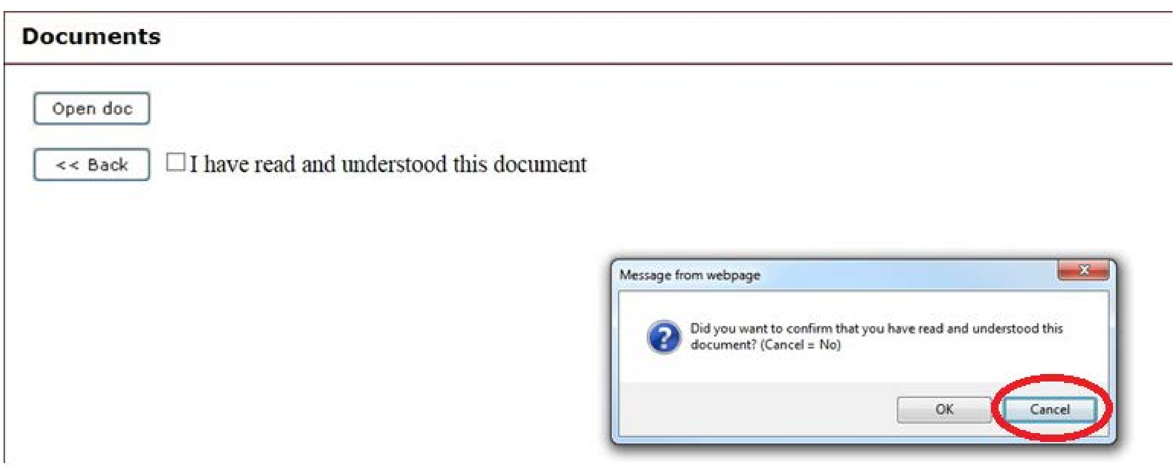

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APPENDIX M

A Place To Grow

A Place to Grow

Growth Plan for the Greater Golden Horseshoe

Office Consolidation 2020

Ontario.ca/growthplanning

Ontario

Niagara Region

COUNCIL'S STRATEGY IMPLEMENTATION PLAN

2019-2022

SHAPE NIAGARA

COUNCIL'S STRATEGY IMPLEMENTATION PLAN

In 2019, Niagara Regional Council developed their new 2019-2022 Strategic Plan. The strategy provides the focus and direction of the organization for the next several years by identifying four priority areas of focus, and the objectives defining how we hope to achieve these priorities. This document represents the implementation plan, containing strategic projects and actions by which the Niagara Region, as an organization, will set out to reach the objectives that Council has identified.

The 2019-2022 Council Strategy Implementation Plan will be a flexible document, allowing for projects or actions to be changed or added as new direction is set by higher levels of government, as new opportunities present themselves, or by other influencing factors.

The Niagara Region provides many core services within the organization and to the broader public that may not be reflected in this document. The document serves to call forward strategic, high level projects and complementary actions that will drive progress in the areas which need extra attention as deemed by Council, and informed through community consultation for the next four year term.

STRATEGIC PRIORITIES

01 SUPPORTING BUSINESSES AND ECONOMIC GROWTH

A coordinated approach to fostering economic growth in Niagara

02 HEALTHY AND VIBRANT COMMUNITY

Foster a high quality of life through safe, healthy, and inclusive neighbourhoods through the delivery of quality, affordable and accessible human services

03 RESPONSIBLE GROWTH AND INFRASTRUCTURE PLANNING

Sustainable investments in transportation, transit and infrastructure, while aligning infrastructure planning with preservation of the natural environment

04 SUSTAINABLE AND ENGAGING GOVERNMENT

A commitment to high quality, efficient, fiscally sustainable and coordinated core services through enhanced communication, partnerships and collaborations with the community

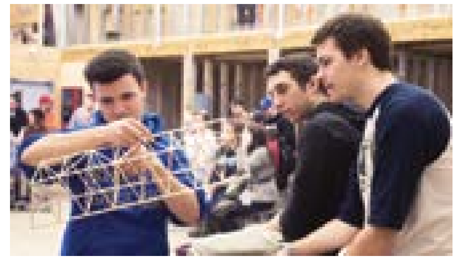
01 STRATEGIC PRIORITIES

SUPPORTING BUSINESSES AND ECONOMIC GROWTH

A coordinated approach to fostering economic growth in Niagara.

Objective 1.1: Economic Growth and Development
Objective 1.2: Support Retention and Development of a Skilled Labour Force
Objective 1.3: Collaborative Approach to Business Growth and Retention
Objective 1.4: Strategically Target Industry Sectors

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Economic Development Long Term Strategy	Goal of the plan is to improve economic growth with a 20 year horizon, to inform decisions along the way and tie into other Niagara Regional plans. Partnering with post-secondary institutions, and informed by research and stakeholder consultations.	• Garner buy-in from regional stakeholders, working together to achieve a unified vision • Sustained regional growth in the long term
	2021 Summer Games	Niagara Region was selected as Host Community for the 2021 Canada Summer Games. Games will showcase Niagara's attributes while driving the development of sustainable infrastructure to be used now and for future recreation.	• The games will establish a foundation for national and international elite sporting events for partner organizations • Maximize economic impact by utilizing local suppliers and businesses • Capitalize on opportunities for community benefits for example volunteers, artwork
	Expand Broadband Infrastructure and Capacity	Secure federal and provincial funding to improve Niagara's fibre technology infrastructure to prepare for 5G. Connects to the objectives outlined in the five year Economic Development strategy.	• Increase connectivity of rural areas for residents and businesses, support advancement of precision agriculture
	Official Plan	The Niagara Official Plan is a long-range, policy planning document to shape Niagara's physical, economic and social development. Tied to three Strategic Priorities, the components of the plan that align to the strategy's objectives include: **Land Strategy:** A land strategy that will be designed to increase shovel ready lands for employment, and identify lands for an employment district to meet provincial requirements. **Environmental Sustainability:** Updating policies and mapping; and create a strategy to protect biodiversity, address natural heritage, and develop a natural environment action plan. **Affordable Housing:** How we manage growth and development, with a range and mix of housing types, including affordable housing.	• **Land Strategy:** Increase competitiveness to attract investment, increase job creation, and the opportunity for higher paying jobs and skilled labour • **Environmental Sustainability:** Stabilization of natural spaces through enhancements or compensation (allowing removal and replacement of trees) • **Affordable Housing:** Increase Niagara's access to affordable housing stock



HOW ELSE ARE WE ACHIEVING THIS?

Strategic Marketing

This is a core function of the Economic Development division. Conducting targeted marketing activities to position Niagara as a competitive location for business investment.

Trade and Investment

This is a core function of the Economic Development division. Promoting Niagara through investment attraction and lead generation activities (investment missions) to strategically target sectors within specific geographies.

Implement Five-Year Economic Development Strategy

As it relates to supporting business growth, employment lands, marketing the region, streamlining planning processes, increasing Niagara's competitiveness, addressing workforce challenges with partners, advocacy for Niagara.

Addressing the Skilled Labour Force Gap

A number of ministries are trying to address this in many ways. The role of the region is facilitation between partners such as, Niagara College. A transformation of the employment business is expected based on Provincial direction. Our role may become clearer pending this information.

02 STRATEGIC PRIORITIES

HEALTHY AND VIBRANT COMMUNITY

Foster a high quality of life through safe, inclusive neighbourhoods and delivery of quality, affordable and accessible human services.

Objective 2.1: Enhance Community Wellbeing
Objective 2.2: Mental Health and Wellbeing
Objective 2.3: Addressing Affordable Housing Needs

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Health Equity Informed Planning	By focusing on the implementation of the Health Equity Strategic Plan, broaden the scope to the corporation as a whole to identify opportunities such as defining priority populations, healthy community design or inequities in service access. Identify health and health equity impacts within projects through tactics such as embedding in capital project business cases, e-scribe reports or through Environmental Assessments.	• Increase access to health equity data and partnerships to drive decisions • Increase consideration of health and health equity impacts in community and infrastructure design • Greater organizational and public awareness of social determinants of health that impact individual health outcomes
	Long-term Care Redevelopment	Two sites fully developed using a campus model with community elements. Creating and establishing opportunities for auxiliary services, compatible housing and small commercial opportunities.	• Develop best practice Long Term Care facilities • Maximize value and yield of Regional assets for the benefit of the community at large
	Community Safety and Well-Being Plan	Development of a Community Safety and Wellbeing Plan as legislated under the Police Services Act. A cross-disciplinary approach, connecting police services, providers in health/mental health, education, community/social services and children/youth services and neighbourhood stakeholders as appropriate.	• Making communities safer and healthier, often guided by four pillars: social development, prevention, risk intervention, and incident response
	Mental Health Addictions and Systems Planning	Identify gaps within the Mental Health system to increase the functionality and collaboration within it. Partnering with the Local Health Integration (LHIN) to review the local landscape to identify opportunities including for new investment.	• Integrate and coordinate the mental health and addictions services through streamlining access to care, reducing repeat Emergency Department visits • Decreasing admissions for mental health and addictions • Decreasing wait times for service
	Affordable Housing	Advance the Regional Affordable Housing Strategy through Niagara's updated Housing and Homelessness Action Plan (HHAP). Further linking the plan to components of the Official Plan and strategic financial investments, in order to increase Niagara's access to affordable housing stock.	• Increase supply of affordable housing (also linked to employment strategy to increase wages) • Achievement of updated Housing and Homelessness Action Plan (HHAP) objectives and performance targets

HOW ELSE ARE WE ACHIEVING THIS?

Parenting Strategy

This strategy guides evidence-informed decision-making around how we support and engage parents and families in Niagara, using a social determinants of health lens to impact health equity, early childhood development, and the well-being of families.

Early Childhood

Supports for licensed childcare, and a system of services and supports for children and their families.

Mental Health Promotion Strategy Implementation

Building mental health literacy, reducing stigma, and ensuring that mental health promotion is embedded into all initiatives within Public Health.

03 STRATEGIC PRIORITIES

RESPONSIBLE GROWTH AND INFRASTRUCTURE PLANNING

Sustainable investments in transportation, transit and infrastructure, while aligning infrastructure planning with preservation of the natural environment.

Objective 3.1: Advancing Regional Transit and GO Rail Services

Objective 3.2: Environmental Sustainability and Stewardship

Objective 3.3: Maintain Existing Infrastructure

Objective 3.4: Facilitating the Movement of Goods and Services

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	GO Train Service Expansion	Promote and protect transit oriented development involving key transportation infrastructure projects adjacent and supportive of GO station locations across all four identified Niagara station sites. Increase service frequency and levels of weekday GO Train service.	• Ridership growth • Increased weekday train frequency/ service levels • Create station enabling infrastructure improvements (mobility hubs) • Enable strategic station developments • Increase access to service communities through bus-meets-train connectivity
	Inter Municipal Transit	Operational harmonization and integration of local transit into a fully integrated transit system. Governance review and modelling development in anticipation of a decision to transition to a new transit entity.	• New transit governance model decided • System connectivity of all 12 municipalities • Ridership growth • Consistency in service delivery across communities • Increased service hours • Significant customer experience improvements
	Waste Management Strategy	Strategic waste management infrastructure planning to ensure resource recovery, sustainable long-term disposal infrastructure, and enhance revenue opportunities.	• Decrease greenhouse gas emissions • Increase waste diversion rates • Long-term facility sustainability • Identify opportunities to increase revenue
	Asset management	Implementation of Asset Management principles and practices focusing on infrastructure renewal to ensure operational costs and asset performance are optimized.	• Optimized practices across the organization • Responsible funding of infrastructure projects • Reduction in future infrastructure funding gaps

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Transportation Master Plan (TMP) Implementation	Implementation of the Transportation Master Plan, with connections to How We Grow, Go, Flow, the Water / Wastewater Master Servicing Plan and the Water / Wastewater Financial Sustainability Review. Establishment of clear policies to address active transportation, complete streets, multimodal road network, wayfinding, transportation demand and system management. Addressing transit, marine, rail, road, airport(s) and how these all integrate together.	• Enhance resident quality of life through pedestrian and cycling facilities, responsive and conventional transit and the creation of an integrated network of roads and highways • Transform the transportation network and the way people and goods move in the region and how transportation can contribute to a high quality of life
	Connective Transportation Initiatives: East - West Corridor, North - South Escarpment Crossing	Moving large scale connective transportation initiatives forward: Advocacy for the East-West Corridor, as a key link to the Niagara-Hamilton trade corridor, as proposed in the Transportation Master Plan. Movement on the North - South Escarpment project Environmental Assessment. Tying in with Smithville By-pass. Dealing with how we link Niagara differently, address congestion, and integrate the system. Each of these initiatives provide a strategic link between Niagara and the Greater Toronto and Hamilton Area (GTHA), incorporating multimodal freight terminals and transport networks to build capacity (trucking, marine, rail, airport). They are linked to tourism and foster diversification and economy of scale for both people and goods.	• Improve the efficiency and reliability of trade corridors through Niagara Region • Support goods movement • Ease congestion issue on QEW (a significant risk to tourism, agriculture and manufacturing sectors in Niagara)

HOW ELSE ARE WE ACHIEVING THIS?

Environmental Planning

New environmental planning team within the Planning and Development Services department, enabling a balance between Niagara's drive to be open for business with good environmental policies and planning.

Urban Design

Ensuring development projects include functional and attractive urban areas, creating a sense of place within the community.

Enhancements of Management Cycle of Pavements

Improving how the cycle of pavement maintenance is managed, including crack sealing patching and re-surfacing.

04 STRATEGIC PRIORITIES

SUSTAINABLE AND ENGAGING GOVERNMENT

A commitment to high quality, efficient, fiscally sustainable and coordinated core services through enhanced communication, partnerships and collaboration with the community.

Objective 4.1: High Quality, Efficient and Coordinated Core Services
Objective 4.2: Enhanced Communication
Objective 4.3: Fiscally Sustainable

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Communications Master Plan	Develop a framework to provide guidance around how Niagara Region will communicate and interact with residents, employees and stakeholders.	• Contribute to higher resident satisfaction in how Niagara Region is managed and governed • Increase transparency and two-way communication between Niagara Region and the public
	Government Relations Strategy	Development of a strategy focusing on what Niagara Region as an organization does, and how we engage other levels of government on advocacy, funding, policy opportunities and collaboration.	• Ensure an aligned approach to advocacy and funding requests to higher levels of government
	Regional Development Charges (RDC) by-law	Update of the Regional Development Charges (RDC) By-law to ensure we are collecting enough revenue to cover growth needs and tie into the Capital Finance Strategy. Re-align incentives for development to Council's strategic priorities.	• Collect growth-related revenue to support growth • Ensuring the infrastructure is in the ground to support and generate future growth
	Community Benefit Charge	Creation of a charge for community benefits in order to fund capital for soft services benefiting new development.	• Collect growth-related revenue to support growth • Align to Capital Finance Strategy and growth planning
	Grants and Incentives Review	Re-align Grants and Incentives program to address Council's key strategic issues such as affordable housing, brownfield remediation, and attracting higher wage jobs. As part of this review, creation of a development portal or application is being created to support expedited service.	• Allocating Council's limited grant dollars to where it matters most • Increase return on investment of grants and incentives • Expedite application and approvals process • Aligns with the Regional Development Charges (RDC) By-law

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Capital Financing Strategy	Balancing financial sustainability of renewal of existing assets and the needs of growth, aligned with asset management planning and growth strategies at Niagara Region.	• Moving towards full cost recovery • Long term commitment by Council to the implementation of the strategy
	Sustainability Review and Implementation	Identification of opportunities to re-purpose dollars towards replacement of infrastructure. Looking for lines of businesses we can do differently or divest of, and right-size funding of programs and services.	• Increased funding towards infrastructure projects through re-allocation of funding • Re-focus on Niagara Regional priorities
	Sponsorship Revenue Strategy and Policy	Identification of opportunities to increase revenue without increasing taxes. Policy development for sponsorship of Regional assets.	• Generate revenue • Identify opportunities for incremental revenue sources • Extending collaboration opportunities with Local Area Municipalities

HOW ELSE ARE WE ACHIEVING THIS?

Emergency Medical Services Transformation

Transforming the Emergency Medical system to be more accessible, available and affordable to meet the needs of residents. Providing the right service, at the right time, for the right cost. Enabling long term financial sustainability for the service by reducing transports to the emergency department, increasing collaboration with service providers, increasing accessibility and availability of resources. As this project reaches full launch, there will be ongoing monitoring of the success of this transformation.

Employee Engagement and Leadership Development

Driving productivity, employee commitment and attraction through a new People Strategy.

Economic Development Marketing Strategy

A framework for conducting targeted marketing activities to position Niagara as a competitive location for business investment.

Enterprise Content Management

An initiative to address gaps in records management activities and policies to ensure the organization has the documentation it requires to support transparency

Customer Service Implementation

Leveraging information and communication technology to modernize how Niagara Region delivers services and interacts with clients and residents.

A COMMITMENT TO ACHIEVING COUNCIL'S OBJECTIVES

To drive transparency and to support Council's commitment to the strategy, the Region commits to ongoing monitoring and evaluation of progress towards these objectives. The Region enables public transparency in two ways: through project progress reporting throughout the term of Council; and through the Region's public facing performance measurement dashboard which allows the public access to performance measures around key activities and influencing factors.

We invite you to follow the progress of the plan and view the performance dashboard through the Regional website at **niagararegion.ca/priorities**.

“However beautiful the strategy, you should occasionally look at the results”

— Sir Winston Churchill

Niagara Region

This report was prepared by Niagara Regional staff from the Internal Control and Organizational Performance division.

A PLACE TO GROW

Growth Plan for the Greater Golden Horseshoe

Office Consolidation

August 2020

Approved by the Lieutenant Governor in Council, Order in Council No 641/2019.
The Growth Plan for the Greater Golden Horseshoe 2019 was prepared and approved under the Places to Grow Act, 2005 to take effect on May 16, 2019. Amendment 1 (2020) to the Growth Plan for the Greater Golden Horseshoe 2019 was approved by the Lieutenant Governor in Council, Order in Council No 1244/2020 to take effect on August 28, 2020.

This consolidation is prepared for purposes of convenience only. It incorporates the above noted documents. For official wording please consult the approved versions of the Growth Plan for the Greater Golden Horseshoe 2019 and Amendment 1 (2020) to the Growth Plan for the Greater Golden Horseshoe 2019 which are available by request.

A Place to Grow

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Introduction

1.1 The Greater Golden Horseshoe

The *Greater Golden Horseshoe* (*GGH*) is one of the most dynamic and fast-growing regions in North America. It is the destination of choice for many people and businesses relocating from other parts of Canada and around the world. They settle here because of the high quality of life and the economic opportunities. This is a place of prosperity where, through their skills and talents, people are building a greater future for themselves.

The *GGH* has one of the world's most vibrant and diverse economies – generating upwards of 25 per cent of Canada's Gross Domestic Product (GDP)[1], it is the economic engine of Ontario. While the *GGH*'s competitive advantage has historically been its location in the heart of the Great Lakes region with close proximity to major United States markets, today the region is widely recognized for its highly-educated workforce and uniquely multicultural population, whose social and economic diversity are critical factors for success in a knowledge-based economy.

The *GGH* contains many of Ontario's most significant ecological and hydrologic natural environments and scenic landscapes, including the Oak Ridges Moraine, the Niagara Escarpment and the other natural areas in the *Greenbelt Area* and beyond. These natural areas support biodiversity, provide drinking water for the region's inhabitants, sustain its many resource-based industries, support recreational activities that benefit public health and overall quality of life, and help moderate the *impacts of a changing climate*.

The region also has some of Canada's most important and productive farmland. Its fertile soil, moderate climate, abundant water resources, and proximity to markets support agricultural production that cannot be duplicated elsewhere in the country.

The First Nations and Métis communities within the Great Lakes region have a unique relationship with the land and its resources, which continues to shape the history and economy of the area today. Ontario, including the area covered by A Place to Grow: Growth Plan for the Greater Golden Horseshoe, is largely covered by a number of Treaties that provide for treaty rights. In addition, Aboriginal communities may have Aboriginal rights within the Plan area. Ontario

[1] Calculated from Statistics Canada (Metropolitan Gross Domestic Product, 2014) and Conference Board of Canada (Metropolitan Outlook 1 & 2, 2014)

recognizes the unique role that Indigenous peoples have had and will continue to have in the growth and development of this region.

As the *GGH* grows and changes, we must continue to value what makes this region unique to ensure the sustained prosperity of Ontario, its people, and future generations. While growth is an important part of vibrant, diversified urban and rural communities and economies, the magnitude of growth that is expected over the coming decades for the *GGH* presents several challenges:

- Increased demand for major *infrastructure* investments driven by population growth, the need to renew aging *infrastructure* and continuing *infrastructure* deficits associated with unmanaged growth, combined with relatively scarce financial resources, means an ever greater imperative to plan to optimize existing assets and make the best use of limited resources by considering full life cycle costs.
- Increased traffic congestion, and the resulting delays in the movement of people and goods in the *GGH*, is costing billions of dollars in lost GDP every year.
- Unmanaged growth can degrade the region's air quality; water resources; natural heritage resources, such as rivers, lakes, *woodlands*, and *wetlands*; and *cultural heritage resources*.
- The impacts of globalization are transforming the regional economy at a rapid pace, which makes long-term planning for employment more uncertain.
- Rates of obesity, diabetes and cardiovascular illnesses are on the rise in the region, in part due to growing rates of inactivity linked to low-density and automobile dependent development patterns.[2]
- People over the age of 60 are expected to comprise over 25% of the population by 2041[3], which will result in the need for more age-friendly development that can address their unique needs and circumstances. This will include a more appropriate range and mix of housing options, easier access to health care and other amenities, walkable built environments, and an age-friendly approach to community design that will meet the needs of people of all ages.

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[2] "Improving Health by Design in the Greater Toronto-Hamilton Area. A Report of Medical Officers of Health in the GTHA", Mowat, D. et al., 2014

[3] "Greater Golden Horseshoe Growth Forecasts to 2041: Technical Report (November 2012) Addendum", Hemson Consulting Ltd., 2013

- The finite supply of quality agricultural lands that feed the region and beyond must be protected to ensure a vibrant rural and productive agricultural economy and a secure food supply for future generations.
- The *impacts of a changing climate* are already being felt. Communities and *infrastructure* must be adapted to be more resilient, greenhouse gas emissions across all sectors of the economy need to be reduced, and valuable water resources and natural areas need to be protected.

To address these challenges and ensure the protection and effective use of finite resources, A Place to Grow Plan, together with the Greenbelt Plan, Oak Ridges Moraine Conservation Plan, and the Niagara Escarpment Plan, builds on the Provincial Policy Statement (PPS) to establish a unique land use planning framework for the *GGH* that supports the achievement of *complete communities*, a thriving economy, a clean and healthy environment, and social equity.

In implementing these provincial plans, the Province recognizes the importance of consulting with First Nations and Métis communities on planning matters that may affect their rights and interests. Provincial plans must be implemented in a manner that is consistent with the recognition and affirmation of existing Aboriginal and treaty rights under section 35 of the Constitution Act, 1982.

1.2 A Place to Grow: Growth Plan for the Greater Golden Horseshoe

A Place to Grow is the Ontario government's initiative to plan for growth and development in a way that supports economic prosperity, protects the environment, and helps communities achieve a high quality of life. The Places to Grow Act, 2005 enables the development of regional growth plans that guide government investments and land use planning policies.

The Growth Plan for the Greater Golden Horseshoe, 2006 (Growth Plan, 2006) was the first growth plan to provide a framework for implementing Ontario's vision for building stronger, prosperous communities by better managing growth in this region. It established the long-term framework for where and how the region will grow, while recognizing the realities facing our cities and smaller communities and acknowledging what governments can and cannot influence. It also demonstrated leadership for improving the ways in which our cities, suburbs, towns, and villages will grow over the long-term.

Vision for the GGH

More than anything, the *Greater Golden Horseshoe (GGH)* will continue to be a great place to live, work and play. Its communities will be supported by a strong economy and an approach that puts people first. This approach protects the Greenbelt and will ensure a cleaner environment is passed on to future generations. A Place to Grow will support the achievement of *complete communities* with access to transit networks, protected employment zones and an increase in the amount and variety of housing available.

The *GGH* will have sufficient housing supply that reflects market demand and what is needed in local communities. Thriving, livable, vibrant, and productive urban and rural areas will foster community health and individual well-being. The region will be supported by modern, well-maintained, sustainable, and resilient *infrastructure* built in accordance with a broad plan for managing growth. Residents will have easy access to food, shelter, education, health care, arts and recreation, and information technology. Public services will be co-located in community hubs that are broadly accessible.

Getting around will be easy. An integrated transportation network will allow people choices for easy travel both within and between urban centres throughout the region. Public transit will be fast, convenient, and affordable. Automobiles will be only one of a variety of effective and well-used choices for transportation. Transit and *active transportation* will be practical elements of our urban *transportation systems*.

A healthy natural environment with clean air, land, and water will characterize the *GGH*. The Greenbelt, including significant natural features, such as the Oak Ridges Moraine and the Niagara Escarpment, will continue to be enhanced and protected in perpetuity. The *GGH*'s rivers and streams, forests and natural areas will be accessible for residents to enjoy their beauty. Our *cultural heritage resources* and open spaces in our cities, towns, and countryside will provide people with a sense of place.

Natural areas and agricultural lands will provide a significant contribution to the region's resilience and our ability to adapt to a changing climate. Unique and high quality agricultural lands will be protected for the provision of healthy, local food for future generations. Farming will be productive, diverse, and sustainable.

Urban centres will be vibrant and characterized by more compact development patterns that support climate change mitigation and adaptation, and provide a diversity of opportunities for living, working, and enjoying culture.

The evolving regional economy of the *GGH* will continue to mature into an economic powerhouse of global significance. It will function as Canada's principal international gateway.

The Greater Toronto and Hamilton Area (GTHA) will be a thriving metropolis with an extraordinary waterfront. The urban areas of the region, including Toronto, will be celebrated centres of influence for commerce, culture, and innovation.

All of this will translate into a place where residents enjoy a high standard of living and an exceptional quality of life.

The implementation of A Place to Grow is supported by Metrolinx (an agency of the Government of Ontario created to improve coordination and integration of all modes of transportation in the GTHA) and The Big Move (the GTHA's first regional transportation plan). The Province has made significant investments in transit projects in the GTHA and beyond, and continues to invest in rapid transit projects to support the regional transit network.

Since the introduction of the Growth Plan for the Greater Golden Horseshoe in 2006, the region has seen a shift to more compact development patterns, a greater variety of housing options, more mixed-use development in *urban growth centres* and other *strategic growth areas*, and greater integration of transit and land use planning.

Despite these early successes, there is still more work to do. Now is the time to build on the progress that has been made towards the achievement of *complete communities* that are compact, *transit-supportive*, and make effective use of investments in *infrastructure* and *public service facilities*. At the same time, A Place to Grow will continue to ensure protection of our agricultural and natural areas and support climate change mitigation and adaptation as Ontario moves towards the goal of environmentally sustainable communities.

A Place to Grow ("this Plan"), builds upon the success of the initial Growth Plan, 2006 and responds to the key challenges that the region continues to face over the coming decades with enhanced policy directions.

1.2.1 Guiding Principles

The successful realization of this vision for the *GGH* centres on effective collaboration amongst the Province, other levels of government, First Nations and Métis communities, residents, private and non-profit sectors across all industries, and other stakeholders. The policies of this Plan regarding how land is developed, resources are managed and protected, and public dollars are invested are based on the following principles:

- Support the achievement of *complete communities* that are designed to support healthy and active living and meet people's needs for daily living throughout an entire lifetime.

- Prioritize *intensification* and higher densities in *strategic growth areas* to make efficient use of land and *infrastructure* and support transit viability.
- Provide flexibility to capitalize on new economic and employment opportunities as they emerge, while providing certainty for traditional industries, including resource-based sectors.
- Support a range and mix of housing options, including additional residential units and *affordable* housing, to serve all sizes, incomes, and ages of households.
- Improve the integration of land use planning with planning and investment in *infrastructure* and *public service facilities*, including integrated service delivery through community hubs, by all levels of government.
- Provide for different approaches to manage growth that recognize the diversity of communities in the *GGH*.
- Protect and enhance natural heritage, hydrologic, and landform systems, features, and functions.
- Support and enhance the long-term viability and productivity of agriculture by protecting *prime agricultural areas* and the *agri-food network*.
- Conserve and promote *cultural heritage resources* to support the social, economic, and cultural well-being of all communities, including First Nations and Métis communities.
- Integrate climate change considerations into planning and managing growth such as planning for more resilient communities and *infrastructure* – that are adaptive to the *impacts of a changing climate* – and moving towards environmentally sustainable communities by incorporating approaches to reduce greenhouse gas emissions.

1.2.2 Legislative Authority

This Plan is issued under the authority of section 7 of the Places to Grow Act, 2005. It was approved through an Order in Council under that Act to come into effect on May 16, 2019. It was most recently amended through an Order in Council under that Act that came into effect on August 28, 2020. This Plan replaces the Growth Plan for the Greater Golden Horseshoe, 2017 that took effect on July 1, 2017.

This Plan applies to the area designated by Ontario Regulation 416/05 as the Greater Golden Horseshoe growth plan area. All decisions in respect of the exercise of any authority that affects a planning matter will conform with this Plan, subject to any legislative or regulatory provisions providing otherwise.

1.2.3 How to Read this Plan

This Plan informs decision-making regarding growth management and environmental protection in the *GGH*. It consists of policies, schedules, definitions, and appendices. It also includes non-policy contextual commentary to provide background and describe the purpose of the policies.

Relationship with the Provincial Policy Statement (PPS)

The PPS provides overall policy directions on matters of provincial interest related to land use and *development* in Ontario, and applies to the *GGH*, except where this Plan or another provincial plan provides otherwise.

Like other provincial plans, this Plan builds upon the policy foundation provided by the PPS and provides additional and more specific land use planning policies to address issues facing specific geographic areas in Ontario. This Plan is to be read in conjunction with the PPS. The policies of this Plan take precedence over the policies of the PPS to the extent of any conflict, except where the relevant legislation provides otherwise. Where the policies of this Plan address the same, similar, related, or overlapping matters as policies in the PPS, applying the more specific policies of this Plan satisfies the requirements of the more general policies in the PPS. In contrast, where matters addressed in the PPS do not overlap with policies in this Plan, those PPS policies must be independently satisfied.

As provided for in the Places to Grow Act, 2005, this Plan prevails where there is a conflict between this Plan and the PPS. The only exception is where the conflict is between policies relating to the natural environment or human health. In that case, the direction that provides more protection to the natural environment or human health prevails.

Relationship with Other Provincial Plans

This Plan must also be read in conjunction with other provincial plans as defined in the Planning Act that may apply within the same geography. Within the *GGH*, this includes the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan, and the Niagara Escarpment Plan. Other provincial plans, including the Parkway Belt West Plan and Central Pickering Development Plan under the Ontario Planning and Development Act, 1994, the Lake Simcoe Protection Plan under the Lake Simcoe Protection Act, 2008 and some source protection plans under the Clean Water Act, 2006, also apply within the *GGH*. Each of these plans applies to certain defined parts of the *GGH* and provides specific policy on certain matters.

Within the *Greenbelt Area*, policies of this Plan that address the same, similar, related, or overlapping matters as the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan, or the Niagara Escarpment Plan do not apply within that part of the *Greenbelt Area* covered by the relevant plan except where the policies of this Plan, the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan, or the Niagara Escarpment Plan provide otherwise.

As provided in the Places to Grow Act, 2005, where there is a conflict between the Greenbelt, Oak Ridges Moraine Conservation, or Niagara Escarpment Plans and this Plan regarding the natural environment or human health, the direction that provides more protection to the natural environment or human health prevails. Detailed conflict provisions are set out in the Places to Grow Act, 2005.

Horizon of this Plan

While the PPS, 2020 provides for a time horizon of up to 25 years for making sufficient land available to meet projected needs, policy 1.1.2 of the PPS, 2020 provides that a provincial plan may provide an alternate time horizon for specific areas of the province. Within the *GGH*, this Plan provides that the applicable time horizon for land use planning is 2051. While certain policies have specific target dates, the goals and policies of this Plan are intended to be achieved within the horizon of this Plan.

Nothing in this Plan limits the planning for *infrastructure* and *public service facilities* beyond the horizon of this Plan. However, planning for *infrastructure* will not predetermine the form, pattern, or extent of *settlement area* boundary expansions. Planning authorities may also plan for the long-term protection of *employment areas* provided lands are not designated beyond the horizon of this Plan.

Read the Entire Plan

This Plan is to be read in its entirety and the relevant policies are to be applied to each situation. The language of each policy, including the policies in Section 5, will assist decision-makers in understanding how the policies are to be implemented.

While some policies refer to other policies for ease of use, these cross-references do not take away from the need to read the Plan as a whole. There is no implied priority in the order in which the policies appear.

Consider Specific Policy Language

Each policy provides direction on how it is to be implemented, how it is situated within this Plan, and how it relates to other policies. The choice of language in the policies is intended to distinguish between the types of policies and the nature of implementation. For example, "will" and “shall” are used interchangeably for policies that indicate positive directives in the same way that just "shall" is generally used in other provincial plans. Similarly, expressions like “is not” and “will not be” are used for policies that set out limitations and prohibitions in the same way as "shall not" is generally used in other plans.

Policies Represent Minimum Standards

The policies of this Plan represent minimum standards. Within the framework of the provincial policy-led planning system, decision-makers are encouraged to go beyond these minimum standards to address matters of importance, unless doing so would conflict with any policy of this Plan.

Defined Terms and Meanings

Italicized terms in this Plan are defined in Section 7. For non-italicized terms, the normal meaning of the word applies. Defined terms are intended to capture both singular and plural forms of these terms in the policies.

Supplementary Direction

Supplementary Direction may be issued by the Minister or by other ministers of the Crown, where appropriate, in accordance with the policies of this Plan to provide technical information and criteria to facilitate the implementation of this Plan.

Guidance Material

Guidance material may be issued to assist decision-makers with implementing the policies of this Plan. Information, technical criteria, and approaches outlined in guidance material are meant to support, but not add to or detract from, the policies of this Plan.

Where and How to Grow

2.1 Context

The *GGH* is a dynamic and diverse area, and one of the fastest growing regions in North America. By 2051, this area is forecast to grow to, at a minimum, 14.8 million people and 7.0 million jobs. The magnitude and pace of this growth necessitates a plan for building healthy and balanced communities and maintaining and improving our quality of life while adapting to the demographic shift underway.

To better co-ordinate planning for growth across the region, this Plan providespopulation and employment forecasts for all upper- and single-tier municipalities in the *GGH*. These growth forecasts are a foundational component of this Plan. They are to be reviewed in consultation with municipalities at least every five years.

This Plan is about accommodating forecasted growth in *complete communities*. These are communities that are well designed to meet people's needs for daily living throughout an entire lifetime by providing convenient access to an appropriate mix of jobs, local services, *public service facilities*, and a full range of housing to accommodate a range of incomes and household sizes. *Complete communities* support quality of life and human health by encouraging the use of *active transportation* and providing high quality public open space, adequate parkland, opportunities for recreation, and access to local and healthy food. They provide for a balance of jobs and housing in communities across the *GGH* to reduce the need for long distance commuting. They also support climate change mitigation by increasing the *modal share* for transit and *active transportation* and by minimizing land consumption through *compact built form*.

To support the achievement of *complete communities*, this Plan establishes minimum intensification and density targets that recognize the diversity of communities across the *GGH*. Some larger urban centres, such as Toronto, have already met some of the minimum targets established in this Plan, while other communities are growing and intensifying at a different pace that reflects their local context.

Building compact and *complete communities*, and protecting agricultural lands, water resources and natural areas will help reduce greenhouse gas emissions and ensure communities are more resilient to the *impacts of a changing climate*. Ontario has recently affirmed its commitment to reduce greenhouse gas emissions by 30 per cent below 2005 levels by 2030 in Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environment Plan. This target aligns Ontario with Canada's 2030 target under the Paris Agreement.

To support the achievement of *complete communities* that are healthier, safer, and more equitable, choices about where and how growth occurs in the *GGH* need to be made carefully. Better use of land and *infrastructure* can be made by directing growth to *settlement areas* and prioritizing *intensification*, with a focus on *strategic growth areas*, including *urban growth centres* and *major transit station areas*, as well as *brownfield sites* and *greyfields*. Concentrating new development in these areas provides a focus for investments in transit as well as other types of *infrastructure* and *public service facilities* to support forecasted growth, while also supporting a more diverse range and mix of housing options. However, to protect public safety and prevent future flood risks, growth should generally be directed away from hazardous areas, including those that have been identified as Special Policy Areas in accordance with the PPS.

The Growth Plan, 2006 identified 25 *urban growth centres* and this Plan continues to recognize those *urban growth centres* as regional focal points for accommodating population and employment growth. The continued revitalization of *urban growth centres* as meeting places, locations for cultural facilities, public institutions, and major services and transit hubs with the potential to become more vibrant, mixed-use, *transit-supportive* communities is particularly important.

This Plan recognizes transit as a first priority for major transportation investments. It sets out a regional vision for transit, and seeks to align transit with growth by directing growth to *major transit station areas* and other *strategic growth areas*, including *urban growth centres*, and promoting transit investments in these areas. To optimize provincial investments in *higher order transit*, this Plan also identifies *priority transit corridors* and the Province expects municipalities to complete detailed planning for *major transit station areas* on these corridors to support planned service levels.

The region is experiencing a dramatic economic change. Traditional industries, such as manufacturing and agri-food businesses, continue to play an important role, but globalization and technology are also transforming the *GGH*'s economy. There has been a shift towards knowledge-intensive, high value-added activities that is increasing the significance of the service and knowledge-based sectors and spurring innovation in other segments of the economy. This change is providing opportunities for a variety of types of businesses to locate and grow in the *GGH*, which is fundamental to ensuring a more prosperous economic future. Therefore, it is important to ensure an adequate supply of land within *employment areas* – both for traditional industries and for service sector and knowledge-based businesses that warrant such locations – and sites for a broad range of other employment uses.

It is important that we maximize the benefits of land use planning as well as existing and future investments in *infrastructure* so that our communities are well-positioned to leverage economic change. It is also critical that we understand the importance of *provincially significant employment zones* and consider opportunities to better co-ordinate our collective efforts across municipalities to support their contribution to economic growth and improve access to transit.

As in many thriving metropolitan regions, many communities in the *GGH* are facing issues of housing affordability, which are being driven primarily by sustained population growth and factors such as a lack of housing supply with record low vacancy rates. This Plan helps to address this challenge by providing direction to plan for a range and mix of housing options, including additional residential units and *affordable* housing and, in particular, higher density housing options that can accommodate a range of household sizes in locations that can provide access to transit and other amenities. There is also a need for stakeholders to work collaboratively to find opportunities to redevelop sites using more age-friendly community design.

Building more compact greenfield communities reduces the rate at which land is consumed. Communities in larger urban centres need to grow at *transit-supportive* densities, with walkable street configurations. *Compact built form* and *intensification* efforts go together with more effective transit and *active transportation* networks and are fundamental to where and how we grow. They are necessary to ensure the viability of transit; connect people to homes, jobs and other aspects of daily living for people of all ages; and meet climate change mitigation and adaptation objectives. Moreover, an increased *modal share* for *active transportation* and transit, including convenient, *multimodal* options for intra- and inter-municipal travel, supports reduced air pollution and improved public health outcomes.

It is important to optimize the use of the existing urban land supply as well as the existing building and housing stock to avoid over-designating land for future urban development while also providing flexibility for local decision-makers to respond to housing need and market demand. This Plan's emphasis on optimizing the use of the existing urban land supply represents an *intensification* first approach to development and city-building, one which focuses on making better use of our existing *infrastructure* and *public service facilities*, and less on continuously expanding the urban area.

Strong, healthy and prosperous rural communities are also vital to the economic success of the *GGH* and contribute to our quality of life. This Plan recognizes and promotes the important role of rural towns and villages as a focus of economic, cultural and social activities that support surrounding rural and agricultural areas across the *GGH*. Opportunities to support a diversified rural economy should be promoted by protecting farmland and the viability of the agri-food sector in rural areas. Healthy rural communities are important to the vitality and well-being of the larger region.

2.2 Policies for Where and How to Grow

2.2.1 Managing Growth

1. Population and employment forecasts contained in Schedule 3 or such higher forecasts as established by the applicable upper- or single-tier municipality through its *municipal comprehensive review* will be used for planning and managing growth in the *GGH* to the horizon of this Plan in accordance with the policies in subsection 5.2.4.
2. Forecasted growth to the horizon of this Plan will be allocated based on the following:
    a) the vast majority of growth will be directed to *settlement areas* that:
        i. have a *delineated built boundary*;
        ii. have existing or planned *municipal water and wastewater systems*; and
        iii. can support the achievement of *complete communities*;
    b) growth will be limited in *settlement areas* that:
        i. are *rural settlements*;
        ii. are not serviced by existing or planned *municipal water and wastewater systems*; or
        iii. are in the *Greenbelt Area*;
    c) within *settlement areas*, growth will be focused in:
        i. *delineated built-up areas*;
        ii. *strategic growth areas*;
        iii. locations with existing or planned transit, with a priority on *higher order transit* where it exists or is planned; and
        iv. areas with existing or planned *public service facilities*;
    d) development will be directed to *settlement areas*, except where the policies of this Plan permit otherwise;
    e) development will be generally directed away from *hazardous lands*; and
    f) the establishment of new *settlement areas* is prohibited.
3. Upper- and single-tier municipalities will undertake integrated planning to manage forecasted growth to the horizon of this Plan, which will:

a) establish a hierarchy of *settlement areas*, and of areas within *settlement areas*, in accordance with policy 2.2.1.2;

b) be supported by planning for *infrastructure* and *public service facilities* by considering the full life cycle costs of these assets and developing options to pay for these costs over the long-term;

c) provide direction for an urban form that will optimize *infrastructure*, particularly along transit and transportation corridors, to support the achievement of *complete communities* through a more *compact built form*;

d) support the environmental and agricultural protection and conservation objectives of this Plan; and

e) be implemented through a *municipal comprehensive review* and, where applicable, include direction to lower-tier municipalities.

4. Applying the policies of this Plan will support the achievement of *complete communities* that:

a) feature a diverse mix of land uses, including residential and employment uses, and convenient access to local stores, services, and *public service facilities*;

b) improve social equity and overall quality of life, including human health, for people of all ages, abilities, and incomes;

c) provide a diverse range and mix of housing options, including additional residential units and *affordable* housing, to accommodate people at all stages of life, and to accommodate the needs of all household sizes and incomes;

d) expand convenient access to:

i. a range of transportation options, including options for the safe, comfortable and convenient use of *active transportation*;

ii. *public service facilities*, co-located and integrated in community hubs;

iii. an appropriate supply of safe, publicly-accessible open spaces, parks, trails, and other recreational facilities; and

iv. healthy, local, and affordable food options, including through urban agriculture;

e) provide for a more *compact built form* and a vibrant *public realm*, including public open spaces;

f) mitigate and adapt to the *impacts of a changing climate*, improve resilience and reduce greenhouse gas emissions, and contribute to environmental sustainability; and

g) integrate *green infrastructure* and appropriate *low impact development*.

5. The Minister will establish a methodology for assessing land needs to implement this Plan, including relevant assumptions and other direction as required. This methodology will be used by upper- and single-tier municipalities to assess the quantity of land required to accommodate forecasted growth to the horizon of this Plan.

6. Based on a land needs assessment undertaken in accordance with policy 2.2.1.5, some upper- and single-tier municipalities in the *outer ring* will determine that they have *excess lands*. These municipalities will:

   a) determine which lands will be identified as *excess lands* based on the hierarchy of *settlement areas* established in accordance with policy 2.2.1.3;

   b) prohibit *development* on all *excess lands* to the horizon of this Plan; and

   c) where appropriate, use additional tools to reduce the land that is available for *development*, such as those set out in policies 5.2.8.3 and 5.2.8.4.

2.2.2 Delineated Built-up Areas

1. By the time the next *municipal comprehensive review* is approved and in effect, and for each year thereafter, the applicable minimum intensification target is as follows:

   a) A minimum of 50 per cent of all residential development occurring annually within each of the Cities of Barrie, Brantford, Guelph, Hamilton, Orillia and Peterborough and the Regions of Durham, Halton, Niagara, Peel, Waterloo and York will be within the *delineated built-up area*; and

   b) The City of Kawartha Lakes and the Counties of Brant, Dufferin, Haldimand, Northumberland, Peterborough, Simcoe and Wellington will, through the next *municipal comprehensive review*, each establish the minimum percentage of all residential development occurring annually that will be within the *delineated built-up area*, based on maintaining or improving upon the minimum intensification target contained in the applicable upper- or single-tier official plan.

2. Until the next *municipal comprehensive review* is approved and in effect, the annual minimum intensification target contained in the applicable upper- or single-tier official plan that is approved and in effect as of July 1, 2017 will continue to apply.

3. All municipalities will develop a strategy to achieve the minimum intensification target and *intensification* throughout *delineated built-up areas*, which will:
   a) identify *strategic growth areas* to support achievement of the intensification target and recognize them as a key focus for development;
   b) identify the appropriate type and scale of development in *strategic growth areas* and transition of built form to adjacent areas;
   c) encourage *intensification* generally throughout the *delineated built-up area*;
   d) ensure lands are zoned and development is designed in a manner that supports the achievement of *complete communities*;
   e) prioritize planning and investment in *infrastructure* and *public service facilities* that will support *intensification*; and
   f) be implemented through official plan policies and designations, updated zoning and other supporting documents.
4. Councils of upper- and single-tier municipalities may request an alternative to the target established in policy 2.2.2.1 where it is demonstrated that this target cannot be achieved and that the alternative target will be appropriate given the size, location and capacity of the *delineated built-up area.*
5. The Minister may permit an alternative to the target established in policy 2.2.2.1. If council does not make a request or the Minister does not permit an alternative target, the target established in policy 2.2.2.1 will apply.

2.2.3 Urban Growth Centres

1. *Urban growth centres* will be planned:
   a) as focal areas for investment in regional *public service facilities*, as well as commercial, recreational, cultural, and entertainment uses;
   b) to accommodate and support the transit network at the regional scale and provide connection points for inter- and intra-regional transit;
   c) to serve as high-density major employment centres that will attract provincially, nationally, or internationally significant employment uses; and
   d) to accommodate significant population and employment growth.
2. *Urban growth centres* will be planned to achieve, by 2031 or earlier, a minimum density target of:

a) 400 residents and jobs combined per hectare for each of the *urban growth centres* in the City of Toronto;

b) 200 residents and jobs combined per hectare for each of the Downtown Brampton, Downtown Burlington, Downtown Hamilton, Downtown Milton, Markham Centre, Downtown Mississauga, Newmarket Centre, Midtown Oakville, Downtown Oshawa, Downtown Pickering, Richmond Hill Centre/Langstaff Gateway, Vaughan Metropolitan Centre, Downtown Kitchener, and Uptown Waterloo *urban growth centres*; and

c) 150 residents and jobs combined per hectare for each of the Downtown Barrie, Downtown Brantford, Downtown Cambridge, Downtown Guelph, Downtown Peterborough and Downtown St. Catharines *urban growth centres*.

2.2.4 Transit Corridors and Station Areas

1. The *priority transit corridors* shown in Schedule 5 will be identified in official plans. Planning will be prioritized for *major transit station areas* on *priority transit corridors*, including zoning in a manner that implements the policies of this Plan.

2. For *major transit station areas* on *priority transit corridors* or subway lines, upper- and single-tier municipalities, in consultation with lower-tier municipalities, will delineate the boundaries of *major transit station areas* in a *transit-supportive* manner that maximizes the size of the area and the number of potential transit users that are within walking distance of the station.

3. *Major transit station areas* on *priority transit corridors* or subway lines will be planned for a minimum density target of:

   a) 200 residents and jobs combined per hectare for those that are served by subways;

   b) 160 residents and jobs combined per hectare for those that are served by light rail transit or bus rapid transit; or

   c) 150 residents and jobs combined per hectare for those that are served by the GO Transit rail network.

4. For a particular *major transit station area*, the Minister may approve a target that is lower than the applicable target established in policy 2.2.4.3, where it has been demonstrated that this target cannot be achieved because:

   a) *development* is prohibited by provincial policy or severely restricted on a significant portion of the lands within the delineated area; or

b) there are a limited number of residents and jobs associated with the built form, but a *major trip generator* or feeder service will sustain high ridership at the station or stop.

5. Notwithstanding policies 5.2.3.2 b) and 5.2.5.3 c), upper- and single-tier municipalities may delineate the boundaries of *major transit station areas* and identify minimum density targets for *major transit station areas* in advance of the next *municipal comprehensive review*, provided it is done in accordance with subsections 16(15) or (16) of the Planning Act, as the case may be.

6. Within *major transit station areas* on *priority transit corridors* or subway lines, land uses and built form that would adversely affect the achievement of the minimum density targets in this Plan will be prohibited.

7. The Province may identify additional *priority transit corridors* and planning requirements for *major transit station areas* on *priority transit corridors* or subway lines, to support the optimization of transit investments across the *GGH*, which may specify:

   a) the timeframes for implementation of the planning requirements;

   b) the boundaries of the area that will be subject to the planning requirements; and

   c) any additional requirements that may apply in relation to these areas.

8. All *major transit station areas* will be planned and designed to be *transit-supportive* and to achieve *multimodal* access to stations and connections to nearby *major trip generators* by providing, where appropriate:

   a) connections to local and regional transit services to support *transit service integration*;

   b) *infrastructure* to support *active transportation*, including sidewalks, bicycle lanes, and secure bicycle parking; and

   c) commuter pick-up/drop-off areas.

9. Within all *major transit station areas*, development will be supported, where appropriate, by:

   a) planning for a diverse mix of uses, including additional residential units and *affordable* housing, to support existing and planned transit service levels;

   b) fostering collaboration between public and private sectors, such as *joint development* projects;

   c) providing alternative development standards, such as reduced parking standards; and

d) prohibiting land uses and built form that would adversely affect the achievement of *transit-supportive* densities.

10. Lands adjacent to or near to existing and planned *frequent transit* should be planned to be *transit-supportive* and supportive of *active transportation* and a range and mix of uses and activities.

11. In planning lands adjacent to or near *higher order transit* corridors and facilities, municipalities will identify and protect lands that may be needed for future enhancement or expansion of transit *infrastructure*, in consultation with Metrolinx, as appropriate.

2.2.5 Employment

1. Economic development and competitiveness in the *GGH* will be promoted by:

   a) making more efficient use of existing *employment areas* and vacant and underutilized employment lands and increasing employment densities;

   b) ensuring the availability of sufficient land, in appropriate locations, for a variety of employment to accommodate forecasted employment growth to the horizon of this Plan;

   c) planning to better connect areas with high employment densities to transit; and

   d) integrating and aligning land use planning and economic development goals and strategies to retain and attract investment and employment.

2. *Major office* and appropriate major institutional development will be directed to *urban growth centres*, *major transit station areas* or other *strategic growth areas* with existing or planned *frequent transit* service.

3. Retail and office uses will be directed to locations that support *active transportation* and have existing or planned transit.

4. In planning for employment, surface parking will be minimized and the development of *active transportation* networks and *transit-supportive* built form will be facilitated.

5. Municipalities should designate and preserve lands within *settlement areas* located adjacent to or near *major goods movement facilities and corridors*, including major highway interchanges, as areas for manufacturing, warehousing and logistics, and appropriate associated uses and ancillary facilities.

6. Upper- and single-tier municipalities, in consultation with lower-tier municipalities, will designate all *employment areas* in official plans and protect them for appropriate employment uses over the long-term. For

greater certainty, *employment area* designations may be incorporated into upper- and single-tier official plans by amendment at any time in advance of the next *municipal comprehensive review*.

7. Municipalities will plan for all *employment areas* within *settlement areas* by:

   a) prohibiting residential uses and prohibiting or limiting other *sensitive land uses* that are not ancillary to the primary employment use;

   b) prohibiting *major retail* uses or establishing a size or scale threshold for any *major retail* uses that are permitted and prohibiting any *major retail* uses that would exceed that threshold; and

   c) providing an appropriate interface between *employment areas* and adjacent non-employment areas to maintain land use compatibility.

8. The development of *sensitive land uses*, *major retail* uses or *major office* uses will, in accordance with provincial guidelines, avoid, or where avoidance is not possible, minimize and mitigate adverse impacts on industrial, manufacturing or other uses that are particularly vulnerable to encroachment.

9. The conversion of lands within *employment areas* to non-employment uses may be permitted only through a *municipal comprehensive review* where it is demonstrated that:

   a) there is a need for the conversion;

   b) the lands are not required over the horizon of this Plan for the employment purposes for which they are designated;

   c) the municipality will maintain sufficient employment lands to accommodate forecasted employment growth to the horizon of this Plan;

   d) the proposed uses would not adversely affect the overall viability of the *employment area* or the achievement of the minimum intensification and density targets in this Plan, as well as the other policies of this Plan; and

   e) there are existing or planned *infrastructure* and *public service facilities* to accommodate the proposed uses.

10. Notwithstanding policy 2.2.5.9, until the next *municipal comprehensive review*, lands within existing *employment areas* may be converted to a designation that permits non-employment uses, provided the conversion would:

   a) satisfy the requirements of policy 2.2.5.9 a), d) and e);

   b) maintain a significant number of jobs on those lands through the establishment of development criteria; and

c) not include any part of an *employment area* identified as a *provincially significant employment zone* unless the part of the *employment area* is located within a *major transit station area* as delineated in accordance with the policies in subsection 2.2.4.

11. Any change to an official plan to permit new or expanded opportunities for *major retail* in an *employment area* may only occur in accordance with policy 2.2.5.9 or 2.2.5.10.

12. The Minister may identify *provincially significant employment zones* and may provide specific direction for planning in those areas to be implemented through appropriate official plan policies and designations and economic development strategies.

13. Upper- and single-tier municipalities, in consultation with lower-tier municipalities, will establish minimum density targets for all *employment areas* within *settlement areas* that:

a) are measured in jobs per hectare;

b) reflect the current and anticipated type and scale of employment that characterizes the *employment area* to which the target applies;

c) reflects opportunities for the *intensification* of *employment areas* on sites that support *active transportation* and are served by existing or planned transit; and

d) will be implemented through official plan policies and designations and zoning by-laws.

14. Outside of *employment areas*, development criteria should be established to ensure that the redevelopment of any employment lands will retain space for a similar number of jobs to remain accommodated on site.

15. The retail sector will be supported by promoting *compact built form* and *intensification* of retail and service uses and areas and encouraging the integration of those uses with other land uses to support the achievement of *complete communities*.

16. Existing *office parks* will be supported by:

a) improving connectivity with transit and *active transportation* networks;

b) providing for an appropriate mix of amenities and open space to serve the workforce;

c) planning for *intensification* of employment uses;

d) ensuring that the introduction of any non-employment uses, if appropriate, would be limited and would not negatively impact the primary function of the area; and

e) approaches to *transportation demand management* that reduce reliance on single-occupancy vehicle use.

17. Upper- and single-tier municipalities, in consultation with lower-tier municipalities, the Province, and other appropriate stakeholders, are encouraged to undertake a co-ordinated approach to planning for large areas with high concentrations of employment that cross municipal boundaries and are *major trip generators*, on matters such as *transportation demand management* and economic development. If necessary, the Minister may identify certain areas that meet these criteria and provide direction for a co-ordinated approach to planning.

18. In recognition of the importance of cross-border trade with the United States, this Plan recognizes a *Gateway Economic Zone* and *Gateway Economic Centre* near the Niagara-United States border. Planning and economic development in these areas will support economic diversity and promote increased opportunities for cross-border trade, movement of goods, and tourism.

2.2.6 Housing

1. Upper- and single-tier municipalities, in consultation with lower-tier municipalities, the Province, and other appropriate stakeholders, will:

   a) support housing choice through the achievement of the minimum intensification and density targets in this Plan, as well as the other policies of this Plan by:

      i. identifying a diverse range and mix of housing options and densities, including additional residential units and *affordable* housing to meet projected needs of current and future residents; and

      ii. establishing targets for *affordable* ownership housing and rental housing;

   b) identify mechanisms, including the use of land use planning and financial tools, to support the implementation of policy 2.2.6.1 a);

   c) align land use planning with applicable housing and homelessness plans required under the Housing Services Act, 2011;

   d) address housing needs in accordance with provincial policy statements such as the Policy Statement: “Service Manager Housing and Homelessness Plans”; and

   e) implement policy 2.2.6.1 a), b), c) and d) through official plan policies and designations and zoning by-laws.

2. Notwithstanding policy 1.4.1 of the PPS, 2020, in implementing policy 2.2.6.1, municipalities will support the achievement of *complete communities* by:
   a) planning to accommodate forecasted growth to the horizon of this Plan;
   b) planning to achieve the minimum intensification and density targets in this Plan;
   c) considering the range and mix of housing options and densities of the existing housing stock; and
   d) planning to diversify their overall housing stock across the municipality.
3. To support the achievement of *complete communities*, municipalities will consider the use of available tools to require that multi-unit residential developments incorporate a mix of unit sizes to accommodate a diverse range of household sizes and incomes.
4. Municipalities will maintain at all times where development is to occur, land with servicing capacity sufficient to provide at least a three-year supply of residential units. This supply will include, and may exclusively consist of, lands suitably zoned for *intensification* and *redevelopment*.
5. When a *settlement area* boundary has been expanded in accordance with the policies in subsection 2.2.8, the new *designated greenfield area* will be planned in accordance with policies 2.2.6.1 and 2.2.6.2.

2.2.7 Designated Greenfield Areas

1. New *development* taking place in *designated greenfield areas* will be planned, designated, zoned and designed in a manner that:
   a) supports the achievement of *complete communities*;
   b) supports *active transportation*; and
   c) encourages the integration and sustained viability of transit services.
2. The minimum density target applicable to the *designated greenfield area* of each upper- and single-tier municipality is as follows:
   a) The Cities of Barrie, Brantford, Guelph, Hamilton, Orillia and Peterborough and the Regions of Durham, Halton, Niagara, Peel, Waterloo and York will plan to achieve within the horizon of this Plan a minimum density target that is not less than 50 residents and jobs combined per hectare; and
   b) The City of Kawartha Lakes and the Counties of Brant, Dufferin, Haldimand, Northumberland, Peterborough, Simcoe and Wellington will plan to achieve within the horizon of this Plan a minimum density

target that is not less than 40 residents and jobs combined per hectare.

3. The minimum density target will be measured over the entire *designated greenfield area* of each upper- or single-tier municipality, excluding the following:

    a) *natural heritage features and areas*, *natural heritage systems* and floodplains, provided *development* is prohibited in these areas;

    b) rights-of-way for:

        i. electricity transmission lines;

        ii. *energy transmission pipelines*;

        iii. freeways, as defined by and mapped as part of the Ontario Road Network; and

        iv. railways;

    c) *employment areas;* and

    d) cemeteries.

4. Councils of upper- and single-tier municipalities may request an alternative to the target established in policy 2.2.7.2 where it is demonstrated that the target cannot be achieved and that the alternative target will support the diversification of the total range and mix of housing options and the achievement of a more *compact built form* in *designated greenfield areas* to the horizon of this Plan in a manner that is appropriate given the characteristics of the municipality and adjacent communities.

5. The Minister may permit an alternative to the target established in policy 2.2.7.2. If council does not make a request or the Minister does not permit an alternative target, the target established in policy 2.2.7.2 will apply.

2.2.8 Settlement Area Boundary Expansions

1. *Settlement area* boundaries will be delineated in official plans.

2. A *settlement area* boundary expansion may only occur through a *municipal comprehensive review* where it is demonstrated that:

    a) based on the minimum intensification and density targets in this Plan and a land needs assessment undertaken in accordance with policy 2.2.1.5, sufficient opportunities to accommodate forecasted growth to the horizon of this Plan are not available through *intensification* and in the *designated greenfield area*:

        i. within the upper- or single-tier municipality, and

ii. within the applicable lower-tier municipality;

b) the proposed expansion will make available sufficient lands not exceeding the horizon of this Plan, based on the analysis provided for in policy 2.2.8.2 a), while minimizing land consumption; and

c) the timing of the proposed expansion and the phasing of development within the *designated greenfield area* will not adversely affect the achievement of the minimum intensification and density targets in this Plan, as well as the other policies of this Plan.

3. Where the need for a *settlement area* boundary expansion has been justified in accordance with policy 2.2.8.2, the feasibility of the proposed expansion will be determined and the most appropriate location for the proposed expansion will be identified based on the comprehensive application of all of the policies in this Plan, including the following:

a) there is sufficient capacity in existing or planned *infrastructure* and *public service facilities*;

b) the *infrastructure* and *public service facilities* needed would be financially viable over the full life cycle of these assets;

c) the proposed expansion would be informed by applicable water and wastewater master plans or equivalent and *stormwater master plans* or equivalent, as appropriate;

d) the proposed expansion, including the associated water, wastewater and stormwater servicing, would be planned and demonstrated to avoid, or if avoidance is not possible, minimize and mitigate any potential negative impacts on watershed conditions and the *water resource system*, including the *quality and quantity of water*;

e) *key hydrologic areas* and the *Natural Heritage System for the Growth Plan* should be avoided where possible;

f) *prime agricultural areas* should be avoided where possible. To support the *Agricultural System*, alternative locations across the upper- or single-tier municipality will be evaluated, prioritized and determined based on avoiding, minimizing and mitigating the impact on the *Agricultural System* and in accordance with the following:

i. expansion into *specialty crop areas* is prohibited;

ii. reasonable alternatives that avoid *prime agricultural areas* are evaluated; and

iii. where *prime agricultural areas* cannot be avoided, lower priority agricultural lands are used;

g) the *settlement area* to be expanded is in compliance with the *minimum distance separation formulae*;

h) any adverse impacts on the *agri-food network*, including agricultural operations, from expanding *settlement areas* would be avoided, or if avoidance is not possible, minimized and mitigated as determined through an *agricultural impact assessment*;

i) the policies of Sections 2 (Wise Use and Management of Resources) and 3 (Protecting Public Health and Safety) of the PPS are applied;

j) the proposed expansion would meet any applicable requirements of the Greenbelt, Oak Ridges Moraine Conservation, Niagara Escarpment, and Lake Simcoe Protection Plans and any applicable source protection plan; and

k) within the Protected Countryside in the *Greenbelt Area*:

   i. the *settlement area* to be expanded is identified in the Greenbelt Plan as a Town/Village;

   ii. the proposed expansion would be modest in size, representing no more than a 5 per cent increase in the geographic size of the *settlement area* based on the *settlement area* boundary delineated in the applicable official plan as of July 1, 2017, up to a maximum size of 10 hectares, and residential *development* would not be permitted on more than 50 per cent of the lands that would be added to the *settlement area*;

   iii. the proposed expansion would support the achievement of *complete communities* or the local agricultural economy;

   iv. the proposed uses cannot be reasonably accommodated within the existing *settlement area* boundary;

   v. the proposed expansion would be serviced by existing *municipal water and wastewater systems* without impacting future *intensification* opportunities in the existing *settlement area*; and

   vi. expansion into the Natural Heritage System that has been identified in the Greenbelt Plan is prohibited.

4. Notwithstanding policy 2.2.8.2, municipalities may adjust *settlement area* boundaries outside of a *municipal comprehensive review*, provided:

a) there would be no net increase in land within *settlement areas*;

b) the adjustment would support the municipality's ability to meet the intensification and density targets established pursuant to this Plan;

c) the location of any lands added to a *settlement area* will satisfy the applicable requirements of policy 2.2.8.3;

d) the affected *settlement areas* are not *rural settlements* or in the *Greenbelt Area*; and

e) the *settlement area* to which lands would be added is serviced by *municipal water and wastewater systems* and there is sufficient reserve *infrastructure* capacity to service the lands.

5. Notwithstanding policies 2.2.8.2 and 5.2.4.3, a *settlement area* boundary expansion may occur in advance of a *municipal comprehensive review*, provided:

a) the lands that are added will be planned to achieve at least the minimum density target in policy 2.2.7.2 or 2.2.5.13, as appropriate;

b) the location of any lands added to a *settlement area* will satisfy the applicable requirements of policy 2.2.8.3;

c) the affected *settlement area* is not a *rural settlement* or in the *Greenbelt Area*;

d) the *settlement area* is serviced by *municipal water and wastewater systems* and there is sufficient reserve *infrastructure* capacity to service the lands; and

e) the additional lands and associated forecasted growth will be fully accounted for in the land needs assessment associated with the next *municipal comprehensive review*.

6. For a *settlement area* boundary expansion undertaken in accordance with policy 2.2.8.5, the amount of land to be added to the *settlement area* will be no larger than 40 hectares.

2.2.9 Rural Areas

1. Municipalities are encouraged to plan for a variety of cultural and economic opportunities within *rural settlements* to serve the needs of rural residents and area businesses.

2. *Public service facilities* in *rural settlements* should be co-located and integrated in community hubs, and priority should be given to maintaining and adapting existing *public service facilities* in community hubs to meet the needs of the community, where feasible.

3. Subject to the policies in Section 4, *development* outside of *settlement areas* may be permitted on *rural lands* for:

a) the management or use of resources;

b) resource-based recreational uses; and

c) other rural land uses that are not appropriate in *settlement areas* provided they:

i. are compatible with the rural landscape and surrounding local land uses;

ii. will be sustained by rural service levels; and

iii. will not adversely affect the protection of *agricultural uses* and other resource-based uses such as *mineral aggregate operations*.

4. Where permitted on *rural lands*, resource-based recreational uses should be limited to tourism-related and recreational uses that are compatible with the scale, character, and capacity of the resource and the surrounding rural landscape, and may include:

a) commercial uses to serve the needs of visitors; and

b) where appropriate, resource-based recreational dwellings for seasonal accommodation.

5. Existing *employment areas* outside of *settlement areas* on *rural lands* that were designated for employment uses in an official plan that was approved and in effect as of June 16, 2006 may continue to be permitted. Expansions to these existing *employment areas* may be permitted only if necessary to support the immediate needs of existing businesses and if compatible with the surrounding uses.

6. *New multiple lots or units for residential development* will be directed to *settlement areas*, but may be allowed on *rural lands* in site-specific locations with approved zoning or designation in an official plan that permitted this type of *development* as of June 16, 2006.

7. Notwithstanding policy 2.2.8.2, minor adjustments may be made to the boundaries of *rural settlements* outside of a *municipal comprehensive review*, subject to the following:

a) the affected *settlement area* is not in the *Greenbelt Area*;

b) the change would constitute minor rounding out of existing development, in keeping with the rural character of the area;

c) confirmation that water and wastewater servicing can be provided in an appropriate manner that is suitable for the long-term with no *negative impacts* on water; and

d) Sections 2 (Wise Use and Management of Resources) and 3 (Protecting Public Health and Safety) of the PPS are applied.

3 Infrastructure to Support Growth

3.1 Context

Well planned *infrastructure* is essential to the viability of Ontario's communities and critical to economic competitiveness, quality of life, and the delivery of public services. This Plan provides the framework to guide and prioritize *infrastructure* planning and investments in the *GGH* to support and accommodate forecasted growth to the horizon of this Plan and beyond.

The *infrastructure* framework in this Plan requires that municipalities undertake an integrated approach to land use planning, *infrastructure* investments, and environmental protection to achieve the outcomes of the Plan. Co-ordination of these different dimensions of planning allows municipalities to identify the most cost-effective options for sustainably accommodating forecasted growth to the horizon of this Plan to support the achievement of *complete communities*. It is estimated that over 30 per cent of *infrastructure* capital costs, and 15 per cent of operating costs[4], could be saved by moving from unmanaged growth to a more *compact built form*.

This Plan is aligned with the Province's approach to long-term *infrastructure* planning as enshrined in the Infrastructure for Jobs and Prosperity Act, 2015, which established mechanisms to encourage principled, evidence-based and strategic long-term *infrastructure* planning.

This Plan is also aligned with the Province's municipal asset management regulation. The purpose of the regulation is to improve the way municipalities plan for their *infrastructure* and includes requirements that promote alignment of planning for land use and *infrastructure*. Significant cost savings can be achieved by ensuring that existing *infrastructure* is optimized before new *infrastructure* is built. This principle is integrated into the policies of this Plan and applies to all forms of *infrastructure*.

The *transportation system* for the *GGH* must be planned and managed for the safe and efficient movement of goods and people, and to reduce greenhouse gas emissions and other negative environmental impacts.

Transit is the first priority for transportation planning and investment. The transit network will support and facilitate improved linkages between *strategic growth areas* and other areas planned for a mix of uses and *transit-supportive* densities.

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[4] "Building Together: Guide for Municipal Asset Management Plans", Ministry of Infrastructure, 2012

System users will benefit from improved linkages between and within municipalities as well as *transit service integration*.

A comprehensive and continuous *active transportation* network will offer a viable alternative to the private automobile for personal travel. Using a *complete streets* approach to roadway design, reconstruction, and refurbishment will ensure that the needs and safety of all road users are considered when planning and building the street network.

To support goods movement, this Plan calls for a co-ordinated goods movement network that links *major goods movement facilities and corridors* to the provincial highway network and areas of significant commercial activity. This Plan also calls for the long-term protection of *planned corridors* and the co-location of *infrastructure* in these corridors where appropriate.

A clean and sustainable supply of water is essential to the long-term health and prosperity of the region. There is a need to co-ordinate investment in water, wastewater, and stormwater *infrastructure* to service future growth in ways that are fiscally sustainable and linked to decisions about how these systems are paid for and administered. Water *infrastructure* planning will be informed by *watershed planning* to ensure that the *quality and quantity of water* is maintained.

The importance of the Great Lakes is reflected in many provincial initiatives, including the Great Lakes Protection Act, 2015 and Ontario's Great Lakes Strategy. This Plan supports these initiatives by providing direction on *watershed*-based, integrated water, wastewater, and stormwater master planning and by restricting future extensions of water and wastewater servicing from the Great Lakes.

Climate change poses a serious challenge for maintaining existing *infrastructure* and planning for new *infrastructure*, however, vulnerability assessments can help to identify risks and options for enhancing resilience. Similarly, comprehensive stormwater management planning, including the use of appropriate *low impact development* and *green infrastructure*, can increase the resiliency of our communities.

Investment in *public service facilities* – such as hospitals, long-term care facilities, libraries and schools – should be planned and located to keep pace with changing needs, maximize existing *infrastructure* and to support the achievement of *complete communities*, co-locating services in community hubs and prioritizing *strategic growth areas* as appropriate.

3.2 Policies for Infrastructure to Support Growth

3.2.1 Integrated Planning

1. *Infrastructure* planning, land use planning, and *infrastructure* investment will be co-ordinated to implement this Plan.
2. Planning for new or expanded *infrastructure* will occur in an integrated manner, including evaluations of long-range scenario-based land use planning, environmental planning and financial planning, and will be supported by relevant studies and should involve:
   a) leveraging *infrastructure* investment to direct growth and development in accordance with the policies and schedules of this Plan, including the achievement of the minimum intensification and density targets in this Plan;
   b) providing sufficient *infrastructure* capacity in *strategic growth areas*;
   c) identifying the full life cycle costs of *infrastructure* and developing options to pay for these costs over the long-term; and
   d) considering the *impacts of a changing climate*.
3. *Infrastructure* investment and other implementation tools and mechanisms will be used to facilitate *intensification* and higher density development in *strategic growth areas*. Priority will be given to *infrastructure* investments made by the Province that support the policies and schedules of this Plan.
4. Municipalities will assess *infrastructure* risks and vulnerabilities, including those caused by the *impacts of a changing climate*, and identify actions and investments to address these challenges, which could be identified as part of municipal asset management planning.
5. The Province will work with public sector partners, including Metrolinx, to identify strategic *infrastructure* needs to support the implementation of this Plan through multi-year *infrastructure* planning for the *transportation system* and *public service facilities*.

3.2.2 Transportation – General

1. *Transportation system* planning, land use planning, and transportation investment will be co-ordinated to implement this Plan.
2. The *transportation system* within the *GGH* will be planned and managed to:

a) provide connectivity among transportation modes for moving people and for moving goods;
b) offer a balance of transportation choices that reduces reliance upon the automobile and promotes transit and *active transportation*;
c) be sustainable and reduce greenhouse gas emissions by encouraging the most financially and environmentally appropriate mode for trip-making and supporting the use of zero- and low-emission vehicles;
d) offer *multimodal* access to jobs, housing, schools, cultural, and recreational opportunities, and goods and services;
e) accommodate agricultural vehicles and equipment, as appropriate; and
f) provide for the safety of system users.

3. In the design, refurbishment, or reconstruction of the existing and planned street network, a *complete streets* approach will be adopted that ensures the needs and safety of all road users are considered and appropriately accommodated.
4. Municipalities will develop and implement *transportation demand management* policies in official plans or other planning documents or programs to:
a) reduce trip distance and time;
b) increase the *modal share* of alternatives to the automobile, which may include setting *modal share* targets;
c) prioritize *active transportation*, transit, and goods movement over single-occupant automobiles;
d) expand *infrastructure* to support *active transportation*; and
e) consider the needs of *major trip generators*.

3.2.3 Moving People

1. Public transit will be the first priority for transportation *infrastructure* planning and major transportation investments.
2. All decisions on transit planning and investment will be made according to the following criteria:
a) aligning with, and supporting, the priorities identified in Schedule 5;
b) prioritizing areas with existing or planned higher residential or employment densities to optimize return on investment and the efficiency and viability of existing and planned transit service levels;
c) increasing the capacity of existing transit systems to support *strategic growth areas*;

d) expanding transit service to areas that have achieved, or will be planned to achieve, *transit-supportive* densities and provide a mix of residential, office, institutional, and commercial development, wherever possible;

e) facilitating improved linkages between and within municipalities from nearby neighbourhoods to *urban growth centres*, *major transit station areas*, and other *strategic growth areas*;

f) increasing the *modal share* of transit; and

g) contributing towards the provincial greenhouse gas emissions reduction targets.

3. Municipalities will work with transit operators, the Province, Metrolinx where applicable, and each other to support *transit service integration* within and across municipal boundaries.

4. Municipalities will ensure that *active transportation* networks are comprehensive and integrated into transportation planning to provide:

a) safe, comfortable travel for pedestrians, bicyclists, and other users of *active transportation*; and

b) continuous linkages between *strategic growth areas*, adjacent neighbourhoods, *major trip generators*, and transit stations, including dedicated lane space for bicyclists on the major street network, or other safe and convenient alternatives.

3.2.4 Moving Goods

1. Linking *major goods movement facilities and corridors*, international gateways, and *employment areas* to facilitate efficient goods movement will be the first priority of highway investment.

2. The Province and municipalities will work with agencies and transportation service providers to:

a) co-ordinate, optimize, and ensure the long-term viability of *major goods movement facilities and corridors*;

b) improve corridors for moving goods across the *GGH* in accordance with Schedule 6;

c) promote and better integrate *multimodal* goods movement and *freight-supportive* land use and *transportation system* planning; and

d) accommodate agricultural vehicles and equipment, as appropriate.

3. Municipalities will provide for the establishment of priority routes for goods movement, where feasible, to facilitate the movement of goods into and out of *employment areas* and other areas of significant

commercial activity and to provide alternate routes connecting to the provincial network.

3.2.5 Infrastructure Corridors

1. In planning for the development, optimization, or expansion of existing and *planned corridors* and supporting facilities, the Province, other public agencies and upper- and single-tier municipalities will:
    a) encourage the co-location of linear *infrastructure* where appropriate;
    b) ensure that existing and *planned corridors* are protected to meet current and projected needs in accordance with the transportation and *infrastructure* corridor protection policies in the PPS;
    c) where applicable, demonstrate through an *agricultural impact assessment* or equivalent analysis as part of an environmental assessment, that any impacts on the *Agricultural System* have been avoided or, if avoidance is not possible, minimized and to the extent feasible mitigated;
    d) where applicable, demonstrate through an environmental assessment, that any impacts on *key natural heritage features* in the *Natural Heritage System for the Growth Plan*, *key hydrologic features* and *key hydrologic areas* have been avoided or, if avoidance is not possible, minimized and to the extent feasible mitigated; and
    e) for existing or *planned corridors* for transportation:
        i. consider increased opportunities for moving people and goods by rail;
        ii. consider separation of modes within corridors; and
        iii. provide opportunities for inter-modal linkages.
2. The planning, location, and design of *planned corridors* and the land use designations along these corridors will support the policies of this Plan, in particular that development is directed to *settlement areas*.

3.2.6 Water and Wastewater Systems

1. Municipalities should generate sufficient revenue to recover the full cost of providing and maintaining *municipal water and wastewater systems*.
2. *Municipal water and wastewater systems* and *private communal water and wastewater systems* will be planned, designed, constructed, or expanded in accordance with the following:
    a) opportunities for optimization and improved efficiency within existing systems will be prioritized and supported by strategies for energy and water conservation and water demand management;

b) the system will serve growth in a manner that supports achievement of the minimum intensification and density targets in this Plan;

c) a comprehensive water or wastewater master plan or equivalent, informed by *watershed planning* or equivalent has been prepared to:

   i. demonstrate that the effluent discharges and water takings associated with the system will not negatively impact the *quality and quantity of water*;

   ii. identify the preferred option for servicing growth and development, subject to the hierarchy of services provided in policies 1.6.6.2, 1.6.6.3, 1.6.6.4 and 1.6.6.5 of the PPS, 2020, which must not exceed the assimilative capacity of the effluent receivers and sustainable water supply for servicing, ecological, and other needs; and

   iii. identify the full life cycle costs of the system and develop options to pay for these costs over the long-term.

d) in the case of *large subsurface sewage disposal systems*, the proponent has demonstrated attenuation capacity; and

e) plans have been considered in the context of applicable inter-provincial, national, bi-national, or state-provincial Great Lakes Basin agreements or provincial legislation or strategies.

3. For *settlement areas* that are serviced by rivers, inland lakes, or groundwater, municipalities will not be permitted to extend water or wastewater services from a Great Lakes source unless:

a) the extension is required for reasons of public health and safety, in which case, the capacity of the water or wastewater services provided in these circumstances will be limited to that required to service the affected *settlement area*, including capacity for planned development within the approved *settlement area* boundary;

b) in the case of an upper- or single-tier municipality with an *urban growth centre* outside of the *Greenbelt Area*:

   i. the need for the extension has been demonstrated;

   ii. the increased servicing capacity will only be allocated to *settlement areas* with *urban growth centres*; and

   iii. the municipality has completed the applicable environmental assessment process in accordance with the Ontario Environmental Assessment Act; or

c) the extension had all necessary approvals as of July 1, 2017 and is only to service growth within the *settlement area* boundary delineated in the official plan that is approved and in effect as of that date.

4. Municipalities that share an inland water source or receiving water body will co-ordinate their planning for potable water, stormwater, and wastewater systems based on *watershed planning* or equivalent to ensure that the *quality and quantity of water* is protected, improved, or restored.

3.2.7 Stormwater Management

1. Municipalities will develop *stormwater master plans* or equivalent for serviced *settlement areas* that:
   a) are informed by *watershed planning* or equivalent;
   b) protect the *quality and quantity of water* by assessing existing stormwater facilities and systems;
   c) characterize existing environmental conditions;
   d) examine the cumulative environmental impacts of stormwater from existing and planned development, including an assessment of how extreme weather events will exacerbate these impacts and the identification of appropriate adaptation strategies;
   e) incorporate appropriate *low impact development* and *green infrastructure*;
   f) identify the need for stormwater retrofits, where appropriate;
   g) identify the full life cycle costs of the stormwater *infrastructure*, including maintenance costs, and develop options to pay for these costs over the long-term; and
   h) include an implementation and maintenance plan.
2. Proposals for large-scale *development* proceeding by way of a secondary plan, plan of subdivision, vacant land plan of condominium or site plan will be supported by a *stormwater management plan* or equivalent, that:
   a) is informed by a *subwatershed plan* or equivalent;
   b) incorporates an integrated treatment approach to minimize stormwater flows and reliance on stormwater ponds, which includes appropriate *low impact development* and *green infrastructure*;
   c) establishes planning, design, and construction practices to minimize vegetation removal, grading and soil compaction, sediment erosion, and impervious surfaces; and
   d) aligns with the *stormwater master plan* or equivalent for the *settlement area*, where applicable.

3.2.8 Public Service Facilities

1. Planning for *public service facilities*, land use planning and investment in *public service facilities* will be co-ordinated to implement this Plan.
2. *Public service facilities* and public services should be co-located in community hubs and integrated to promote cost-effectiveness.
3. Priority should be given to maintaining and adapting existing *public service facilities* and spaces as community hubs to meet the needs of the community and optimize the long-term viability of public investments.
4. Existing *public service facilities* that are located in or near *strategic growth areas* and are easily accessible by *active transportation* and transit, where that service is available, should be the preferred location for community hubs.
5. Municipalities will collaborate and consult with service planning, funding, and delivery sectors to facilitate the co-ordination and planning of community hubs and other *public service facilities*.
6. New *public service facilities*, including hospitals and schools, should be located in *settlement areas* and preference should be given to sites that are easily accessible by *active transportation* and transit, where that service is available.

Protecting What is Valuable

4.1 Context

The *GGH* contains a broad array of important hydrologic and *natural heritage features and areas*, a vibrant and diverse agricultural land base, irreplaceable *cultural heritage resources*, and valuable renewable and non-renewable resources. These lands, features and resources are essential for the long-term quality of life, economic prosperity, environmental health, and *ecological integrity* of the region. They collectively provide essential ecosystem services, including water storage and filtration, cleaner air and habitats, and support pollinators, carbon storage, adaptation and resilience to climate change.

These valuable assets must be wisely protected and managed as part of planning for future growth. This is of particular importance in the fast-growing *GGH*, which supports some of the most diverse vegetation and wildlife in Canada, including the Niagara Escarpment (a UNESCO World Biosphere Reserve) and the Oak Ridges Moraine – two of Ontario's most significant landforms – as well as the Rouge National Urban Park. There are existing legislation and policies in place to identify and protect these features, areas, and sites, including the Ontario Heritage Act, statements of provincial policy such as the PPS, and provincial plans such as the Greenbelt, Oak Ridges Moraine Conservation, Niagara Escarpment, and Lake Simcoe Protection Plans.

Through their historic relationship with the lands and resources in this region, Indigenous communities have gained traditional knowledge that is of value to the planning decisions being made today. A balanced approach to the wise use and management of all resources, including those related to water, natural heritage, agriculture, cultural heritage, and mineral aggregates, will be implemented in the *GGH*.

This Plan recognizes and supports the role of municipal policy in providing leadership and innovation in developing a culture of conservation and addressing climate change. As the *GGH* grows, so will the overall demand for water, energy, air, and land. The ongoing availability of these natural resources is essential for the sustainability of all communities.

This Plan requires the identification of *water resource systems* and the protection of *key hydrologic features* and *key hydrologic areas*, similar to the level of protection provided in the Greenbelt. This provides a consistent framework for water protection across the *GGH*, and builds on existing plans and policies, including the Lake Simcoe Protection Plan and source protection plans developed under the Clean Water Act, 2006. Recognizing that *watersheds* are the most important scale for protecting the *quality and quantity of water*, municipalities are required to undertake *watershed planning* to inform the protection of *water resource systems* and decisions related to planning for growth.

This Plan also provides for the identification and protection of a *Natural Heritage System for the Growth Plan* outside of the *Greenbelt Area* and *settlement areas*, and applies protections similar to those in the Greenbelt Plan to provide consistent and long-term protection throughout the *GGH*.

The *GGH* is home to some of Canada's most important and productive farmland, which is a finite, non-renewable resource. The region's fertile soil, favourable climate, and access to water make it significant on both a national and international scale. This Plan provides for the identification and protection of the *Agricultural System* in the *GGH*. The *Agricultural System* includes a continuous and productive land base, comprised of *prime agricultural areas*, including *specialty crop areas*, and *rural lands*, as well as a complementary *agri-food network* that together enable the agri-food sector to thrive. Many farms within the *Agricultural System* also contain important natural heritage and hydrologic features, and farmers play a vital role in their stewardship. Protecting the *Agricultural System* will support the viability of the agricultural sector as the region grows.

The *GGH* also contains important *cultural heritage resources* that contribute to a sense of identity, support a vibrant tourism industry, and attract investment based on cultural amenities. Accommodating growth can put pressure on these resources through *development* and *site alteration*. It is necessary to plan in a way that protects and maximizes the benefits of these resources that make our communities unique and attractive places to live.

Building compact communities and the *infrastructure* needed to support growth requires significant *mineral aggregate resources*. The Aggregate Resources Act establishes the overall process for the management of *mineral aggregate operations*, and this Plan works within this framework to provide guidance on where and how aggregate resource extraction can occur, while balancing other planning priorities. The *GGH* contains significant deposits of *mineral aggregate resources*, which require long-term management, including aggregate reuse and recycling. Ensuring *mineral aggregate resources* are available in proximity to demand can support the timely provision of *infrastructure* and reduce transportation-related greenhouse gas emissions.

The *water resource systems*, *Natural Heritage System for the Growth Plan*, and *Agricultural System* for the *GGH* also play an important role in addressing climate change and building resilience. Greenhouse gas emissions can be offset by natural areas that act as carbon sinks. Municipalities play a crucial role in managing and reducing Ontario's greenhouse gas emissions and supporting adaptation to the changing climate. The Province will work with municipalities to develop approaches to inventory, reduce, and offset greenhouse gas emissions in support of provincial targets as we move towards environmentally sustainable communities.

4.2 Policies for Protecting What is Valuable

4.2.1 Water Resource Systems

1. Upper- and single-tier municipalities, partnering with lower-tier municipalities and conservation authorities as appropriate, will ensure that *watershed planning* is undertaken to support a comprehensive, integrated, and long-term approach to the protection, enhancement, or restoration of the *quality and quantity of water* within a *watershed*.
2. *Water resource systems* will be identified to provide for the long-term protection of *key hydrologic features*, *key hydrologic areas*, and their functions.
3. *Watershed planning* or equivalent will inform:
   a) the identification of *water resource systems;*
   b) the protection, enhancement, or restoration of the *quality and quantity of water;*
   c) decisions on allocation of growth; and
   d) planning for water, wastewater, and stormwater *infrastructure*.
4. Planning for large-scale *development* in *designated greenfield areas,* including secondary plans*,* will be informed by a *subwatershed plan* or equivalent.
5. Municipalities will consider the Great Lakes Strategy, the targets and goals of the Great Lakes Protection Act, 2015, and any applicable Great Lakes agreements as part of *watershed planning* and coastal or waterfront planning initiatives.

4.2.2 Natural Heritage System

1. A *Natural Heritage System for the Growth Plan* has been mapped by the Province to support a comprehensive, integrated, and long-term approach to planning for the protection of the region's natural heritage and biodiversity. The *Natural Heritage System for the Growth Plan* excludes lands within *settlement area* boundaries that were approved and in effect as of July 1, 2017.

2. Municipalities will incorporate the *Natural Heritage System for the Growth Plan* as an overlay in official plans, and will apply appropriate policies to maintain, restore, or enhance the diversity and connectivity of the system and the long-term ecological or *hydrologic functions* of the features and areas as set out in the policies in this subsection and the policies in subsections 4.2.3 and 4.2.4.
3. Within the *Natural Heritage System for the Growth Plan*:
   a) new *development* or *site alteration* will demonstrate that:
      i. there are no *negative impacts* on *key natural heritage features* or *key hydrologic features* or their functions;
      ii. connectivity along the system and between *key natural heritage features* and *key hydrologic features* located within 240 metres of each other will be maintained or, where possible, enhanced for the movement of native plants and animals across the landscape;
      iii. the removal of other natural features not identified as *key natural heritage features* and *key hydrologic features* is avoided, where possible. Such features should be incorporated into the planning and design of the proposed use wherever possible;
      iv. except for uses described in and governed by the policies in subsection 4.2.8, the disturbed area, including any buildings and structures, will not exceed 25 per cent of the *total developable area*, and the impervious surface will not exceed 10 per cent of the *total developable area*;
      v. with respect to golf courses, the disturbed area will not exceed 40 per cent of the *total developable area*; and
      vi. at least 30 per cent of the *total developable area* will remain or be returned to *natural self-sustaining vegetation*, except where specified in accordance with the policies in subsection 4.2.8; and
   b) the full range of existing and new *agricultural uses*, *agriculture-related uses*, *on-farm diversified uses*, and *normal farm practices* are permitted. However, new buildings or structures for *agricultural uses*, *agriculture-related uses*, or *on-farm diversified uses* are not subject to policy 4.2.2.3 a), but are subject to the policies in subsections 4.2.3 and 4.2.4.
4. Provincial mapping of the *Natural Heritage System for the Growth Plan* does not apply until it has been implemented in the applicable upper- or single-tier official plan. Until that time, the policies in this Plan that refer

to the *Natural Heritage System for the Growth Plan* will apply outside *settlement areas* to the *natural heritage systems* identified in official plans that were approved and in effect as of July 1, 2017.

5. Upper- and single-tier municipalities may refine provincial mapping of the *Natural Heritage System for the Growth Plan* at the time of initial implementation in their official plans. For upper-tier municipalities, the initial implementation of provincial mapping may be done separately for each lower-tier municipality. After the *Natural Heritage System for the Growth Plan* has been implemented in official plans, further refinements may only occur through a *municipal comprehensive review.*

6. Beyond the *Natural Heritage System for the Growth Plan*, including within *settlement areas*, the municipality:

   a) will continue to protect any other *natural heritage features and areas* in a manner that is consistent with the PPS; and

   b) may continue to protect any other *natural heritage system* or identify new systems in a manner that is consistent with the PPS.

7. If a *settlement area* is expanded to include the *Natural Heritage System for the Growth Plan* in accordance with the policies in subsection 2.2.8, the portion that is within the revised *settlement area* boundary will:

   a) be designated in official plans;

   b) no longer be subject to policy 4.2.2.3; and

   c) continue to be protected in a manner that ensures that the connectivity between, and diversity and functions of, the *natural heritage features and areas* will be maintained, restored, or enhanced.

4.2.3 Key Hydrologic Features, Key Hydrologic Areas and Key Natural Heritage Features

1. Outside of *settlement areas*, *development* or *site alteration* is not permitted in *key natural heritage features* that are part of the *Natural Heritage System for the Growth Plan* or in *key hydrologic features*, except for:

   a) forest, fish, and wildlife management;

   b) conservation and flood or erosion control projects, but only if they have been demonstrated to be necessary in the public interest and after all alternatives have been considered;

   c) activities that create or maintain *infrastructure* authorized under an environmental assessment process;

   d) *mineral aggregate operations* and wayside pits and quarries;

e) expansions to existing buildings and structures, accessory structures and uses, and conversions of legally existing uses which bring the use more into conformity with this Plan, subject to demonstration that the use does not expand into the *key hydrologic feature* or *key natural heritage feature* or *vegetative protection zone* unless there is no other alternative, in which case any expansion will be limited in scope and kept within close geographical proximity to the existing structure;

f) expansions or alterations to existing buildings and structures for *agricultural uses*, *agriculture-related uses*, or *on-farm diversified uses* and expansions to existing residential dwellings if it is demonstrated that:

   i. there is no alternative, and the expansion or alteration in the feature is minimized and, in the *vegetation protection zone*, is directed away from the feature to the maximum extent possible; and

   ii. the impact of the expansion or alteration on the feature and its functions is minimized and mitigated to the maximum extent possible; and

g) small-scale structures for recreational uses, including boardwalks, footbridges, fences, docks, and picnic facilities, if measures are taken to minimize the number of such structures and their *negative impacts*.

2. Outside of *settlement areas*, proposals for large-scale *development* proceeding by way of plan of subdivision, vacant land plan of condominium or site plan may be permitted within a *key hydrologic area* where it is demonstrated that the *hydrologic functions*, including the *quality and quantity of water*, of these areas will be protected and, where possible, enhanced or restored through:

   a) the identification of planning, design, and construction practices and techniques;

   b) meeting other criteria and direction set out in the applicable *watershed planning* or *subwatershed plans*; and

   c) meeting any applicable provincial standards, guidelines, and procedures.

4.2.4 Lands Adjacent to Key Hydrologic Features and Key Natural Heritage Features

1. Outside *settlement areas*, a proposal for new *development* or *site alteration* within 120 metres of a *key natural heritage feature* within the

Natural Heritage System for the Growth Plan or a *key hydrologic feature* will require a natural heritage evaluation or hydrologic evaluation that identifies a *vegetation protection zone*, which:

a) is of sufficient width to protect the *key natural heritage feature* or *key hydrologic feature* and its functions from the impacts of the proposed change;

b) is established to achieve and be maintained as *natural self-sustaining vegetation*; and

c) for *key hydrologic features*, *fish habitat*, and *significant woodlands*, is no less than 30 metres measured from the outside boundary of the *key natural heritage feature* or *key hydrologic feature*.

2. Evaluations undertaken in accordance with policy 4.2.4.1 will identify any additional restrictions to be applied before, during, and after *development* to protect the *hydrologic functions* and *ecological functions* of the feature.

3. *Development* or *site alteration* is not permitted in the *vegetation protection zone*, with the exception of that described in policy 4.2.3.1 or shoreline *development* as permitted in accordance with policy 4.2.4.5.

4. Notwithstanding policies 4.2.4.1, 4.2.4.2 and 4.2.4.3:

a) a natural heritage or hydrologic evaluation will not be required for a proposal for *development* or *site alteration* on a site where the only *key natural heritage feature* is the *habitat of endangered species and threatened species*;

b) new buildings and structures for *agricultural uses, agriculture-related uses*, or *on-farm diversified uses* will not be required to undertake a natural heritage or hydrologic evaluation if a minimum 30 metre *vegetation protection zone* is provided from a *key natural heritage feature* or *key hydrologic feature*; and

c) uses permitted in accordance with policy 4.2.4.4 b):

i. are exempt from the requirement of establishing a condition of *natural self-sustaining vegetation* if the land is, and will continue to be, used for agricultural purposes; and

ii. will pursue best management practices to protect and restore *key natural heritage features*, *key hydrologic features*, and their functions.

5. Outside of *settlement areas*, in developed shoreline areas of inland lakes that are designated or zoned for concentrations of *development* as of July 1, 2017, infill *development*, *redevelopment* and resort *development* is permitted, subject to municipal and agency planning and regulatory requirements, if the *development* will:

a) be integrated with existing or proposed parks and trails, and will not constrain ongoing or planned stewardship and remediation efforts;

b) restore, to the maximum extent possible, the ecological features and functions in developed shoreline areas; and

c) in the case of *redevelopment* and resort *development*:

   i. establish, or increase the extent and width of, a *vegetation protection zone* along the shoreline to a minimum of 30 metres;

   ii. increase the extent of *fish habitat* in the littoral zone;

   iii. be planned, designed, and constructed to protect *hydrologic functions*, minimize erosion, and avoid or mitigate sedimentation and the introduction of nutrient or other pollutants into the lake;

   iv. exclude shoreline structures that will impede the natural flow of water or exacerbate algae concerns along the shoreline;

   v. enhance the ability of native plants and animals to use the shoreline as both *wildlife habitat* and a movement corridor;

   vi. use lot-level stormwater controls to reduce stormwater runoff volumes and pollutant loadings;

   vii. use natural shoreline treatments, where practical, for shoreline stabilization, erosion control, or protection;

   viii. meet other criteria and direction set out in applicable *watershed planning* and *subwatershed plans*;

   ix. be serviced by *sewage works* which reduce nutrient inputs to groundwater and the lake from baseline levels; and

   x. demonstrate available capacity in the receiving water body based on inputs from existing and approved development.

4.2.5 Public Open Space

1. Municipalities, conservation authorities, non-governmental organizations, and other interested parties are encouraged to develop a system of publicly-accessible parkland, open space, and trails, including in shoreline areas, within the *GGH* that:

   a) clearly demarcates where public access is and is not permitted;

   b) is based on a co-ordinated approach to trail planning and development; and

c) is based on good land stewardship practices for public and private lands.

2. Municipalities are encouraged to establish an open space system within *settlement areas*, which may include opportunities for urban agriculture, rooftop gardens, communal courtyards, and public parks.

4.2.6 Agricultural System

1. An *Agricultural System* for the *GGH* has been identified by the Province.
2. *Prime agricultural areas*, including *specialty crop areas*, will be designated in accordance with mapping identified by the Province and these areas will be protected for long-term use for agriculture.
3. Where *agricultural uses* and non-agricultural uses interface outside of *settlement areas*, land use compatibility will be achieved by avoiding or where avoidance is not possible, minimizing and mitigating adverse impacts on the *Agricultural System*. Where mitigation is required, measures should be incorporated as part of the non-agricultural uses, as appropriate, within the area being developed. Where appropriate, this should be based on an *agricultural impact assessment*.
4. The geographic continuity of the agricultural land base and the functional and economic connections to the *agri-food network* will be maintained and enhanced.
5. The retention of existing lots of record for *agricultural uses* is encouraged, and the use of these lots for non-agricultural uses is discouraged.
6. Integrated planning for growth management, including goods movement and transportation planning, will consider opportunities to support and enhance the *Agricultural System*.
7. Municipalities are encouraged to implement regional agri-food strategies and other approaches to sustain and enhance the *Agricultural System* and the long-term economic prosperity and viability of the agri-food sector, including the maintenance and improvement of the *agri-food network* by:

   a) providing opportunities to support access to healthy, local, and affordable food, urban and near-urban agriculture, food system planning and promoting the sustainability of agricultural, agri-food, and agri-product businesses while protecting agricultural resources and minimizing land use conflicts;

   b) protecting, enhancing, or supporting opportunities for *infrastructure*, services, and assets. Where negative impacts on the *agri-food* *network* are unavoidable, they will be assessed, minimized, and mitigated to the extent feasible; and

c) establishing or consulting with agricultural advisory committees or liaison officers.

8. Outside of the *Greenbelt Area*, provincial mapping of the agricultural land base does not apply until it has been implemented in the applicable upper- or single-tier official plan. Until that time, *prime agricultural areas* identified in upper- and single-tier official plans that were approved and in effect as of July 1, 2017 will be considered the agricultural land base for the purposes of this Plan.

9. Upper- and single-tier municipalities may refine provincial mapping of the agricultural land base at the time of initial implementation in their official plans, based on implementation procedures issued by the Province. For upper-tier municipalities, the initial implementation of provincial mapping may be done separately for each lower-tier municipality. After provincial mapping of the agricultural land base has been implemented in official plans, further refinements may only occur through a *municipal comprehensive review.*

4.2.7 Cultural Heritage Resources

1. *Cultural heritage resources* will be *conserved* in order to foster a sense of place and benefit communities, particularly in *strategic growth areas*.

2. Municipalities will work with stakeholders, as well as First Nations and Métis communities, in developing and implementing official plan policies and strategies for the identification, wise use and management of *cultural heritage resources*.

3. Municipalities are encouraged to prepare archaeological management plans and municipal cultural plans and consider them in their decision-making.

4.2.8 Mineral Aggregate Resources

1. Municipalities will develop and implement official plan policies and other strategies to conserve *mineral aggregate resources*, including:

   a) the recovery and recycling of manufactured materials derived from *mineral aggregate resources* for reuse in construction, manufacturing, industrial, or maintenance projects as a substitute for new *mineral aggregate resources*; and

   b) the wise use of *mineral aggregate resources*, including utilization or extraction of on-site *mineral aggregate resources* prior to development occurring.

2. Notwithstanding the policies in subsections 4.2.1, 4.2.2, 4.2.3 and 4.2.4, within the *Natural Heritage System for the Growth Plan*, *mineral aggregate operations* and wayside pits and quarries are subject to the following:

   a) no new *mineral aggregate operation* and no new wayside pits and quarries, or any ancillary or accessory use thereto, will be permitted in the following *key natural heritage features* and *key hydrologic features*:

      i. *significant wetlands*;

      ii. *habitat of endangered species and threatened species;* and

      iii. *significant woodlands* unless the woodland is occupied by young plantation or early successional habitat, as defined by the Province, in which case, the application must demonstrate that policies 4.2.8.4 b) and c) and 4.2.8.5 c) have been addressed and that they will be met by the operation;

   b) any application for a new *mineral aggregate operation* will be required to demonstrate:

      i. how the connectivity between *key natural heritage features* and *key hydrologic features* will be maintained before, during, and after the extraction of *mineral aggregate resources*;

      ii. how the operator could replace *key natural heritage features* and *key hydrologic features* that would be lost from the site with equivalent features on another part of the site or on adjacent lands;

      iii. how the *water resource system* will be protected or enhanced; and

      iv. how any *key natural heritage features* and *key hydrologic features* and their associated *vegetation protection zones* not identified in policy 4.2.8.2 a) will be addressed in accordance with policies 4.2.8.4 b) and c) and 4.2.8.5 c); and

   c) an application requiring a new approval under the Aggregate Resources Act to expand an existing *mineral aggregate operation* may be permitted in the *Natural Heritage System for the Growth Plan*, including in *key natural heritage features*, *key hydrologic features* and any associated *vegetation protection zones*, only if the related decision is consistent with the PPS and satisfies the rehabilitation requirements of the policies in this subsection.

3. In *prime agricultural areas*, applications for new *mineral aggregate operations* will be supported by an *agricultural impact assessment* and,

where possible, will seek to maintain or improve connectivity of the *Agricultural System*.

4. For rehabilitation of new *mineral aggregate operation* sites, the following apply:

   a) the disturbed area of a site will be rehabilitated to a state of equal or greater *ecological value* and, for the entire site, long-term *ecological integrity* will be maintained or enhanced;

   b) if there are *key natural heritage features* or *key hydrologic features* on the site, or if such features existed on the site at the time of the application:

      i. the health, diversity, and size of these *key natural heritage features* and *key hydrologic features* will be maintained or enhanced; and

      ii. any permitted extraction of *mineral aggregate resources* that occurs in a feature will be completed, and the area will be rehabilitated, as early as possible in the life of the operation;

   c) aquatic areas remaining after extraction are to be rehabilitated to aquatic enhancement, which will be representative of the natural ecosystem in that particular setting or ecodistrict, and the combined terrestrial and aquatic rehabilitation will meet the intent of policy 4.2.8.4 b); and

   d) outside the *Natural Heritage System for the Growth Plan*, and except as provided in policies 4.2.8.4 a), b) and c), final rehabilitation will appropriately reflect the long-term land use of the general area, taking into account applicable policies of this Plan and, to the extent permitted under this Plan, existing municipal and provincial policies. In *prime agricultural areas*, the site will be rehabilitated in accordance with policy 2.5.4 of the PPS, 2020.

5. Final rehabilitation for new *mineral aggregate operations* in the *Natural Heritage System for the Growth Plan* will meet these additional criteria:

   a) where there is no extraction below the water table, an amount of land equal to that under natural vegetated cover prior to extraction, and no less than 35 per cent of the land subject to each license in the *Natural Heritage System for the Growth Plan*, is to be rehabilitated to forest cover, which will be representative of the natural ecosystem in that particular setting or ecodistrict. If the site is also in a *prime agricultural area*, the remainder of the land subject to the license is to be rehabilitated back to an *agricultural condition*;

b) where there is extraction below the water table, no less than 35 per cent of the non-aquatic portion of the land subject to each license in the *Natural Heritage System for the Growth Plan* is to be rehabilitated to forest cover, which will be representative of the natural ecosystem in that particular setting or ecodistrict. If the site is also in a *prime agricultural area*, the remainder of the land subject to the license is to be rehabilitated in accordance with policy 2.5.4 of the PPS, 2020; and

c) rehabilitation will be implemented so that the connectivity of the *key natural heritage features* and the *key hydrologic features* on the site and on adjacent lands will be maintained or enhanced.

6. Except as provided by the policies of this subsection, decisions on planning matters must be consistent with the policies in the PPS that pertain to the management of *mineral aggregate resources*.

7. Where an application under the Aggregate Resources Act has been received and deemed complete by the Province as of July 1, 2017, any applications under the Planning Act to permit the making, establishment or operation of the pit or quarry to which the Aggregate Resources Act application relates, if approved, will not be subject to the policies of this Plan.

4.2.9 A Culture of Conservation

1. Municipalities will develop and implement official plan policies and other strategies in support of the following conservation objectives:

   a) water conservation, including through:

      i. water demand management for the efficient use of water; and

      ii. water recycling to maximize the reuse and recycling of water;

   b) energy conservation for existing buildings and planned developments, including municipally owned facilities, including through:

      i. identification of opportunities for conservation, energy efficiency and demand management, as well as district energy generation, *renewable energy systems* and *alternative energy systems* and distribution through community, municipal, and regional energy planning processes, and in the development of conservation and demand management plans;

      ii. land use patterns and urban design standards that support energy efficiency and demand reductions, and opportunities for *alternative energy systems*, including district energy systems; and

iii. other conservation, energy efficiency and demand management techniques to use energy wisely as well as reduce consumption;

c) air quality improvement and protection, including through reduction in emissions from municipal, commercial, industrial, and residential sources; and

d) integrated waste management, including through:

i. enhanced waste reduction, composting, and recycling initiatives, and the identification of new opportunities for energy from waste, source reduction, reuse, and diversion, where appropriate;

ii. a comprehensive plan with integrated approaches to waste management, including reduction, reuse, recycling, composting, diversion, and disposal of residual waste;

iii. promotion of building conservation and adaptive reuse, as well as the reuse and recycling of construction materials; and

iv. consideration of waste management initiatives within the context of long-term regional planning, and in collaboration with neighbouring municipalities.

2. Municipalities should develop excess soil reuse strategies as part of planning for growth and development.

3. Municipal planning policies and relevant development proposals will incorporate best practices for the management of excess soil generated and fill received during *development* or *site alteration*, including *infrastructure* development, to ensure that:

a) any excess soil is reused on-site or locally to the maximum extent possible and, where feasible, excess soil reuse planning is undertaken concurrently with development planning and design;

b) appropriate sites for excess soil storage and processing are permitted close to areas where proposed development is concentrated or areas of potential soil reuse; and

c) fill quality received and fill placement at a site will not cause an adverse effect with regard to the current or proposed use of the property or the natural environment and is compatible with adjacent land uses.

4.2.10 Climate Change

1. Upper- and single-tier municipalities will develop policies in their official plans to identify actions that will reduce greenhouse gas emissions and address climate change adaptation goals, aligned with other provincial plans and policies for environmental protection, that will include:
   a) supporting the achievement of *complete communities* as well as the minimum intensification and density targets in this Plan;
   b) reducing dependence on the automobile and supporting existing and planned transit and *active transportation*;
   c) assessing *infrastructure* risks and vulnerabilities and identifying actions and investments to address these challenges;
   d) undertaking stormwater management planning in a manner that assesses the impacts of extreme weather events and incorporates appropriate *green infrastructure* and *low impact development*;
   e) recognizing the importance of *watershed planning* for the protection of the *quality and quantity of water* and the identification and protection of hydrologic features and areas;
   f) protecting the *Natural Heritage System for the Growth Plan* and *water resource systems*;
   g) promoting local food, food security, and soil health, and protecting the agricultural land base;
   h) providing direction that supports a culture of conservation in accordance with the policies in subsection 4.2.9; and
   i) any additional policies to reduce greenhouse gas emissions and build resilience, as appropriate, provided they do not conflict with this Plan.
2. In planning to reduce greenhouse gas emissions and address the *impacts of a changing climate*, municipalities are encouraged to:
   a) develop strategies to reduce greenhouse gas emissions and improve resilience through the identification of vulnerabilities to climate change, land use planning, planning for *infrastructure*, including transit and energy, *green infrastructure*, and *low impact development*, and the conservation objectives in policy 4.2.9.1;
   b) develop greenhouse gas inventories for transportation, buildings, waste management and municipal operations; and
   c) establish municipal interim and long-term greenhouse gas emission reduction targets that support provincial targets and reflect consideration of the goal of low-carbon communities and monitor and report on progress made towards the achievement of these targets.

5 Implementation and Interpretation

5.1 Context

Key to the success of this Plan is its effective implementation. Successful implementation will require that all levels of government, First Nations and Métis communities, non-governmental organizations, the private sector, and residents work together in a co-ordinated and collaborative way to implement the policies of this Plan to realize its goals.

The timely implementation of this Plan relies on the strong leadership of upper- and single-tier municipalities to provide more specific planning direction for their respective jurisdictions through a *municipal comprehensive review*. While it may take some time before all official plans have been amended to conform with this Plan, the Planning Act requires that all decisions in respect of planning matters will conform with this Plan as of its effective date (subject to any legislative or regulatory provisions providing otherwise).

Except for some minor matters, most planning decisions can affect the achievement of the policies of this Plan. It is therefore in the best interest of all municipalities to complete their work to conform with this Plan, including all official plans and zoning by-laws, as expeditiously as possible within required timeframes. This should include using relevant legislative and regulatory tools and other strategies to plan for a variety of heights, densities and other elements of site design within *settlement areas* to achieve the desired urban form and the minimum intensification and density targets in this Plan.

Where a municipality must decide on a planning matter before its official plan has been amended to conform with this Plan, or before other applicable planning instruments have been updated accordingly, it must still consider the impact of the decision as it relates to the policies of this Plan which require comprehensive municipal implementation.

The success of this Plan is also dependent on a range of mechanisms being in place to implement this Plan's policies. Although primarily implemented through Ontario's land use planning system, including official plans, this Plan is not solely a land use plan. Certain policies of this Plan contemplate implementation by both the Province and by municipalities through other related tools, regulations, policies, and guidelines. In addition to the legislative framework provided by the Places to Grow Act, 2005, this includes a wide range of complementary planning and fiscal tools, including instruments found in the Planning Act and the Municipal Act, 2001.

To continue to make steady progress towards the desired outcomes, the Province will provide information to build understanding of growth management and facilitate informed involvement in the implementation of this Plan. The Province will also ensure ongoing engagement with the public, stakeholders, municipalities, and First Nations and Métis communities on the implementation of this Plan.

Measuring the success of this Plan will require rigorous and consistent evaluation of its progress. The Province will work with its public sector partners, including municipalities and agencies, other stakeholders, and First Nations and Métis communities to compile and share the base of information that is needed to support the ongoing monitoring of the implementation of this Plan.

5.2 Policies for Implementation and Interpretation

5.2.1 General Interpretation

1. The policies and schedules of this Plan should be read in a manner that recognizes this Plan as an integrated policy framework.
2. A *municipal comprehensive review* that is undertaken in accordance with this Plan will be deemed to fulfill the requirements in the PPS to undertake a comprehensive review.
3. References to the responsibilities of the Minister set out in this Plan should be read as the Minister of Municipal Affairs and Housing, his or her assignee, his or her delegate pursuant to the Places to Grow Act, 2005, or any other member of Executive Council given responsibility for the Places to Grow Act, 2005.
4. References to the responsibilities of the Province set out in this Plan should be read as one or more members of Executive Council.

5.2.2 Supplementary Direction

1. To implement this Plan, the Minister will, in collaboration with other Ministers of the Crown where appropriate, identify, establish, or update the following:
   a) the *delineated built boundary*;
   b) the size and location of the *urban growth centres*;
   c) a standard methodology for land needs assessment; and
   d) *provincially significant employment zones.*
2. To implement this Plan, the Province will identify, establish, or update the following:

a) the *Agricultural System* for the *GGH*; and

b) the *Natural Heritage System for the Growth Plan*.

3. The Province may review and update *provincially significant employment zones*, the agricultural land base mapping or the *Natural Heritage System for the Growth Plan* in response to a municipal request.

5.2.3 Co-ordination

1. A co-ordinated approach will be taken to implement this Plan, in particular for issues that cross municipal boundaries, both between Provincial ministries and agencies, and by the Province in its dealings with municipalities, local boards, and other related planning agencies.

2. Upper-tier municipalities, in consultation with lower-tier municipalities, will, through a *municipal comprehensive review*, provide policy direction to implement this Plan, including:

   a) identifying minimum intensification targets for lower-tier municipalities based on the capacity of *delineated built-up areas*, including the applicable minimum density targets for *strategic growth areas* in this Plan, to achieve the minimum intensification target in this Plan;

   b) identifying minimum density targets for *strategic growth areas*, including any *urban growth centres* or *major transit station areas*, in accordance with this Plan;

   c) identifying minimum density targets for *employment areas*;

   d) identifying minimum density targets for the *designated greenfield areas* of the lower-tier municipalities, to achieve the minimum density target for the upper- or single-tier municipality;

   e) allocating forecasted growth to the horizon of this Plan to the lower-tier municipalities in a manner that would support the achievement of the minimum intensification and density targets in this Plan; and

   f) addressing matters that cross municipal boundaries.

3. Municipalities are encouraged to engage the public and stakeholders in local efforts to implement this Plan, and to provide the necessary information to ensure the informed involvement of local citizens.

4. Municipalities shall engage Indigenous communities in local efforts to implement this Plan, and to provide the necessary information to ensure the informed involvement of these communities.

5. In cases where lower-tier official plans are not updated to implement this Plan in a timely or appropriate manner, upper-tier municipalities are

encouraged to act in accordance with subsection 27(2) of the Planning Act.

6. Single-tier municipalities in the *outer ring* and adjacent municipalities should ensure a co-ordinated approach to implement the policies of this Plan.
7. Planning authorities shall co-ordinate planning matters with Indigenous communities throughout the planning process to ensure that appropriate engagement is undertaken. Municipalities are encouraged to build constructive, cooperative relationships with First Nations and Métis communities and to facilitate knowledge sharing in growth management and land use planning processes.

5.2.4 Growth Forecasts

1. All references to forecasted growth to the horizon of this Plan are references to the population and employment forecasts in Schedule 3 or such higher forecasts as are established by the applicable upper- or single-tier municipality through its *municipal comprehensive review*.
2. All upper- and single-tier municipalities will, at a minimum, through a *municipal comprehensive review*, apply the forecasts in Schedule 3 or such higher forecasts as are established by the applicable upper- or single-tier municipality through its *municipal comprehensive review* for planning and managing growth to the horizon of this Plan.
3. The population and employment forecasts and plan horizon contained in the applicable upper- or single-tier official plan that is approved and in effect as of August 28, 2020 will apply to all planning matters in that municipality, including lower-tier planning matters where applicable, until the upper- or single-tier municipality has applied the forecasts in Schedule 3 in accordance with policy 5.2.4.2 and those forecasts are approved and in effect in the upper- or single-tier official plan.
4. Notwithstanding the policies of this Plan regarding planning and managing forecasted growth to the horizon of this Plan, including the time horizon for making sufficient land available to meet projected needs, lower-tier municipalities cannot designate land beyond the horizon established in the applicable upper-tier official plan that is approved and in effect.
5. Within *delineated built-up areas*, municipalities may plan for *development* beyond the horizon of this Plan for *strategic growth areas* that are delineated in official plans and subject to minimum density targets, provided that:

a) integrated planning for *infrastructure* and *public service facilities* would ensure that the *development* does not exceed existing or planned capacity;

b) the type and scale of built form for the *development* would be contextually appropriate; and

c) the *development* would support the achievement of *complete communities*, including a diverse mix of land uses and sufficient open space.

6. Outside of a *municipal comprehensive review*, the forecasts in Schedule 3 cannot be applied on a site-specific scale as the basis for approving or refusing proposals for *development* that would otherwise conform with all the policies of this Plan.

7. The Minister will review the forecasts contained in Schedule 3 at least every five years in consultation with municipalities, and may revise the schedule, where appropriate.

8. Higher forecasts established by upper- and single-tier municipalities through their *municipal comprehensive reviews* will not apply to Provincial ministries and agencies.

5.2.5 Targets

1. The minimum intensification and density targets in this Plan, including any alternative targets that have been permitted by the Minister, are minimum standards and municipalities are encouraged to go beyond these minimum targets, where appropriate, except where doing so would conflict with any policy of this Plan, the PPS or any other provincial plan.

2. The minimum intensification and density targets in this Plan or established pursuant to this Plan will be identified in upper- and single-tier official plans. Any changes to the targets established pursuant to this Plan may only be implemented through a *municipal comprehensive review*.

3. For the purposes of implementing the minimum intensification and density targets in this Plan, upper- and single-tier municipalities will, through a *municipal comprehensive review*, delineate the following in their official plans, where applicable:

a) *delineated built-up areas*;

b) *urban growth centres*;

c) *major transit station areas*;

d) other *strategic growth areas* for which a minimum density target will be established; and

e) *excess lands*.

4. Except as provided in policy 2.2.7.3, the minimum intensification and density targets in this Plan will be measured across all lands within the relevant area, including any lands that are subject to more than one target.

5. For each applicable delineated area, the minimum density targets in this Plan are to be implemented through:

    a) upper-tier official plan policies that identify the minimum density targets and require lower-tier municipalities to undertake planning, such as secondary plans, to establish permitted uses and identify densities, heights, and other elements of site design;

    b) single-tier official plan policies that identify the minimum density targets and, through secondary planning or other initiatives, establish permitted uses within the delineated area and identify densities, heights, and other elements of site design;

    c) zoning all lands in a manner that would implement the official plan policies; and

    d) the use of any applicable legislative and regulatory tools that may establish area or site-specific minimum densities, heights, and other elements of site design.

6. In planning to achieve the minimum intensification and density targets in this Plan, municipalities will develop and implement urban design and site design official plan policies and other supporting documents that direct the development of a high quality *public realm* and *compact built form*.

7. The minimum intensification and density targets in this Plan do not require or permit:

    a) in a Special Policy Area that has been approved by the Province in accordance with policy 3.1.4 of the PPS, 2020, *development* that is beyond what has been permitted; or

    b) in other *hazardous lands*, *development* that is not permitted by the PPS.

8. The identification of *strategic growth areas*, *delineated built-up areas*, and *designated greenfield areas* are not land use designations and their delineation does not confer any new land use designations, nor alter existing land use designations. Any development on lands within the boundary of these identified areas is still subject to the relevant provincial and municipal land use planning policies and approval processes.

9. Any alternative target permitted by the Minister will be revisited through each *municipal comprehensive review*. If a municipality does not request a new alternative target, or the Minister does not permit the requested alternative target, the applicable minimum intensification or density target in this Plan will apply.

5.2.6 Performance Indicators and Monitoring

1. The Minister will develop a set of performance indicators to measure the effectiveness of the policies of this Plan. The Minister will monitor the implementation of this Plan, including reviewing performance indicators concurrent with any review of this Plan.
2. Municipalities will monitor and report on the implementation of this Plan's policies within their municipality, in accordance with any reporting requirements, data standards, and any other guidelines that may be issued by the Minister.
3. The Minister may require municipalities and conservation authorities to provide data and information to the Minister, as collected in accordance with policy 5.2.6.2, to demonstrate progress made towards the implementation of this Plan.

5.2.7 Schedules and Appendices

1. The Minister will review the schedules of this Plan at least every five years in consultation with municipalities, and may revise these schedules, where appropriate.
2. Unless otherwise stated, the boundaries and lines displayed on the schedules are not to scale and provide general direction only.
3. The *delineated built boundary* has been issued for the purpose of measuring the minimum intensification target in this Plan. The conceptual *delineated built-up area* shown on Schedules 2, 4, 5, and 6 is for information purposes. For the actual delineation, the *delineated built boundary* that has been issued by the Minister should be consulted.
4. The *designated greenfield areas* shown on Schedules 2, 4, 5, and 6 are conceptual. Actual *designated greenfield areas* will be delineated in applicable official plans.
5. The *settlement area* boundaries shown on Schedules 2, 4, 5, and 6 are conceptual. Actual *settlement area* boundaries will be delineated in applicable official plans.
6. The appendices in this Plan are provided for information purposes only.

5.2.8 Other Implementation

1. Where the policies of this Plan require the completion of specific types of master plans, assessments, studies, or other plans, including the equivalent, before a decision can be made, including in respect of matters in process, the policy direction in this Plan may be implemented based on, collectively, existing, enhanced, or new assessments, studies, and plans, provided that these achieve or exceed the same objectives.
2. In implementing the policies of this Plan, municipalities are encouraged to use available tools to reduce or eliminate any *excess lands*.
3. Draft plans of subdivision will include a lapsing date under subsection 51(32) of the Planning Act. When determining whether draft approval should be extended for lapsing draft plans of subdivision, the policies of this Plan must be considered in the development review process.
4. If a plan of subdivision or part thereof has been registered for eight years or more and does not meet the growth management objectives of this Plan, municipalities are encouraged to use their authority under subsection 50(4) of the Planning Act to deem it not to be a registered plan of subdivision and, where appropriate, amend site-specific designations and zoning accordingly.

Simcoe Sub-area

6.1 Context

While this Plan is to be read in its entirety and all policies are applicable to all municipalities within the *GGH*, this section provides additional, more specific direction on how this Plan's vision will be achieved in the *Simcoe Sub-area*. The *Simcoe Sub-area* is comprised of the County of Simcoe and the cities of Barrie and Orillia.

The policies in Section 6 direct a significant portion of growth within the *Simcoe Sub-area* to communities where development can be most effectively serviced, and where growth improves the range of opportunities for people to live, work, and play in their communities, with a particular emphasis on *primary settlement areas*. The City of Barrie is the principal *primary settlement area*. Downtown Barrie is the only *urban growth centre* in the *Simcoe Sub-area*. The policies in Section 6 recognize and support the vitality of urban and rural communities in the *Simcoe Sub-area*. All municipalities will play an important role in ensuring that future growth is planned for and managed in an effective and sustainable manner that conforms with this Plan.

Ensuring an appropriate supply of land for employment and residential growth, and making the best use of existing *infrastructure* is also important to the prosperity of the *Simcoe Sub-area*. Section 6 identifies specific employment areas that will enable municipalities in the *Simcoe Sub-area* to benefit from existing and future economic opportunities. By providing further direction on where growth is to occur in the *Simcoe Sub-area*, it also establishes a foundation for municipalities to align *infrastructure* investments with growth management, optimize the use of existing and planned *infrastructure*, co-ordinate water and wastewater services, and promote *green infrastructure* and innovative technologies.

A more livable, compact, complete urban structure with good design and built form will support the achievement of economic and environmental benefits. Through effective growth management, municipalities will ensure that the natural environment is protected from the impacts of growth in the *Simcoe Sub-area*, while providing amenities for the residents and visitors to this area from across the *GGH* and beyond.

6.2 Growth Forecasts

1. Through the next *municipal comprehensive review*, Simcoe County will allocate the growth forecasts in Schedule 3 to lower-tier municipalities in accordance with policy 5.2.3.2 e) in a manner that implements the

policies of this Plan, such that a significant portion of population and employment growth is directed to lower-tier municipalities that contain *primary settlement areas*.

2. The employment forecasts in this Plan include employment located in the *strategic settlement employment areas* and *economic employment districts*.

6.3 Managing Growth

1. *Primary settlement areas* for the *Simcoe Sub-area* are identified in Schedule 8.
2. *Municipalities with primary settlement areas* will, in their official plans and other supporting documents:
   a) identify *primary settlement areas*;
   b) identify and plan for *strategic growth areas* within *primary settlement areas*;
   c) plan to support the achievement of *complete communities* within *primary settlement areas*; and
   d) ensure the development of high quality urban form and public open spaces within *primary settlement areas* through site design and urban design standards that create attractive and vibrant places that support walking and cycling for everyday activities and are *transit-supportive*.
3. *Primary settlement areas* in the County will be identified in the official plan of the County of Simcoe.
4. The Town of Innisfil, the Town of Bradford West Gwillimbury and the Town of New Tecumseth will direct a significant portion of population and employment growth forecasted to the applicable *primary settlement areas*. The Town of Bradford West Gwillimbury and the Town of Innisfil, in planning to meet their employment forecasts, may direct appropriate employment to the *Bradford West Gwillimbury strategic settlement employment area* and the *Innisfil Heights strategic settlement employment area* respectively.
5. Any lands that are designated for *agricultural uses* or rural uses in a lower-tier official plan as of January 20, 2017 can only be re-designated for the purposes of development within a *settlement area* subject to the policies in subsection 2.2.8.

6.4 Employment Lands

1. The *Bradford West Gwillimbury strategic settlement employment area*, the *Innisfil Heights strategic settlement employment area*, the *Lake*

Simcoe Regional Airport economic employment district and the *Rama Road economic employment district* are identified in Schedule 8.

2. The Minister, in consultation with affected municipalities and stakeholders, has determined the location and boundaries of *strategic settlement employment areas*, and has established as appropriate the following:
   a) permitted uses, and the mix and percentage of certain uses;
   b) permitted uses for specific areas within the *strategic settlement employment areas*;
   c) lot sizes; and
   d) any additional policies and definitions that apply to these areas.
3. The Minister, in consultation with affected municipalities and stakeholders, has determined the location and boundaries, and established as appropriate the uses permitted in the *economic employment districts*.
4. The Minister may review and amend decisions made pursuant to policies 6.4.2 and 6.4.3. Municipalities in the *Simcoe Sub-area* may request the Minister to consider a review.
5. The County of Simcoe and lower-tier municipalities in the County in which the *strategic settlement employment areas* and *economic employment districts* are located, will delineate the areas and districts, as determined by the Minister, in their official plans.
6. The lower-tier municipalities in the County in which the *strategic settlement employment areas* and *economic employment districts* are located will develop official plan policies to implement the matters determined by the Minister in accordance with policies 6.4.2, 6.4.3, and 6.4.4, as applicable.
7. Although not *settlement areas*, the *strategic settlement employment areas* and *economic employment districts* are subject to policy 2.2.5.5.
8. For lands within *strategic settlement employment areas* and the *economic employment districts* the municipality can identify the *natural heritage systems*, features, and areas for protection.

6.5 Implementation

1. The policies in Section 6 apply only to the *Simcoe Sub-area*.
2. For the *Simcoe Sub-area*, where there is a conflict between policies in Section 6 and Schedule 8 and the rest of this Plan, the policies in Section 6 and Schedule 8 prevail.

3. The Minister has identified minimum intensification and density targets for lower-tier municipalities in the County of Simcoe to 2031. These minimum targets are considered to be alternative targets for the purposes of this Plan and will continue to apply subject to policy 5.2.5.9.

Definitions

As defined in this glossary, many of the defined terms in this Plan have the same meaning or are based on the meaning of another provincial document, particularly the PPS, 2020. For convenience, a parenthetical note following definitions indicates where this is the case.

Active Transportation

Human-powered travel, including but not limited to, walking, cycling, inline skating and travel with the use of mobility aids, including motorized wheelchairs and other power-assisted devices moving at a comparable speed. (PPS, 2020)

Affordable

a) in the case of ownership housing, the least expensive of:
   i. housing for which the purchase price results in annual accommodation costs which do not exceed 30 per cent of gross annual household income for low and moderate income households; or
   ii. housing for which the purchase price is at least 10 per cent below the average purchase price of a resale unit in the regional market area;
b) in the case of rental housing, the least expensive of:
   i. a unit for which the rent does not exceed 30 per cent of gross annual household income for low and moderate income households; or
   ii. a unit for which the rent is at or below the average market rent of a unit in the regional market area.

For the purposes of this definition:

Low and moderate income households means, in the case of ownership housing, households with incomes in the lowest 60 per cent of the income distribution for the regional market area; or in the case of rental housing, households with incomes in the lowest 60 per cent of the income distribution for renter households for the regional market area.

Regional market area means an area, generally broader than a lower-tier municipality that has a high degree of social and economic interaction. In the *GGH*, the upper- or single-tier municipality will normally serve as the regional market area. Where a regional market area extends significantly beyond upper- or single-tier boundaries, it may include a combination of upper-, single- and/or lower-tier municipalities. (Based on PPS, 2020 and modified for this Plan)

Agricultural Condition

a) in regard to *specialty crop areas*, a condition in which substantially the same areas and same average soil capability for agriculture are restored, the same range and productivity of specialty crops common in the area can be achieved, and, where applicable, the microclimate on which the site and surrounding area may be dependent for specialty crop production shall be maintained or restored; and

b) in regard to *prime agricultural land* outside of *specialty crop areas*, a condition in which substantially the same areas and same average soil capability for agriculture are restored.

(PPS, 2020)

Agri-food Network

Within the *Agricultural System*, a network that includes elements important to the viability of the agri-food sector such as regional *infrastructure* and transportation networks; on-farm buildings and infrastructure; agricultural services, farm markets, distributors, and primary processing; and vibrant, agriculture-supportive communities. (Greenbelt Plan)

Agricultural Impact Assessment

A study that evaluates the potential impacts of non-agricultural development on agricultural operations and the *Agricultural System* and recommends ways to avoid or, if avoidance is not possible, minimize and mitigate adverse impacts. (Greenbelt Plan)

Agricultural System

The system mapped and issued by the Province in accordance with this Plan, comprised of a group of inter-connected elements that collectively create a viable, thriving agricultural sector. It has two components: 1. An agricultural land base comprised of *prime agricultural areas*, including *specialty crop areas,* and *rural lands* that together create a continuous productive land base for agriculture; 2. An *agri-food network* which includes *infrastructure*, services, and assets important to the viability of the agri-food sector. (Greenbelt Plan)

Agricultural Uses

The growing of crops, including nursery, biomass, and horticultural crops; raising of livestock; raising of other animals for food, fur or fibre, including poultry and fish; aquaculture; apiaries; agro-forestry; maple syrup production; and associated on-farm buildings and structures, including, but not limited to livestock facilities, manure storages, value-retaining facilities, and accommodation for full-time farm labour when the size and nature of the operation requires additional employment. (PPS, 2020)

Agriculture-related Uses
Farm-related commercial and farm-related industrial uses that are directly related to farm operations in the area, support agriculture, benefit from being in close proximity to farm operations, and provide direct products and/or services to farm operations as a primary activity. (PPS, 2020)

Alternative Energy System
A system that uses sources of energy or energy conversion processes to produce power, heat and/or cooling that significantly reduces the amount of harmful emissions to the environment (air, earth and water) when compared to conventional energy systems. (PPS, 2020)

Alvars
Naturally open areas of thin or no soil over essentially flat limestone, dolostone, or marble rock, supporting a sparse vegetation cover of mostly shrubs and herbs. (Greenbelt Plan)

Archaeological Resources
Includes artifacts, archaeological sites, marine archaeological sites, as defined under the Ontario Heritage Act. The identification and evaluation of such resources are based upon archaeological fieldwork undertaken in accordance with the Ontario Heritage Act. (PPS, 2020)

Bradford West Gwillimbury Strategic Settlement Employment Area
Location set out in Schedule 8. The *Bradford West Gwillimbury strategic settlement employment area* boundary is determined by the Minister and planned for in accordance with the policies in subsection 6.4.

Brownfield Sites
Undeveloped or previously developed properties that may be contaminated. They are usually, but not exclusively, former industrial or commercial properties that may be underutilized, derelict or vacant. (PPS, 2020)

Built Heritage Resource
A building, structure, monument, installation or any manufactured remnant that contributes to a property's cultural heritage value or interest as identified by a community, including an Aboriginal community. Built heritage resources are generally located on property that has been designated under Parts IV or V of the Ontario Heritage Act, or included on local, provincial and/or, federal registers.

Compact Built Form
A land use pattern that encourages the efficient use of land, walkable neighbourhoods, mixed land uses (residential, retail, workplace, and

institutional) all within one neighbourhood, proximity to transit and reduced need for *infrastructure*. *Compact built form* can include detached and semi-detached houses on small lots as well as townhouses and walk-up apartments, multi-storey commercial developments, and apartments or offices above retail. Walkable neighbourhoods can be characterized by roads laid out in a well-connected network, destinations that are easily accessible by transit and *active transportation*, sidewalks with minimal interruptions for vehicle access, and a pedestrian-friendly environment along roads to encourage *active transportation*.

Complete Communities

Places such as mixed-use neighbourhoods or other areas within cities, towns, and *settlement areas* that offer and support opportunities for people of all ages and abilities to conveniently access most of the necessities for daily living, including an appropriate mix of jobs, local stores, and services, a full range of housing, transportation options and *public service facilities*. *Complete communities* are age-friendly and may take different shapes and forms appropriate to their contexts.

Complete Streets

Streets planned to balance the needs of all road users, including pedestrians, cyclists, transit-users, and motorists.

Conserved

The identification, protection, management and use of built heritage resources, cultural heritage landscapes and archaeological resources in a manner that ensures their cultural heritage value or interest is retained under the Ontario Heritage Act. This may be achieved by the implementation of recommendations set out in a conservation plan, archaeological assessment, and/or heritage impact assessment. Mitigative measures and/or alternative development approaches can be included in these plans and assessments.

Cultural Heritage Landscape

A defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Indigenous community. The area may include features such as buildings, structures, spaces, views, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. *Cultural heritage landscapes* may be properties that have been determined to have cultural heritage value or interest under the Ontario Heritage Act or have been included on federal and/or international registers, and/or protected through official plan, zoning by-law, or other land use planning mechanisms. (PPS, 2020)

Cultural Heritage Resources

Built heritage resources, *cultural heritage landscapes* and *archaeological resources* that have been determined to have cultural heritage value or interest for the important contribution they make to our understanding of the history of a place, an event, or a people. While some *cultural heritage resources* may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation. (Greenbelt Plan)

Delineated Built Boundary

The limits of the developed urban area as defined by the Minister in consultation with affected municipalities for the purpose of measuring the minimum intensification target in this Plan.

Delineated Built-up Area

All land within the *delineated built boundary*.

Designated Greenfield Area

Lands within *settlement areas* (not including *rural settlements*) but outside of *delineated built-up areas* that have been designated in an official plan for development and are required to accommodate forecasted growth to the horizon of this Plan. *Designated greenfield areas* do not include *excess lands*.

Development

The creation of a new lot, a change in land use, or the construction of buildings and structures requiring approval under the Planning Act, but does not include:

a) activities that create or maintain *infrastructure* authorized under an environmental assessment process; or

b) works subject to the Drainage Act.

(Based on PPS, 2020 and modified for this Plan)

Drinking-water System

A system of works, excluding plumbing, that is established for the purpose of providing users of the system with drinking water and that includes:

a) any thing used for the collection, production, treatment, storage, supply, or distribution of water;

b) any thing related to the management of residue from the treatment process or the management of the discharge of a substance into the natural environment from the treatment system; and

c) a well or intake that serves as the source or entry point of raw water supply for the system.

(Safe Drinking Water Act, 2002)

Ecological Function

The natural processes, products or services that living and non-living environments provide or perform within or between species, ecosystems and landscapes, including *hydrologic functions* and biological, physical, chemical and socio-economic interactions. (Greenbelt Plan)

Ecological Integrity

Which includes hydrological integrity, means the condition of ecosystems in which:

a) the structure, composition and function of the ecosystems are unimpaired by the stresses from human activity;

b) natural ecological processes are intact and self-sustaining; and

c) the ecosystems evolve naturally.

(Greenbelt Plan)

Ecological Value

The value of vegetation in maintaining the health of the *key natural heritage feature* or *key hydrologic feature* and the related ecological features and *ecological functions*, as measured by factors such as the diversity of species, the diversity of habitats, and the suitability and amount of habitats that are available for rare, threatened and endangered species. (Greenbelt Plan)

Economic Employment Districts

Areas that have been identified by the Minister that are to be planned and protected for locally significant employment uses. These areas are not *settlement areas*.

Employment Area

Areas designated in an official plan for clusters of business and economic activities including, but not limited to, manufacturing, warehousing, offices, and associated retail and ancillary facilities. (PPS, 2020)

Energy Transmission Pipeline

A pipeline for transporting large quantities of oil or natural gas within a province or across provincial or international boundaries. *Energy transmission pipelines* do not include local distribution pipelines.

Excess Lands

Vacant, unbuilt but developable lands within *settlement areas* but outside of *delineated built-up areas* that have been designated in an official plan for development but are in excess of what is needed to accommodate forecasted growth to the horizon of this Plan.

Fish Habitat

As defined in the Fisheries Act, means spawning grounds and any other areas, including nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes. (PPS, 2020)

Freight-supportive

In regard to land use patterns, means *transportation systems* and facilities that facilitate the movement of goods. This includes policies or programs intended to support efficient freight movement through the planning, design and operation of land use and *transportation systems*. Approaches may be recommended by the Province or based on municipal approaches that achieve the same objectives. (PPS, 2020)

Frequent Transit

A public transit service that runs at least every 15 minutes in both directions throughout the day and into the evening every day of the week.

Gateway Economic Centre

Settlement areas identified in this Plan, as conceptually depicted on Schedules 2, 5, and 6 that, due to their proximity to major international border crossings, have unique economic importance to the region and Ontario.

Gateway Economic Zone

Settlement areas identified in this Plan within the zone that is conceptually depicted on Schedules 2, 5, and 6, that, due to their proximity to major international border crossings, have unique economic importance to the region and Ontario.

Greater Golden Horseshoe (GGH)

The geographic area identified as the Greater Golden Horseshoe growth plan area in Ontario Regulation 416/05 under the Places to Grow Act, 2005.

Green Infrastructure

Natural and human-made elements that provide ecological and *hydrologic functions* and processes. *Green infrastructure* can include components such as natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces, and green roofs. (PPS, 2020)

Greenbelt Area
The geographic area identified as the Greenbelt Area in Ontario Regulation 59/05 under the Greenbelt Act, 2005.

Greyfields
Previously developed properties that are not contaminated. They are usually, but not exclusively, former commercial properties that may be underutilized, derelict, or vacant.

Ground Water Features
Water-related features in the earth's subsurface, including recharge/discharge areas, water tables, aquifers and unsaturated zones that can be defined by surface and subsurface hydrogeologic investigations. (PPS, 2020)

Habitat of Endangered Species and Threatened Species
Habitat within the meaning of section 2 of the Endangered Species Act, 2007. (PPS, 2020)

Hazardous Lands
Property or lands that could be unsafe for development due to naturally occurring processes. Along the shorelines of the Great Lakes – St Lawrence River System, this means the land, including that covered by water, between the international boundary, where applicable, and the furthest landward limit of the flooding hazard, erosion hazard or dynamic beach hazard limits. Along the shorelines of large, inland lakes, this means the land, including that covered by water, between a defined offshore distance or depth and the furthest landward limit of the flooding hazard, erosion hazard or dynamic beach hazard limits. Along river, stream and small inland lake systems, this means the land, including that covered by water, to the furthest landward limit of the flooding hazard or erosion hazard limits. (PPS, 2020)

Higher Order Transit
Transit that generally operates in partially or completely dedicated rights-of-way, outside of mixed traffic, and therefore can achieve levels of speed and reliability greater than mixed-traffic transit. *Higher order transit* can include heavy rail (such as subways and inter-city rail), light rail, and buses in dedicated rights-of-way.

Highly Vulnerable Aquifer
Aquifers, including lands above the aquifers, on which external sources have or are likely to have a significant adverse effect. (Greenbelt Plan)

Hydrologic Function

The functions of the hydrological cycle that include the occurrence, circulation, distribution and chemical and physical properties of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere, and water's interaction with the environment including its relation to living things. (PPS, 2020)

Impacts of a Changing Climate

The present and future consequences from changes in weather patterns at local and regional levels including extreme weather events and increased climate variability. (PPS, 2020)

Infrastructure

Physical structures (facilities and corridors) that form the foundation for development. *Infrastructure* includes: sewage and water systems, septage treatment systems, stormwater management systems, waste management systems, electricity generation facilities, electricity transmission and distribution systems, communications/telecommunications, transit and transportation corridors and facilities, oil and gas pipelines and associated facilities. (PPS, 2020)

Inner Ring

The geographic area consisting of the cities of Hamilton and Toronto and the Regions of Durham, Halton, Peel, and York.

Innisfil Heights Strategic Settlement Employment Area

Location set out in Schedule 8. The *Innisfil Heights strategic settlement employment area* boundary is determined by the Minister and planned for in accordance with the policies in subsection 6.4.

Intensification

The development of a property, site or area at a higher density than currently exists through:

a) *redevelopment*, including the reuse of *brownfield sites*;
b) the development of vacant and/or underutilized lots within previously developed areas;
c) infill development; and
d) the expansion or conversion of existing buildings.

(PPS, 2020)

Intermittent Streams

Stream-related watercourses that contain water or are dry at times of the year that are more or less predictable, generally flowing during wet seasons of the year but not the entire year, and where the water table is above the stream bottom during parts of the year. (Greenbelt Plan)

Joint Development

Agreements entered into voluntarily between the public sector and property owners or third parties, whereby private entities share some of the costs of *infrastructure* improvements or contribute some benefits back to the public sector based on a mutual recognition of the benefits of such *infrastructure* improvements. Approaches to *joint development* may be recommended in guidelines developed by the Province.

Key Hydrologic Areas

Significant groundwater recharge areas, *highly vulnerable aquifers*, and *significant surface water contribution areas* that are necessary for the ecological and hydrologic integrity of a *watershed*.

Key Hydrologic Features

Permanent streams, *intermittent streams*, inland lakes and their littoral zones, *seepage areas and springs*, and *wetlands*.

Key Natural Heritage Features

Habitat of endangered species and threatened species; *fish habitat*; *wetlands*; *life science areas of natural and scientific interest* (ANSIs), *significant valleylands*, *significant woodlands*; *significant wildlife habitat* (including habitat of special concern species); *sand barrens*, *savannahs*, and *tallgrass prairies*; and *alvars*.

Lake Simcoe Regional Airport Economic Employment District

Location set out in Schedule 8. The *Lake Simcoe Regional Airport economic employment district* boundary is determined by the Minister and planned for in accordance with the policies in subsection 6.4. *Major retail* and residential uses are not permitted.

Large Subsurface Sewage Disposal Systems

Subsurface disposal systems with a design capacity in excess of 10,000 litres per day. These systems are to be designed in accordance with section 22 of “Design Guidelines for Sewage Works, 2008”.

Life Science Areas of Natural and Scientific Interest (ANSIs)

An area that has been identified as having life science values related to protection, scientific study, or education; and further identified by the Ministry of Natural Resources and Forestry using evaluation procedures established by that Ministry, as amended from time to time. (Greenbelt Plan)

Low Impact Development

An approach to stormwater management that seeks to manage rain and other precipitation as close as possible to where it falls to mitigate the impacts of increased runoff and stormwater pollution. It typically includes a set of site design strategies and distributed, small-scale structural practices to mimic the natural hydrology to the greatest extent possible through infiltration, evapotranspiration, harvesting, filtration, and detention of stormwater. *Low impact development* can include, for example: bio-swales, vegetated areas at the edge of paved surfaces, permeable pavement, rain gardens, green roofs, and exfiltration systems. *Low impact development* often employs vegetation and soil in its design, however, that does not always have to be the case and the specific form may vary considering local conditions and community character.

Major Goods Movement Facilities and Corridors

The transportation facilities and corridors associated with the inter- and intra-provincial movement of goods. Examples include: inter-modal facilities, ports, airports, truck terminals, freight corridors, freight facilities, and haul routes and primary transportation corridors used for the movement of goods. Approaches that are *freight-supportive* may be recommended in guidelines developed by the Province or based on municipal approaches that achieve the same objectives. (PPS, 2020)

Major Office

Freestanding office buildings of approximately 4,000 square metres of floor space or greater, or with approximately 200 jobs or more.

Major Retail

Large-scale or large-format stand-alone retail stores or retail centres that have the primary purpose of commercial activities.

Major Transit Station Area

The area including and around any existing or planned *higher order transit* station or stop within a *settlement area*; or the area including and around a major bus depot in an urban core. *Major transit station areas* generally are defined as the area within an approximate 500 to 800 metre radius of a transit station, representing about a 10-minute walk.

Major Trip Generators

Origins and destinations with high population densities or concentrated activities which generate many trips (e.g., *urban growth centres* and other downtowns, *major office* and *office parks*, *major retail*, *employment areas*, community hubs, large parks and recreational destinations, post-secondary institutions and other *public service facilities*, and other mixed-use areas).

Mineral Aggregate Operations

a) lands under license or permit, other than for wayside pits and quarries, issued in accordance with the Aggregate Resources Act;

b) for lands not designated under the Aggregate Resources Act, established pits and quarries that are not in contravention of municipal zoning by-laws and including adjacent land under agreement with or owned by the operator, to permit continuation of the operation; and

c) associated facilities used in extraction, transport, beneficiation, processing, or recycling of *mineral aggregate resources* and derived products, such as asphalt and concrete, or the production of secondary related products.

(PPS, 2020)

Mineral Aggregate Resources

Gravel, sand, clay, earth, shale, stone, limestone, dolostone, sandstone, marble, granite, rock or other material prescribed under the Aggregate Resources Act suitable for construction, industrial, manufacturing and maintenance purposes but does not include metallic ores, asbestos, graphite, kyanite, mica, nepheline syenite, salt, talc, wollastonite, mine tailings or other material prescribed under the Mining Act. (PPS, 2020)

Minimum Distance Separation Formulae

Formulae and guidelines developed by the Province, as amended from time to time, to separate uses so as to reduce incompatibility concerns about odour from livestock facilities. (PPS, 2020)

Modal Share

The percentage of person-trips or of freight movements made by one travel mode, relative to the total number of such trips made by all modes.

Multimodal

Relating to the availability or use of more than one form of transportation, such as automobiles, walking, cycling, buses, rapid transit, rail (such as commuter and freight), trucks, air, and marine. (Based on PPS, 2020 and modified for this Plan)

Municipal Comprehensive Review

A new official plan, or an official plan amendment, initiated by an upper- or single-tier municipality under section 26 of the Planning Act that comprehensively applies the policies and schedules of this Plan.

Municipal Water and Wastewater Systems

Municipal water systems are all or part of a *drinking-water system*:

a) that is owned by a municipality or by a municipal service board established under section 195 of the Municipal Act, 2001;

b) that is owned by a corporation established under section 203 of the Municipal Act, 2001;

c) from which a municipality obtains or will obtain water under the terms of a contract between the municipality and the owner of the system; or

d) that is in a prescribed class of municipal *drinking-water systems* as defined in regulation under the Safe Drinking Water Act, 2002, including centralized and decentralized systems.

And, municipal wastewater systems are any *sewage works* owned or operated by a municipality.

Municipalities with Primary Settlement Areas

City of Barrie, City of Orillia, Town of Bradford West Gwillimbury, Town of Collingwood, Town of Innisfil, Town of Midland, Town of New Tecumseth, and Town of Penetanguishene.

Natural Heritage Features and Areas

Features and areas, including *significant wetlands*, significant coastal *wetlands*, other coastal *wetlands* in Ecoregions 5E, 6E and 7E, *fish habitat*, *significant woodlands* and *significant valleylands* in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River), *habitat of endangered species and threatened species*, *significant wildlife habitat*, and significant areas of natural and scientific interest, which are important for their environmental and social values as a legacy of the natural landscapes of an area. (PPS, 2020)

Natural Heritage System

A system made up of *natural heritage features and areas*, and linkages intended to provide connectivity (at the regional or site level) and support natural processes which are necessary to maintain biological and geological diversity, natural functions, viable populations of indigenous species, and ecosystems. The system can include *key natural heritage features*, *key hydrologic features*, federal and provincial parks and conservation reserves, other *natural heritage features and areas*, lands that have been restored or have the potential to be restored to a natural state, associated areas that support *hydrologic functions*, and working landscapes that enable *ecological functions* to continue. (Based on PPS, 2020 and modified for this Plan)

Natural Heritage System for the Growth Plan

The *natural heritage system* mapped and issued by the Province in accordance with this Plan.

Natural Self-Sustaining Vegetation

Vegetation dominated by native plant species that can grow and persist without direct human management, protection, or tending. (Greenbelt Plan)

Negative Impact

a) In regard to water, degradation to the quality or quantity of surface or groundwater, *key hydrologic features* or vulnerable areas and their related *hydrologic functions* due to single, multiple or successive *development* or *site alteration* activities;

b) In regard to *fish habitat*, any permanent alteration to or destruction of *fish habitat*, except where, in conjunction with the appropriate authorities, it has been authorized under the Fisheries Act; and

c) In regard to other *natural heritage features and areas*, degradation that threatens the health and integrity of the natural features or *ecological functions* for which an area is identified due to single, multiple or successive *development* or *site alteration* activities.

New Multiple Lots or Units for Residential Development

The creation of more than three units or lots through either plan of subdivision, consent, or plan of condominium.

Normal Farm Practices

A practice, as defined in the Farming and Food Production Protection Act, 1998, that is conducted in a manner consistent with proper and acceptable customs and standards as established and followed by similar agricultural operations under similar circumstances; or makes use of innovative technology in a manner consistent with proper advanced farm management practices. Normal farm practices shall be consistent with the Nutrient Management Act, 2002 and regulations made under that Act. (PPS, 2020)

Office Parks

Employment areas or areas where there are significant concentrations of offices with high employment densities.

On-farm Diversified Uses

Uses that are secondary to the principal *agricultural use* of the property, and are limited in area. *On-farm diversified uses* include, but are not limited to, home occupations, home industries, agri-tourism uses, and uses that produce value-added agricultural products. Ground-mounted solar facilities are permitted in *prime agricultural areas* and *specialty crop areas* only as *on-farm diversified uses*. (PPS, 2020)

Outer Ring

The geographic area consisting of the cities of Barrie, Brantford, Guelph, Kawartha Lakes, Orillia, and Peterborough; the Counties of Brant, Dufferin, Haldimand, Northumberland, Peterborough, Simcoe, and Wellington; and the Regions of Niagara and Waterloo.

Planned Corridors

Corridors or future corridors which are required to meet projected needs, and are identified through this Plan, preferred alignment(s) determined through the Environmental Assessment Act process, or identified through planning studies where the Ministry of Transportation, Ministry of Energy, Northern Development and Mines, Metrolinx, or Independent Electricity System Operator (IESO) or any successor to those Ministries or entities, is actively pursuing the identification of a corridor. Approaches for the protection of *planned corridors* may be recommended in guidelines developed by the Province. (Based on PPS, 2020 and modified for this Plan)

Primary Settlement Areas

Locations set out in Schedule 8. *Primary settlement areas* are the *settlement areas* of the City of Barrie, the City of Orillia, the Town of Collingwood, the Town of Midland together with the Town of Penetanguishene, and the *settlement areas* of the communities of Alcona in the Town of Innisfil, Alliston in the Town of New Tecumseth and Bradford in the Town of Bradford West Gwillimbury.

Prime Agricultural Area

An area where *prime agricultural lands* predominate. This includes areas of *prime agricultural lands* and associated Canada Land Inventory Class 4 through 7 lands and additional areas where there is a local concentration of farms which exhibit characteristics of ongoing agriculture. *Prime agricultural areas* are to be identified by the Ontario Ministry of Agriculture, Food and Rural Affairs using guidelines developed by the Province as amended from time to time. (Based on PPS, 2020 and modified for this Plan)

Prime Agricultural Lands

Specialty crop areas and/or Canada Land Inventory Class 1, 2, and 3 lands, as amended from time to time, in this order of priority for protection (PPS, 2020).

Priority Transit Corridors
Transit corridors shown in Schedule 5 or as further identified by the Province for the purpose of implementing this Plan.

Private Communal Water and Wastewater Systems
Private communal water systems are *drinking-water systems* that are not municipal water systems and that serve six or more lots or private residences, and

Private communal wastewater systems are *sewage works* that serve six or more lots or private residences and are not owned or operated by a municipality.

Provincially Significant Employment Zones
Areas defined by the Minister in consultation with affected municipalities for the purpose of long-term planning for job creation and economic development. *Provincially significant employment zones* can consist of *employment areas* as well as mixed-use areas that contain a significant number of jobs.

Public Service Facilities
Lands, buildings and structures for the provision of programs and services provided or subsidized by a government or other body, such as social assistance, recreation, police and fire protection, health and educational programs, long-term care services, and cultural services. *Public service facilities* do not include *infrastructure*. (PPS, 2020)

Public Realm
All spaces to which the public has unrestricted access, such as streets, parks, and sidewalks.

Quality and Quantity of Water
Measured by indicators associated with *hydrologic function* such as minimum base flow, depth to water table, aquifer pressure, oxygen levels, suspended solids, temperature, bacteria, nutrients and hazardous contaminants, and hydrologic regime. (PPS, 2020)

Rama Road Economic Employment District
Location set out in Schedule 8. The *Rama Road economic employment district* boundary is determined by the Minister and planned for in accordance with the policies in subsection 6.4. *Major retail* uses are not permitted.

Redevelopment
The creation of new units, uses or lots on previously developed land in existing communities, including *brownfield sites*. (PPS, 2020)

Renewable Energy System

A system that generates electricity, heat and/or cooling from a renewable energy source.

For the purposes of this definition:

A renewable energy source is an energy source that is renewed by natural processes and includes wind, water, biomass, biogas, biofuel, solar energy, geothermal energy and tidal forces. (PPS, 2020)

Rural Lands

Lands which are located outside *settlement areas* and which are outside *prime agricultural areas*. (PPS, 2020)

Rural Settlements

Existing hamlets or similar existing small *settlement areas* that are long-established and identified in official plans. These communities are serviced by individual private on-site water and/or private wastewater systems, contain a limited amount of undeveloped lands that are designated for development and are subject to official plan policies that limit growth. All *settlement areas* that are identified as hamlets in the Greenbelt Plan, as rural settlements in the Oak Ridges Moraine Conservation Plan, or as minor urban centres in the Niagara Escarpment Plan are considered *rural settlements* for the purposes of this Plan, including those that would not otherwise meet this definition.

Sand Barren

Land (not including land that is being used for agricultural purposes or no longer exhibits *sand barren* characteristics) that:

a) has sparse or patchy vegetation that is dominated by plants that are:
   i. adapted to severe drought and low nutrient levels; and
   ii. maintained by severe environmental limitations such as drought, low nutrient levels, and periodic disturbances such as fire;
b) has less than 25 per cent tree cover;
c) has sandy soils (other than shorelines) exposed by natural erosion, depositional process, or both; and
d) has been further identified, by the Ministry of Natural Resources and Forestry or by any other person, according to evaluation procedures established by the Ministry of Natural Resources and Forestry, as amended from time to time.

(Greenbelt Plan)

Savannah

Land (not including land that is being used for agricultural purposes or no longer exhibits *savannah* characteristics) that:

a) has vegetation with a significant component of non-woody plants, including *tallgrass prairie* species that are maintained by seasonal drought, periodic disturbances such as fire, or both;
b) has from 25 per cent to 60 per cent tree cover;
c) has mineral soils; and
d) has been further identified, by the Ministry of Natural Resources and Forestry or by any other person, according to evaluation procedures established by the Ministry of Natural Resources and Forestry, as amended from time to time.

(Greenbelt Plan)

Seepage Areas and Springs

Sites of emergence of groundwater where the water table is present at the ground surface. (Greenbelt Plan)

Sensitive Land Uses

Buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more adverse effects from contaminant discharges generated by nearby major facilities. *Sensitive land uses* may be a part of the natural or built environment. Examples may include, but are not limited to: residences, day care centres, and educational and health facilities. (PPS, 2020)

Settlement Areas

Urban areas and *rural settlements* within municipalities (such as cities, towns, villages and hamlets) that are:

a) built up areas where development is concentrated and which have a mix of land uses; and
b) lands which have been designated in an official plan for development in accordance with the policies of this Plan. Where there are no lands that have been designated for development, the *settlement area* may be no larger than the area where development is concentrated.

(Based on PPS, 2020 and modified for this Plan)

Sewage Works

Any works for the collection, transmission, treatment, and disposal of sewage or any part of such works, but does not include plumbing to which the Building Code Act, 1992 applies. (Ontario Water Resources Act)

For the purposes of this definition:

Sewage includes, but is not limited to drainage, stormwater, residential wastewater, commercial wastewater, and industrial wastewater.

Significant Groundwater Recharge Area

An area that has been identified:

a) as a *significant groundwater recharge area* by any public body for the purposes of implementing the PPS, 2020;

b) as a *significant groundwater recharge area* in the assessment report required under the Clean Water Act, 2006; or

c) as an ecologically *significant groundwater recharge area* delineated in a *subwatershed plan* or equivalent in accordance with provincial guidelines.

For the purposes of this definition, ecologically *significant groundwater recharge areas* are areas of land that are responsible for replenishing groundwater systems that directly support sensitive areas like cold water streams and *wetlands*. (Greenbelt Plan)

Significant Surface Water Contribution Areas

Areas, generally associated with headwater catchments, that contribute to baseflow volumes which are significant to the overall surface water flow volumes within a *watershed*. (Greenbelt Plan)

Significant Wetland

A *wetland* that has been identified as provincially significant by the Province. (Based on PPS, 2020 and modified for this Plan)

Significant Wildlife Habitat

A *wildlife habitat* that is ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or *natural heritage system*. These are to be identified using criteria established by the Province. (Based on PPS, 2020 and modified for this Plan)

Significant Woodland

A *woodland* which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history. These are to be identified using criteria established by the Province. (Based on PPS, 2020 and modified for this Plan)

Significant Valleyland

A *valleyland* which is ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or *natural heritage system*. These are to be identified using criteria established by the Province. (Based on PPS, 2020 and modified for this Plan)

Simcoe Sub-area

The geographic area consisting of the County of Simcoe, the City of Barrie and the City of Orillia.

Site Alteration

Activities, such as grading, excavation and the placement of fill that would change the landform and natural vegetative characteristics of a site. (PPS, 2020)

Specialty Crop Area

Areas designated using guidelines developed by the Province, as amended from time to time. In these areas, specialty crops are predominantly grown such as tender fruits (peaches, cherries, plums), grapes, other fruit crops, vegetable crops, greenhouse crops, and crops from agriculturally developed organic soil usually resulting from:

a) soils that have suitability to produce specialty crops, or lands that are subject to special climatic conditions, or a combination of both;
b) farmers skilled in the production of specialty crops; and
c) a long-term investment of capital in areas such as crops, drainage, *infrastructure* and related facilities and services to produce, store, or process specialty crops.

(PPS, 2020)

Stormwater Master Plan

A long-range plan that assesses existing and planned stormwater facilities and systems and outlines stormwater *infrastructure* requirements for new and existing development within a *settlement area*. *Stormwater master plans* are informed by *watershed planning* and are completed in accordance with the Municipal Class Environmental Assessment.

Stormwater Management Plan

A plan that provides direction to avoid or minimize and mitigate stormwater volume, contaminant loads, and impacts on receiving water courses to: maintain groundwater quality and flow and stream baseflow; protect water quality; minimize the disruption of pre-existing (natural) drainage patterns wherever possible; prevent increases in stream channel erosion; prevent any increase in flood risk; and protect aquatic species and their habitat.

Strategic Growth Areas

Within *settlement areas*, nodes, corridors, and other areas that have been identified by municipalities or the Province to be the focus for accommodating *intensification* and higher-density mixed uses in a more *compact built form*. *Strategic growth areas* include *urban growth centres*, *major transit station areas*, and other major opportunities that may include infill, *redevelopment*, *brownfield sites*, the expansion or conversion of existing buildings, or *greyfields*. Lands along major roads, arterials, or other areas with existing or planned *frequent transit* service or *higher order transit* corridors may also be identified as *strategic growth areas*.

Strategic Settlement Employment Areas

Areas that have been identified by the Minister that are to be planned and protected for employment uses that require large lots of land and depend upon efficient movement of goods and access to Highway 400. These are not *settlement areas*. *Major retail* and residential uses are not permitted.

Subwatershed Plan

A plan that reflects and refines the goals, objectives, targets, and assessments of *watershed planning*, as available at the time a *subwatershed plan* is completed, for smaller drainage areas, is tailored to subwatershed needs and addresses local issues.

A *subwatershed plan* should: consider existing development and evaluate impacts of any potential or proposed land uses and development; identify hydrologic features, areas, linkages, and functions; identify natural features, areas, and related *hydrologic functions*; and provide for protecting, improving, or restoring the *quality and quantity of water* within a subwatershed.

A *subwatershed plan* is based on pre-development monitoring and evaluation; is integrated with natural heritage protection; and identifies specific criteria, objectives, actions, thresholds, targets, and best management practices for development, for water and wastewater servicing, for stormwater management, for managing and minimizing impacts related to severe weather events, and to support ecological needs. (Greenbelt Plan)

Surface Water Features

Water-related features on the earth's surface, including headwaters, rivers, stream channels, inland lakes, seepage areas, recharge/discharge areas, springs, *wetlands*, and associated riparian lands that can be defined by their soil moisture, soil type, vegetation or topographic characteristics. (PPS, 2020)

Tallgrass Prairies

Land (not including land that is being used for agricultural purposes or no longer exhibits *tallgrass prairie* characteristics) that:

a) has vegetation dominated by non-woody plants, including *tallgrass prairie* species that are maintained by seasonal drought, periodic disturbances such as fire, or both;
b) has less than 25 per cent tree cover;
c) has mineral soils; and
d) has been further identified, by the Minister of Natural Resources and Forestry or by any other person, according to evaluation procedures established by the Ministry of Natural Resources and Forestry, as amended from time to time.

(Greenbelt Plan)

Total Developable Area

The total area of the property less the area occupied by *key natural heritage features*, *key hydrologic features* and any related *vegetation protection zone*. (Greenbelt Plan)

Transit Service Integration

The co-ordinated planning or operation of transit service between two or more agencies or services that contributes to the goal of seamless service for riders and could include considerations of service schedules, service routes, information, fare policy, and fare payment.

Transit-supportive

Relating to development that makes transit viable and improves the quality of the experience of using transit. It often refers to compact, mixed-use development that has a high level of employment and residential densities. *Transit-supportive* development will be consistent with Ontario's Transit Supportive Guidelines.

Transportation Demand Management

A set of strategies that result in more efficient use of the *transportation system* by influencing travel behaviour by mode, time of day, frequency, trip length, regulation, route, or cost. (PPS, 2020)

Transportation System

A system consisting of facilities, corridors and rights-of-way for the movement of people and goods, and associated transportation facilities including transit stops and stations, sidewalks, cycle lanes, bus lanes, high occupancy vehicle lanes, rail facilities, parking facilities, park-and-ride lots, service centres, rest stops, vehicle inspection stations, inter-modal facilities, harbours, airports, marine facilities, ferries, canals and associated facilities such as storage and maintenance. (PPS, 2020)

Urban Growth Centres

Existing or emerging downtown areas shown in Schedule 4 and as further identified by the Minister on April 2, 2008.

Valleylands

A natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of the year. (PPS, 2020)

Vegetation Protection Zone

A vegetated buffer area surrounding a *key natural heritage feature* or *key hydrologic feature*. (Greenbelt Plan)

Water Resource System

A system consisting of *ground water features* and areas and *surface water features* (including shoreline areas), and *hydrologic functions*, which provide the water resources necessary to sustain healthy aquatic and terrestrial ecosystems and human water consumption. The *water resource system* will comprise *key hydrologic features* and *key hydrologic areas*.

Watershed

An area that is drained by a river and its tributaries. (PPS, 2020)

Watershed Planning

Planning that provides a framework for establishing goals, objectives, and direction for the protection of water resources, the management of human activities, land, water, aquatic life, and resources within a *watershed* and for the assessment of cumulative, cross-jurisdictional, and cross-*watershed* impacts.

Watershed planning typically includes: *watershed* characterization, a water budget, and conservation plan; nutrient loading assessments; consideration of the *impacts of a changing climate* and severe weather events; land and water use management objectives and strategies; scenario modelling to evaluate the impacts of forecasted growth and servicing options, and mitigation measures; an environmental monitoring plan; requirements for the use of environmental best management practices, programs, and performance measures; criteria for evaluating the protection of *quality and quantity of water*; the identification and protection of hydrologic features, areas, and functions and the inter-relationships between or among them; and targets for the protection and restoration of riparian areas.

Watershed planning is undertaken at many scales, and considers cross-jurisdictional and cross-*watershed* impacts. The level of analysis and specificity generally increases for smaller geographic areas such as subwatersheds and tributaries. (Greenbelt Plan)

Wetlands

Lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic plants or water tolerant plants. The four major types of *wetlands* are swamps, marshes, bogs and fens.

Periodically soaked or wet lands being used for agricultural purposes which no longer exhibit *wetland* characteristics are not considered to be *wetlands* for the purposes of this definition.

Wetlands are further identified, by the Ministry of Natural Resources and Forestry or by any other person, according to evaluation procedures established by the Ministry of Natural Resources and Forestry, as amended from time to time. (Greenbelt Plan)

Wildlife Habitat

Areas where plants, animals and other organisms live, and find adequate amounts of food, water, shelter and space needed to sustain their populations. Specific *wildlife habitats* of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle; and areas which are important to migratory or non-migratory species. (PPS, 2020)

Woodlands

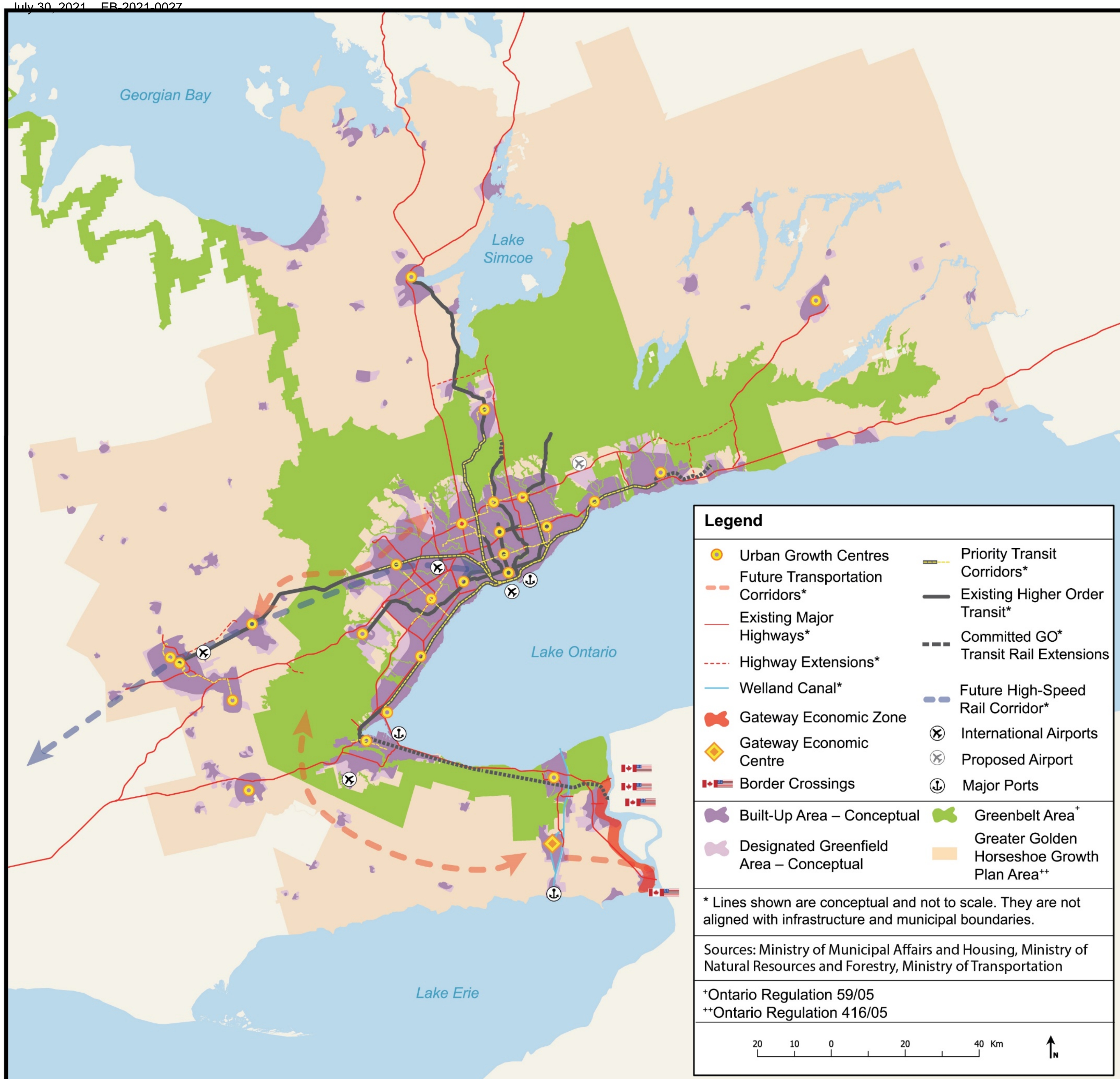
Treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as erosion prevention, hydrological and nutrient cycling, provision of clean air and the long-term storage of carbon, provision of *wildlife habitat*, outdoor recreational opportunities, and the sustainable harvest of a wide range of *woodland* products. *Woodlands* include treed areas, woodlots or forested areas and vary in their level of significance at the local, regional and provincial levels. *Woodlands* may be delineated according to the Forestry Act definition or the Province's Ecological Land Classification system definition for "forest." (PPS, 2020)

Ontario

SCHEDULE 1

Greater Golden Horseshoe Growth Plan Area

Note: The information displayed on this map is not to scale, does not accurately reflect approved land-use and planning boundaries, and may be out of date. For more information on precise boundaries, the appropriate municipality should be consulted. For more information on Greenbelt Area boundaries, the Greenbelt Plan should be consulted. The Province of Ontario assumes no responsibility or liability for any consequences of any use made of this map.



Ontario

SCHEDULE 2

A Place to Grow Concept

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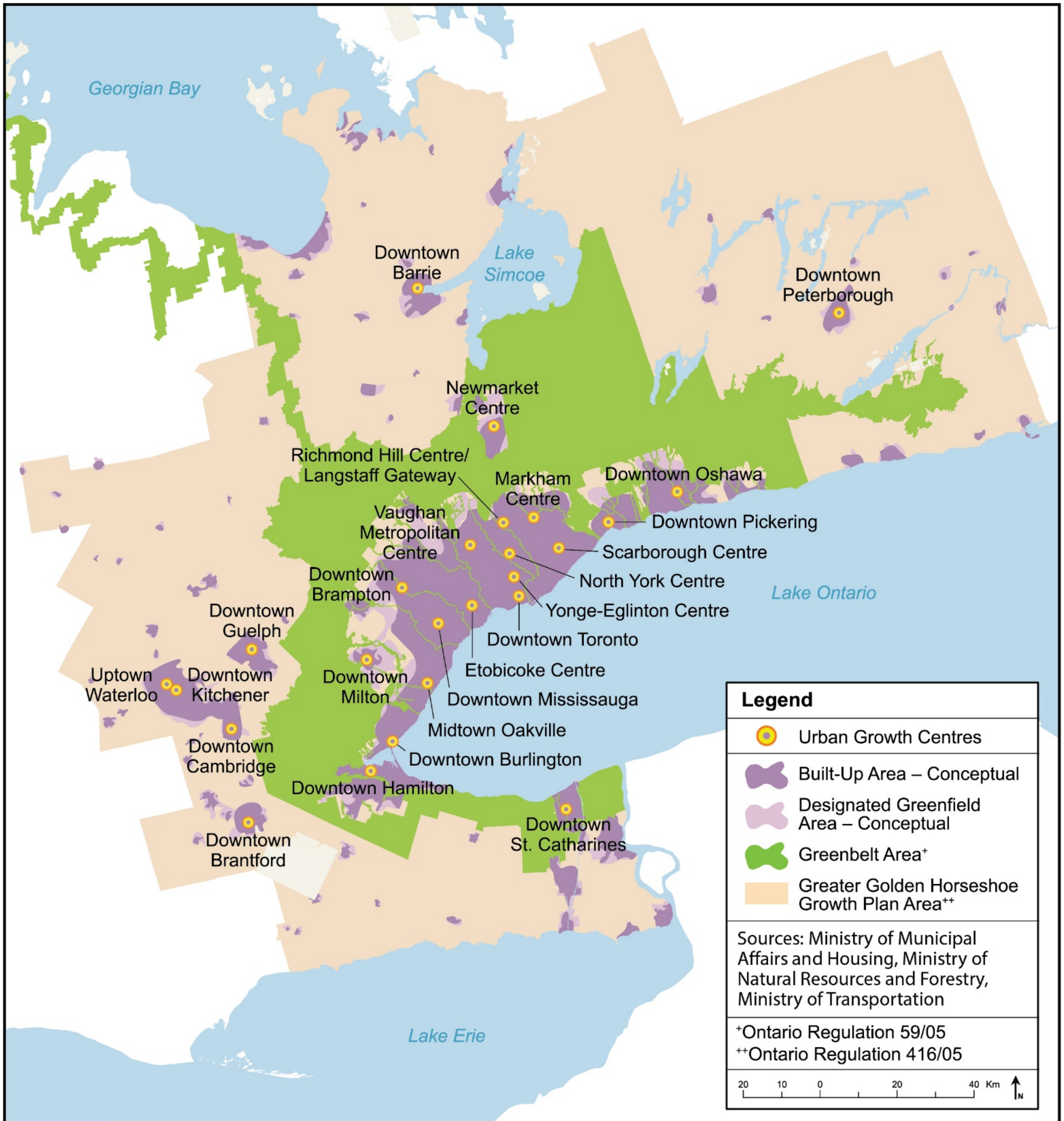
Distribution of Population and Employment for the Greater Golden Horseshoe to 2051		
	POPULATION	EMPLOYMENT
	2051	2051
Region of Durham	1,300,000	460,000
Region of York	2,020,000	990,000
City of Toronto	3,650,000	1,980,000
Region of Peel	2,280,000	1,070,000
Region of Halton	1,100,000	500,000
City of Hamilton	820,000	360,000
GTHA TOTAL*	**11,170,000**	**5,360,000**
County of Northumberland	122,000	44,000
County of Peterborough	82,000	26,000
City of Peterborough	125,000	63,000
City of Kawartha Lakes	117,000	39,000
County of Simcoe	555,000	198,000
City of Barrie	298,000	150,000
City of Orillia	49,000	26,000
County of Dufferin	95,000	39,000
County of Wellington	160,000	70,000
City of Guelph	203,000	116,000
Region of Waterloo	923,000	470,000
County of Brant	59,000	26,000
City of Brantford	165,000	80,000
County of Haldimand	75,000	29,000
Region of Niagara	674,000	272,000
OUTER RING TOTAL*	**3,700,000**	**1,650,000**
TOTAL GGH*	**14,870,000**	**7,010,000**

Note: Numbers rounded off to nearest 10,000 for GTAH municipalities, GTAH Total and Outer Ring Total, and to nearest 1,000 for outer ring municipalities.
**Total may not add up due to rounding*

Ontario

SCHEDULE 3

Distribution of Population and Employment for the Greater Golden Horseshoe to 2051



Ontario

SCHEDULE 4

Urban Growth Centres

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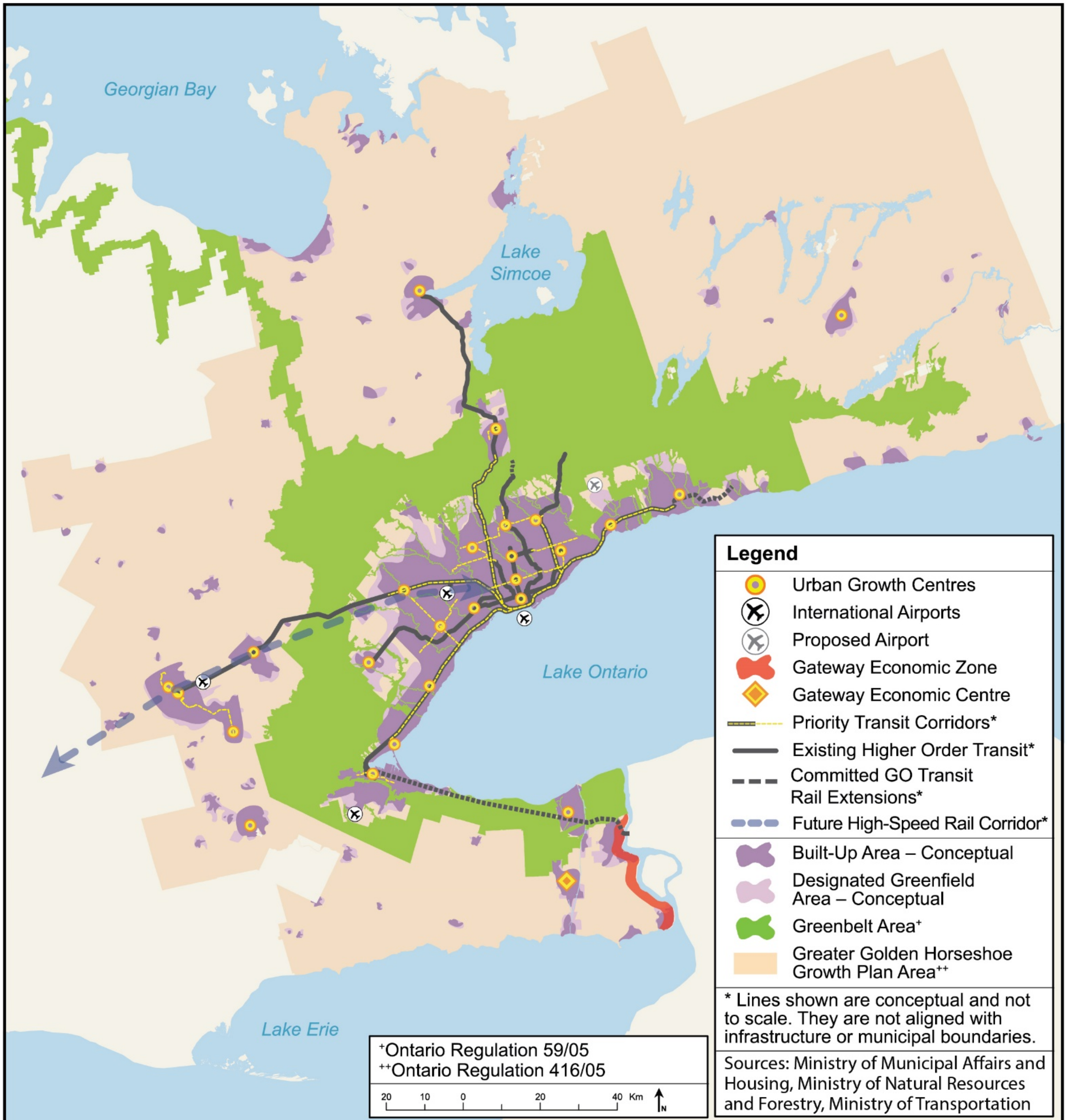
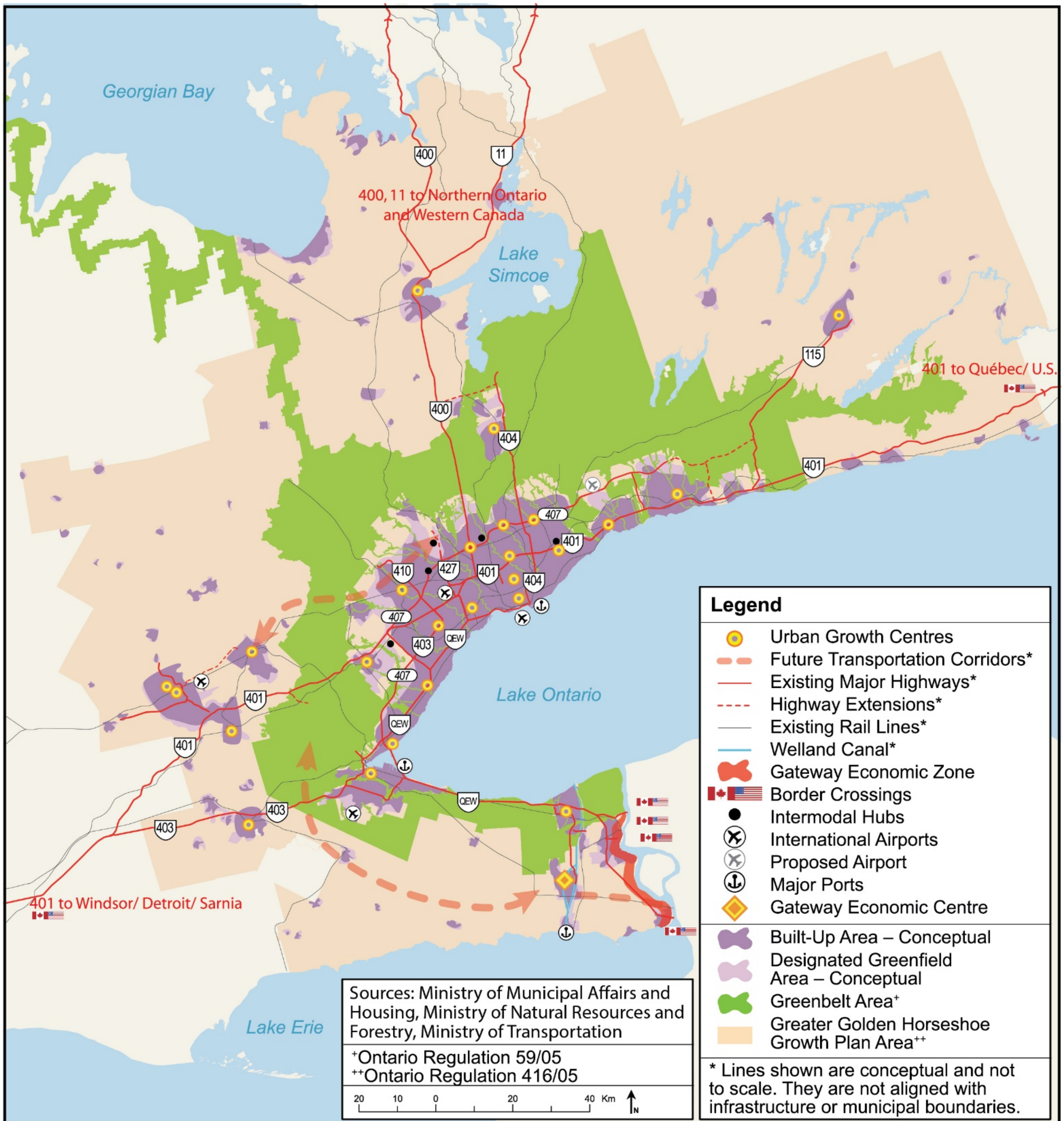


Ontario

SCHEDULE 5

Moving People - Transit

Note: The information displayed on this map is not to scale, does not accurately reflect approved land-use and planning boundaries, and may be out of date. For more information on precise boundaries, the appropriate municipality should be consulted. For more information on Greenbelt Area boundaries, the Greenbelt Plan should be consulted. The Province of Ontario assumes no responsibility or liability for any consequences of any use made of this map.



Ontario

SCHEDULE 6

Moving Goods

Note: The information displayed on this map is not to scale, does not accurately reflect approved land-use and planning boundaries, and may be out of date. For more information on precise boundaries, the appropriate municipality should be consulted. For more information on Greenbelt Area boundaries, the Greenbelt Plan should be consulted. The Province of Ontario assumes no responsibility or liability for any consequences of any use made of this map.

Ontario

SCHEDULE 7 has been deleted

Ontario

SCHEDULE 8

Simcoe Sub-Area

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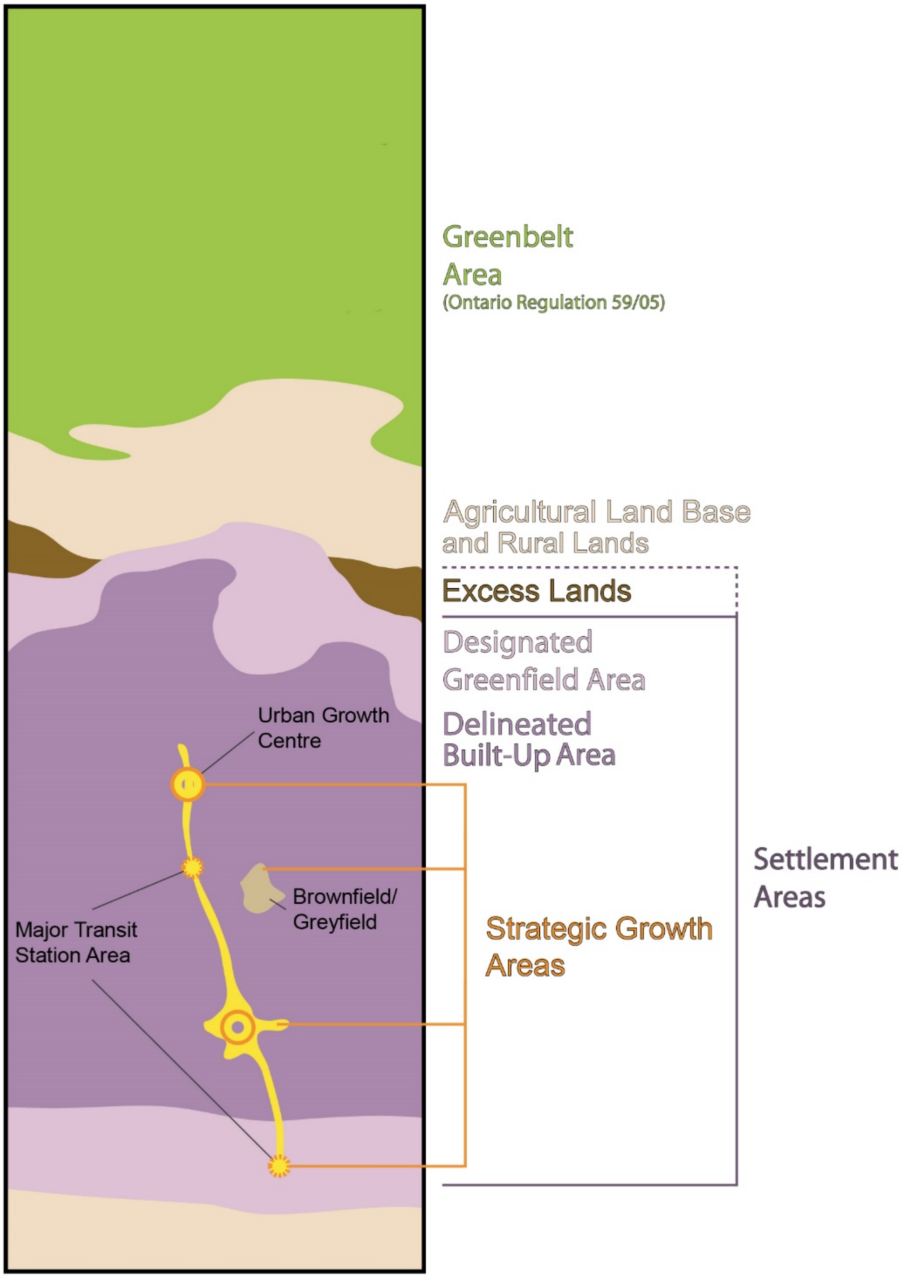
Ontario

APPENDIX 1

Context Map: Location of the Greater Golden Horseshoe within Ontario

The information displayed in the map above is not to scale. This appendix is included for information only and should be read as a part of the Growth Plan for the Greater Golden Horseshoe.



Ontario

APPENDIX 2

Illustration Diagram: Growth Plan Land Use Terminology

The information displayed in the map above is not to scale. This appendix is included for information only and should be read as a part of the Growth Plan for the Greater Golden Horseshoe.

Ministry of Municipal Affairs and Housing

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Disponible en français

This document is available in alternative format
ontario.ca/document/place-grow-growth-plan-greater-golden-horseshoe

APPENDIX N1

Niagara Region Implementation Plan

Niagara Region

COUNCIL'S STRATEGY IMPLEMENTATION PLAN

2019-2022

SHAPE NIAGARA

COUNCIL'S STRATEGY IMPLEMENTATION PLAN

In 2019, Niagara Regional Council developed their new 2019-2022 Strategic Plan. The strategy provides the focus and direction of the organization for the next several years by identifying four priority areas of focus, and the objectives defining how we hope to achieve these priorities. This document represents the implementation plan, containing strategic projects and actions by which the Niagara Region, as an organization, will set out to reach the objectives that Council has identified.

The 2019-2022 Council Strategy Implementation Plan will be a flexible document, allowing for projects or actions to be changed or added as new direction is set by higher levels of government, as new opportunities present themselves, or by other influencing factors.

The Niagara Region provides many core services within the organization and to the broader public that may not be reflected in this document. The document serves to call forward strategic, high level projects and complementary actions that will drive progress in the areas which need extra attention as deemed by Council, and informed through community consultation for the next four year term.

STRATEGIC PRIORITIES

01 SUPPORTING BUSINESSES AND ECONOMIC GROWTH

A coordinated approach to fostering economic growth in Niagara

02 HEALTHY AND VIBRANT COMMUNITY

Foster a high quality of life through safe, healthy, and inclusive neighbourhoods through the delivery of quality, affordable and accessible human services

03 RESPONSIBLE GROWTH AND INFRASTRUCTURE PLANNING

Sustainable investments in transportation, transit and infrastructure, while aligning infrastructure planning with preservation of the natural environment

04 SUSTAINABLE AND ENGAGING GOVERNMENT

A commitment to high quality, efficient, fiscally sustainable and coordinated core services through enhanced communication, partnerships and collaborations with the community

01 STRATEGIC PRIORITIES

SUPPORTING BUSINESSES AND ECONOMIC GROWTH

A coordinated approach to fostering economic growth in Niagara.

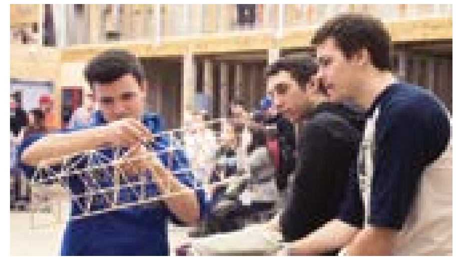
Objective 1.1: Economic Growth and Development

Objective 1.2: Support Retention and Development of a Skilled Labour Force

Objective 1.3: Collaborative Approach to Business Growth and Retention

Objective 1.4: Strategically Target Industry Sectors

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Economic Development Long Term Strategy	Goal of the plan is to improve economic growth with a 20 year horizon, to inform decisions along the way and tie into other Niagara Regional plans. Partnering with post-secondary institutions, and informed by research and stakeholder consultations.	• Garner buy-in from regional stakeholders, working together to achieve a unified vision • Sustained regional growth in the long term
	2021 Summer Games	Niagara Region was selected as Host Community for the 2021 Canada Summer Games. Games will showcase Niagara's attributes while driving the development of sustainable infrastructure to be used now and for future recreation.	• The games will establish a foundation for national and international elite sporting events for partner organizations • Maximize economic impact by utilizing local suppliers and businesses • Capitalize on opportunities for community benefits for example volunteers, artwork
	Expand Broadband Infrastructure and Capacity	Secure federal and provincial funding to improve Niagara's fibre technology infrastructure to prepare for 5G. Connects to the objectives outlined in the five year Economic Development strategy.	• Increase connectivity of rural areas for residents and businesses, support advancement of precision agriculture
	Official Plan	The Niagara Official Plan is a long-range, policy planning document to shape Niagara's physical, economic and social development. Tied to three Strategic Priorities, the components of the plan that align to the strategy's objectives include: **Land Strategy:** A land strategy that will be designed to increase shovel ready lands for employment, and identify lands for an employment district to meet provincial requirements. **Environmental Sustainability:** Updating policies and mapping; and create a strategy to protect biodiversity, address natural heritage, and develop a natural environment action plan. **Affordable Housing:** How we manage growth and development, with a range and mix of housing types, including affordable housing.	• **Land Strategy:** Increase competitiveness to attract investment, increase job creation, and the opportunity for higher paying jobs and skilled labour • **Environmental Sustainability:** Stabilization of natural spaces through enhancements or compensation (allowing removal and replacement of trees) • **Affordable Housing:** Increase Niagara's access to affordable housing stock



HOW ELSE ARE WE ACHIEVING THIS?

Strategic Marketing

This is a core function of the Economic Development division. Conducting targeted marketing activities to position Niagara as a competitive location for business investment.

Trade and Investment

This is a core function of the Economic Development division. Promoting Niagara through investment attraction and lead generation activities (investment missions) to strategically target sectors within specific geographies.

Implement Five-Year Economic Development Strategy

As it relates to supporting business growth, employment lands, marketing the region, streamlining planning processes, increasing Niagara's competitiveness, addressing workforce challenges with partners, advocacy for Niagara.

Addressing the Skilled Labour Force Gap

A number of ministries are trying to address this in many ways. The role of the region is facilitation between partners such as, Niagara College. A transformation of the employment business is expected based on Provincial direction. Our role may become clearer pending this information.

02 STRATEGIC PRIORITIES

HEALTHY AND VIBRANT COMMUNITY

Foster a high quality of life through safe, inclusive neighbourhoods and delivery of quality, affordable and accessible human services.

Objective 2.1: Enhance Community Wellbeing
Objective 2.2: Mental Health and Wellbeing
Objective 2.3: Addressing Affordable Housing Needs

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Health Equity Informed Planning	By focusing on the implementation of the Health Equity Strategic Plan, broaden the scope to the corporation as a whole to identify opportunities such as defining priority populations, healthy community design or inequities in service access. Identify health and health equity impacts within projects through tactics such as embedding in capital project business cases, e-scribe reports or through Environmental Assessments.	• Increase access to health equity data and partnerships to drive decisions • Increase consideration of health and health equity impacts in community and infrastructure design • Greater organizational and public awareness of social determinants of health that impact individual health outcomes
	Long-term Care Redevelopment	Two sites fully developed using a campus model with community elements. Creating and establishing opportunities for auxiliary services, compatible housing and small commercial opportunities.	• Develop best practice Long Term Care facilities • Maximize value and yield of Regional assets for the benefit of the community at large
	Community Safety and Well-Being Plan	Development of a Community Safety and Wellbeing Plan as legislated under the Police Services Act. A cross-disciplinary approach, connecting police services, providers in health/mental health, education, community/social services and children/youth services and neighbourhood stakeholders as appropriate.	• Making communities safer and healthier, often guided by four pillars: social development, prevention, risk intervention, and incident response
	Mental Health Addictions and Systems Planning	Identify gaps within the Mental Health system to increase the functionality and collaboration within it. Partnering with the Local Health Integration (LHIN) to review the local landscape to identify opportunities including for new investment.	• Integrate and coordinate the mental health and addictions services through streamlining access to care, reducing repeat Emergency Department visits • Decreasing admissions for mental health and addictions • Decreasing wait times for service
	Affordable Housing	Advance the Regional Affordable Housing Strategy through Niagara's updated Housing and Homelessness Action Plan (HHAP). Further linking the plan to components of the Official Plan and strategic financial investments, in order to increase Niagara's access to affordable housing stock.	• Increase supply of affordable housing (also linked to employment strategy to increase wages) • Achievement of updated Housing and Homelessness Action Plan (HHAP) objectives and performance targets

HOW ELSE ARE WE ACHIEVING THIS?

Parenting Strategy

This strategy guides evidence-informed decision-making around how we support and engage parents and families in Niagara, using a social determinants of health lens to impact health equity, early childhood development, and the well-being of families.

Early Childhood

Supports for licensed childcare, and a system of services and supports for children and their families.

Mental Health Promotion Strategy Implementation

Building mental health literacy, reducing stigma, and ensuring that mental health promotion is embedded into all initiatives within Public Health.

03 STRATEGIC PRIORITIES

RESPONSIBLE GROWTH AND INFRASTRUCTURE PLANNING

Sustainable investments in transportation, transit and infrastructure, while aligning infrastructure planning with preservation of the natural environment.

Objective 3.1: Advancing Regional Transit and GO Rail Services

Objective 3.2: Environmental Sustainability and Stewardship

Objective 3.3: Maintain Existing Infrastructure

Objective 3.4: Facilitating the Movement of Goods and Services

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	GO Train Service Expansion	Promote and protect transit oriented development involving key transportation infrastructure projects adjacent and supportive of GO station locations across all four identified Niagara station sites. Increase service frequency and levels of weekday GO Train service.	• Ridership growth • Increased weekday train frequency/ service levels • Create station enabling infrastructure improvements (mobility hubs) • Enable strategic station developments • Increase access to service communities through bus-meets-train connectivity
	Inter Municipal Transit	Operational harmonization and integration of local transit into a fully integrated transit system. Governance review and modelling development in anticipation of a decision to transition to a new transit entity.	• New transit governance model decided • System connectivity of all 12 municipalities • Ridership growth • Consistency in service delivery across communities • Increased service hours • Significant customer experience improvements
	Waste Management Strategy	Strategic waste management infrastructure planning to ensure resource recovery, sustainable long-term disposal infrastructure, and enhance revenue opportunities.	• Decrease greenhouse gas emissions • Increase waste diversion rates • Long-term facility sustainability • Identify opportunities to increase revenue
	Asset management	Implementation of Asset Management principles and practices focusing on infrastructure renewal to ensure operational costs and asset performance are optimized.	• Optimized practices across the organization • Responsible funding of infrastructure projects • Reduction in future infrastructure funding gaps

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Transportation Master Plan (TMP) Implementation	Implementation of the Transportation Master Plan, with connections to How We Grow, Go, Flow, the Water / Wastewater Master Servicing Plan and the Water / Wastewater Financial Sustainability Review. Establishment of clear policies to address active transportation, complete streets, multimodal road network, wayfinding, transportation demand and system management. Addressing transit, marine, rail, road, airport(s) and how these all integrate together.	• Enhance resident quality of life through pedestrian and cycling facilities, responsive and conventional transit and the creation of an integrated network of roads and highways • Transform the transportation network and the way people and goods move in the region and how transportation can contribute to a high quality of life
	Connective Transportation Initiatives: East - West Corridor, North - South Escarpment Crossing	Moving large scale connective transportation initiatives forward: Advocacy for the East-West Corridor, as a key link to the Niagara-Hamilton trade corridor, as proposed in the Transportation Master Plan. Movement on the North - South Escarpment project Environmental Assessment. Tying in with Smithville By-pass. Dealing with how we link Niagara differently, address congestion, and integrate the system. Each of these initiatives provide a strategic link between Niagara and the Greater Toronto and Hamilton Area (GTHA), incorporating multimodal freight terminals and transport networks to build capacity (trucking, marine, rail, airport). They are linked to tourism and foster diversification and economy of scale for both people and goods.	• Improve the efficiency and reliability of trade corridors through Niagara Region • Support goods movement • Ease congestion issue on QEW (a significant risk to tourism, agriculture and manufacturing sectors in Niagara)

HOW ELSE ARE WE ACHIEVING THIS?

Environmental Planning

New environmental planning team within the Planning and Development Services department, enabling a balance between Niagara's drive to be open for business with good environmental policies and planning.

Urban Design

Ensuring development projects include functional and attractive urban areas, creating a sense of place within the community.

Enhancements of Management Cycle of Pavements

Improving how the cycle of pavement maintenance is managed, including crack sealing patching and re-surfacing.

04 STRATEGIC PRIORITIES

SUSTAINABLE AND ENGAGING GOVERNMENT

A commitment to high quality, efficient, fiscally sustainable and coordinated core services through enhanced communication, partnerships and collaboration with the community.

Objective 4.1: High Quality, Efficient and Coordinated Core Services
Objective 4.2: Enhanced Communication
Objective 4.3: Fiscally Sustainable

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Communications Master Plan	Develop a framework to provide guidance around how Niagara Region will communicate and interact with residents, employees and stakeholders.	• Contribute to higher resident satisfaction in how Niagara Region is managed and governed • Increase transparency and two-way communication between Niagara Region and the public
	Government Relations Strategy	Development of a strategy focusing on what Niagara Region as an organization does, and how we engage other levels of government on advocacy, funding, policy opportunities and collaboration.	• Ensure an aligned approach to advocacy and funding requests to higher levels of government
	Regional Development Charges (RDC) by-law	Update of the Regional Development Charges (RDC) By-law to ensure we are collecting enough revenue to cover growth needs and tie into the Capital Finance Strategy. Re-align incentives for development to Council's strategic priorities.	• Collect growth-related revenue to support growth • Ensuring the infrastructure is in the ground to support and generate future growth
	Community Benefit Charge	Creation of a charge for community benefits in order to fund capital for soft services benefiting new development.	• Collect growth-related revenue to support growth • Align to Capital Finance Strategy and growth planning
	Grants and Incentives Review	Re-align Grants and Incentives program to address Council's key strategic issues such as affordable housing, brownfield remediation, and attracting higher wage jobs. As part of this review, creation of a development portal or application is being created to support expedited service.	• Allocating Council's limited grant dollars to where it matters most • Increase return on investment of grants and incentives • Expedite application and approvals process • Aligns with the Regional Development Charges (RDC) By-law

PRIORITY ALIGNMENT	PROJECT NAME	PROJECT OBJECTIVES	ANTICIPATED OUTCOMES
	Capital Financing Strategy	Balancing financial sustainability of renewal of existing assets and the needs of growth, aligned with asset management planning and growth strategies at Niagara Region.	• Moving towards full cost recovery • Long term commitment by Council to the implementation of the strategy
	Sustainability Review and Implementation	Identification of opportunities to re-purpose dollars towards replacement of infrastructure. Looking for lines of businesses we can do differently or divest of, and right-size funding of programs and services.	• Increased funding towards infrastructure projects through re-allocation of funding • Re-focus on Niagara Regional priorities
	Sponsorship Revenue Strategy and Policy	Identification of opportunities to increase revenue without increasing taxes. Policy development for sponsorship of Regional assets.	• Generate revenue • Identify opportunities for incremental revenue sources • Extending collaboration opportunities with Local Area Municipalities

HOW ELSE ARE WE ACHIEVING THIS?

Emergency Medical Services Transformation

Transforming the Emergency Medical system to be more accessible, available and affordable to meet the needs of residents. Providing the right service, at the right time, for the right cost. Enabling long term financial sustainability for the service by reducing transports to the emergency department, increasing collaboration with service providers, increasing accessibility and availability of resources. As this project reaches full launch, there will be ongoing monitoring of the success of this transformation.

Employee Engagement and Leadership Development

Driving productivity, employee commitment and attraction through a new People Strategy.

Economic Development Marketing Strategy

A framework for conducting targeted marketing activities to position Niagara as a competitive location for business investment.

Enterprise Content Management

An initiative to address gaps in records management activities and policies to ensure the organization has the documentation it requires to support transparency

Customer Service Implementation

Leveraging information and communication technology to modernize how Niagara Region delivers services and interacts with clients and residents.

A COMMITMENT TO ACHIEVING COUNCIL'S OBJECTIVES

To drive transparency and to support Council's commitment to the strategy, the Region commits to ongoing monitoring and evaluation of progress towards these objectives. The Region enables public transparency in two ways: through project progress reporting throughout the term of Council; and through the Region's public facing performance measurement dashboard which allows the public access to performance measures around key activities and influencing factors.

We invite you to follow the progress of the plan and view the performance dashboard through the Regional website at **niagararegion.ca/priorities**.

“However beautiful the strategy, you should occasionally look at the results”

— Sir Winston Churchill

Niagara Region

This report was prepared by Niagara Regional staff from the Internal Control and Organizational Performance division.

APPENDIX N2

Niagara Region Strategic Plan

Niagara Region

STRATEGIC PLAN 2019-2022

SHAPE NIAGARA

MESSAGE FROM THE CHAIR

On behalf of myself and the members of Niagara Regional Council, I am pleased to present Council's 2019-2022 Strategic Plan, Shape Niagara. The strategy sets the stage for the priorities we set and the decisions we make as a Council and an organization over the next four years. In developing this strategy, we heard from over 1500 participants from across Niagara. It was encouraging to see the common vision, interests and priorities across the community emerge, and then form the basis for this strategic plan.

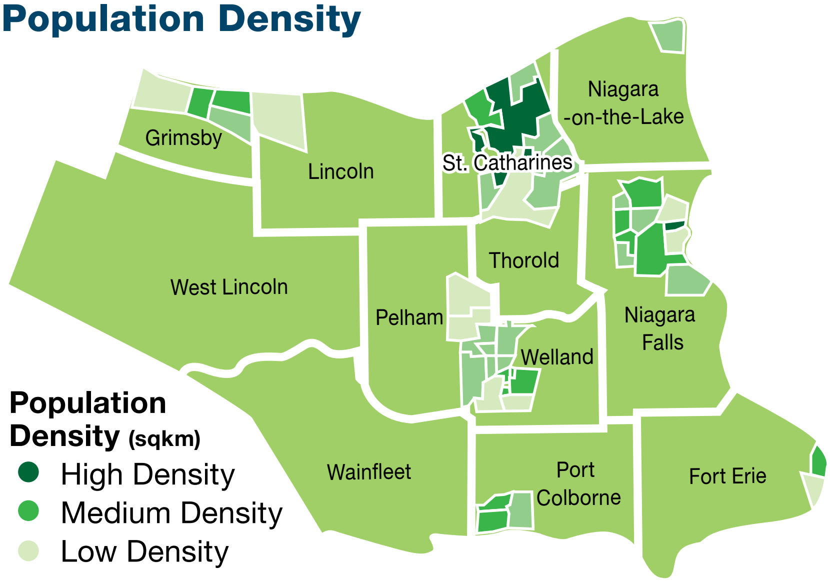
The strategic planning process has given us the opportunity to come together, and talk about what we value in the community, as well as identify what we would like to see change and improve. This plan identifies the immediate priorities and objectives that will help us accomplish both Council's and the community's vision for the future. It will be a valuable tool to guide Council and staff's decision-making processes, directing resources to where they will have the most impact in achieving our goals. As a Council, we are excited by this new strategy and the implementation plan that accompanies it, and we look forward to working together to build a Niagara that we can all be proud of.

Jim Bradley

Regional Chair Jim Bradley

NIAGARA AT A GLANCE

Population Density



Statistics Canada, Census (2016)

Employees

209,890

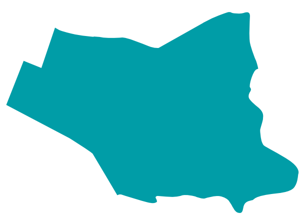
people employed in the labour force

80,000

projected new people employed by 2041

Municipal Comprehensive Review, Phase 4 Forecast (2018)

Tourism

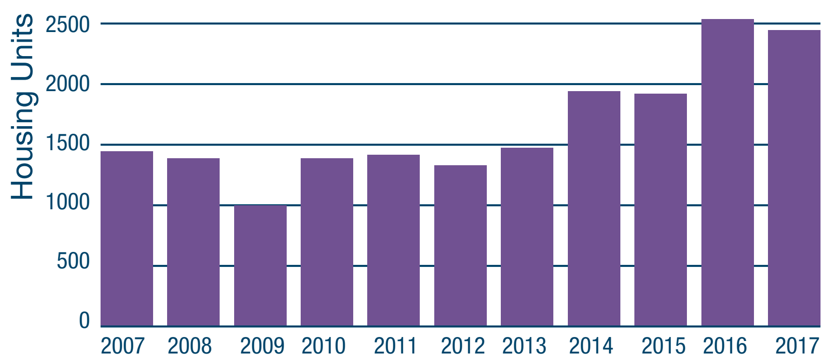


13,000,000

VISITORS TO NIAGARA

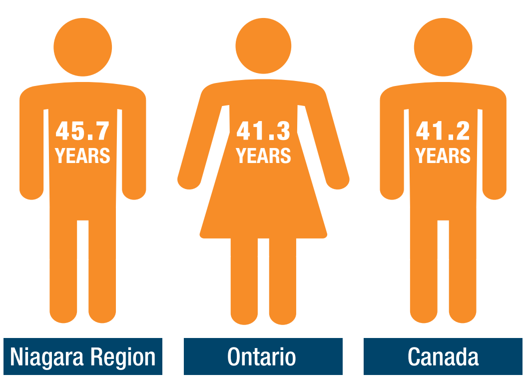
Ontario Ministry of Tourism (2016)

Housing Starts



Canada Mortgage and Housing Corporation, Housing Now Tables (2018)

Population's Median Age

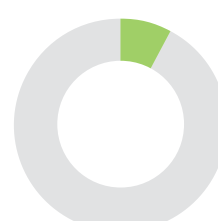


Statistics Canada, Median Age (2016)

Cost of Living

Family of four in 2017

$71,294



8.9%

Increase in just one year

Niagara Poverty Reduction Network (2017)

INTRODUCTION

The purpose of a strategic plan is to guide the work of the organization over a four year period, to shape a new direction for Niagara as a community and an organization. Niagara Regional Council set strategic directions focused on services provided at the Regional government level, bringing attention to the areas which require more immediate and focused attention.

Creating the Plan: The Voice of the Community

This strategic plan was informed by an extensive community engagement initiative that captured the priorities identified by Niagara's residents, businesses, organizations and local area municipalities. Over 1,500 of Niagara's community members contributed to the creation of this strategic plan by participating and sharing their ideas in-person and online. An overview of the initiative and full summary of the community's input can be found in the report titled "Shape Niagara – What We've Heard". The strategy was also informed by a current state analysis of Niagara, as captured in the report titled "Shape Niagara – Setting the Stage for Strategy". Both reports can be found at **niagararegion.ca/priorities**.

What a Strategic Plan Means to Niagara

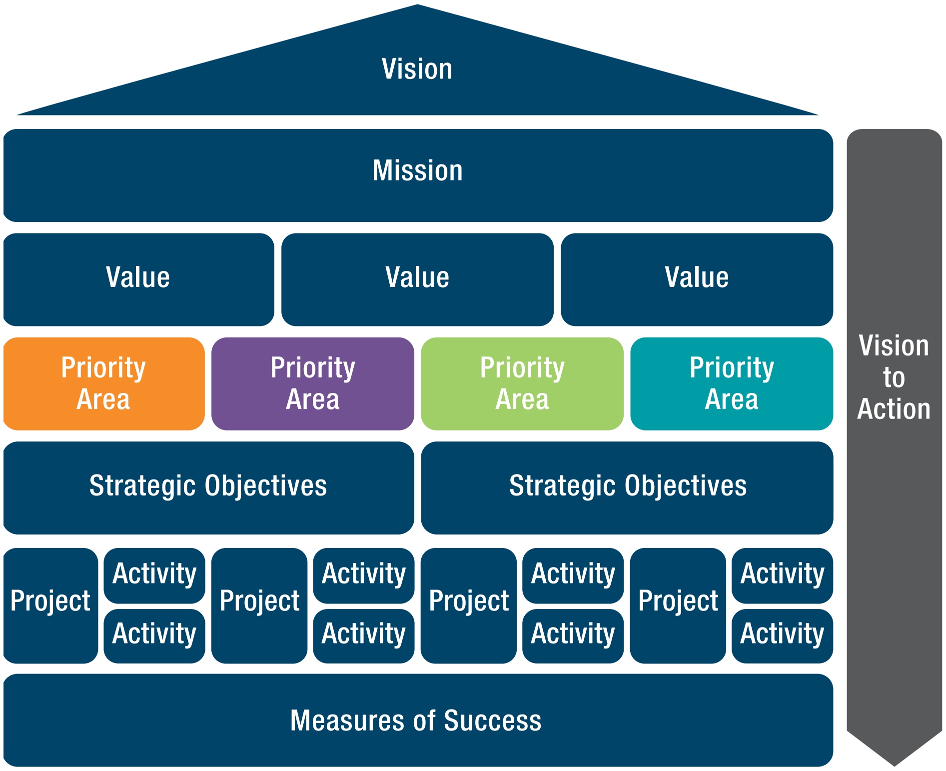
A strategic plan is an important document that underpins all of the work the Region will set out to achieve over the next four years. It is focused in its intent, aligned with the mandate of services provided at this level of government, and set up in a way to act as a motivation to work together to achieve something great.

Members of Niagara Regional Council came together to create this plan, informed by the community's input, with an understanding that for municipal government, a strategy is the basis for aligning the work of the organization with the priorities of Council. It is about solving the right problems, to deliver value to the residents of Niagara by demonstrating transparency and accountability.

The strategic plan references many other important and directional documents at the Region, such as Niagara's Transportation Master Plan, and the work going on to update the Official Plan. It will serve to inform new plans such as the Community Safety and Well-Being Plan. These strategic documents are also developed with significant time and input from Niagara's residents, as they reflect on what they envision for the future of Niagara, and the path to get us there.

VISION TO ACTION

A strategic framework serves to provide structure to this type of long-term planning by focusing on key elements: Vision, Mission, Corporate Values, Priority areas of focus and the Objectives that identify what we hope to achieve. The Implementation Plan that accompanies this strategy, consists of the actions and projects that we will undertake to meet those objectives. The following framework is the basis of this 2019-2022 Council Strategic Plan:



Following this framework, Niagara Regional Council refreshed their Vision, Missions and Values for Niagara as a community and organization, as well as identified four priority areas of focus, and the objectives for each that define how we might achieve progress on these priorities.

VISION, MISSION CORPORATE VALUES

VISION

Niagara Region is a mosaic of diverse communities. We strive to achieve a prosperous, safe and inclusive community that embraces our natural spaces and promotes holistic wellbeing and quality of life.

MISSION

Niagara Region will serve its residents, businesses and tourists through collaborative leadership, responsible policy and the provision of effective and efficient community-focused services, while maintaining environmental and economic sustainability.

CORPORATE VALUES

Equity
Inclusive, acting with compassion for the community

Innovation and Continuous Improvement
Striving to improve through innovation, not limitation

Integrity
Behaving ethically, and acting with respect, accountability and trust

Stewardship
Working to consider long term consequences of actions, think broadly across issues and act responsibly

Foster Partnerships
Building partnerships to leverage resources and talents

OUR STRATEGIC PRIORITIES

01 SUPPORTING BUSINESSES AND ECONOMIC GROWTH

A coordinated approach to fostering economic growth in Niagara

02 HEALTHY AND VIBRANT COMMUNITY

Foster a high quality of life through safe, healthy, and inclusive neighbourhoods through the delivery of quality, affordable and accessible human services

03 RESPONSIBLE GROWTH AND INFRASTRUCTURE PLANNING

Sustainable investments in transportation, transit and infrastructure, while aligning infrastructure planning with preservation of the natural environment

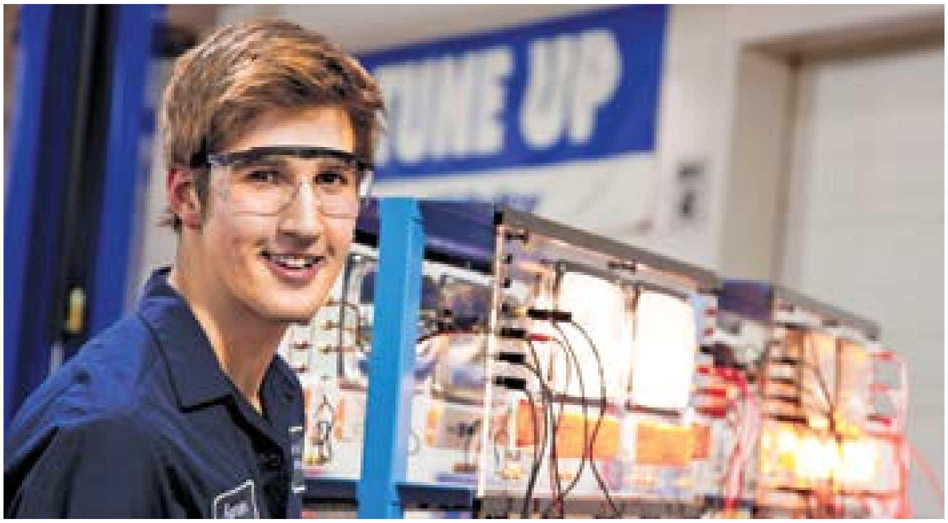
04 SUSTAINABLE AND ENGAGING GOVERNMENT

A commitment to high quality, efficient, fiscally sustainable and coordinated core services through enhanced communication, partnerships and collaborations with the community

01 STRATEGIC PRIORITIES

SUPPORTING BUSINESSES AND ECONOMIC GROWTH

A coordinated approach to fostering economic growth in Niagara.



Objective 1.1: Economic Growth and Development

- Enhance integration with local area municipalities' economic development and planning departments to provide supports and improve interactions with businesses to expedite and navigate development processes
- Forward thinking approach to economic development in Niagara through long term strategic planning and leveraging partnerships with post-secondary institutions

Objective 1.2: Support Retention and Development of a Skilled Labour Force

- Partner with all levels of education, private sector businesses and industry associations to advocate for skilled trade labour to address the workforce gap
- Explore the development of a regional talent network, and develop an advanced manufacturing workforce strategy for Niagara

Objective 1.3: Collaborative Approach to Business Growth and Retention

- Work collaboratively with local area municipalities to connect with existing businesses proactively to achieve long term economic success
- Work collaboratively with community organizations, post-secondary institutions and businesses to support research and technology facilities in the region that foster new business start-up opportunities

Objective 1.4: Strategically Target Industry Sectors

- Define Niagara's role in tourism including areas such as sport, eco, agricultural and culture tourism
- Through advocacy and collaboration with Tourism Partnership of Niagara, encourage visitors to spend more and stay longer, using an inclusive approach across all areas of the region
- Foster opportunities to drive economic diversity through value-add sectors such as agri-business

02 STRATEGIC PRIORITIES

HEALTHY AND VIBRANT COMMUNITY

Foster a high quality of life through safe, inclusive neighbourhoods and delivery of quality, affordable and accessible human services.

Objective 2.1: Enhance Community Wellbeing

- Foster safe and inclusive neighbourhoods and communities tied to a larger strategic Community Safety and Wellbeing strategy
- Drive positive and healthy early childhood education and experiences through the delivery of high quality and affordable child care services
- Increase the capacity of long-term care across the region to meet the needs of the aging population

Objective 2.2: Mental Health and Wellbeing

- Support the health and wellbeing of the community by facilitating and advocating for access and timeliness of mental health services for all residents

Objective 2.3: Addressing Affordable Housing Needs

- Retain, protect and increase the supply of affordable housing stock to provide a broad range of housing to meet the needs of the community
- Support clients through the stages of the housing continuum, towards more stable and permanent housing

03 STRATEGIC PRIORITIES

RESPONSIBLE GROWTH AND INFRASTRUCTURE PLANNING

Sustainable investments in transportation, transit and infrastructure, while aligning infrastructure planning with preservation of the natural environment.

Objective 3.1: Advancing Regional Transit and GO Rail Services

- Advance and advocate for Niagara's effort towards integrated and efficient conventional, specialized and higher order transit, enabling seamless and connective travel for all people throughout Niagara and the Greater Toronto and Hamilton Area (GTHA)

Objective 3.2: Environmental Sustainability and Stewardship

- A holistic and flexible approach to environmental stewardship and consideration of the natural environment, such as in infrastructure, planning and development, aligned with a renewed Official Plan
- Drive environmental protection and addressing climate change such as through increasing waste diversion rates and reducing our carbon footprint

Objective 3.3: Maintain Existing Infrastructure

- Sound asset management planning to ensure sustainable investments in the infrastructure needed to support existing residents and businesses, as well as future growth in Niagara

Objective 3.4: Facilitating the Movement of People and Goods

- Commitment to the implementation of Niagara's Transportation Master Plan, creating an integrated network of roads and highways for the movement of people and goods
- Advocate and support for Niagara's transportation projects, safe and healthy streets supporting active transportation, and opportunities in rail

04 STRATEGIC PRIORITIES

SUSTAINABLE AND ENGAGING GOVERNMENT

A commitment to high quality, efficient, fiscally sustainable and coordinated core services through enhanced communication, partnerships and collaboration with the community.

Objective 4.1: High Quality, Efficient and Coordinated Core Services

- Promote an organizational culture that values continuous improvement, collaboration, and innovation
- Explore cost-efficiencies through coordinated service delivery and collaboration with local area municipalities
- Commit to customer focused services, improving access such as through digital and online service delivery
- Drive evidence informed decisions by building staff skills and capacity, and by making information and data accessible across the organization

Objective 4.2: Enhanced Communication

- Increase public knowledge through education and promotion of Regional programs and services, initiatives and priorities. Focus on clear and consistent communication on Regional budget, activities and successes, in a simplified manner
- Strive to be inclusive and increase the reach of communications with the community and explore best practice multi-media approaches

Objective 4.3: Fiscally Sustainable

- Build an adaptive environment that employs leading business practices, such as asset management, to foster financial stability in delivering critical infrastructure and services
- Explore opportunities for driving new revenues and generating business

COMMITMENT TO ACTION

Implementation Plan

A strategic plan has no true value without an action plan to implement the goals and objectives that it identifies. In order to move these strategic priorities forward, specific projects, initiatives and actions will be identified for the term of Council to achieve the objectives. It is important to note that these projects and initiatives are not intended to be an inclusive list of everything the Region does as core services. The implementation plan identifies new or ongoing initiatives that the organization needs to focus on specifically to enact Council's priorities. They will ensure the Region is meeting the current and most immediate needs of the community, as identified through the strategic planning process.

The 2019 – 2022 Council Strategic Plan, the background reports that informed this strategy, the Implementation Plan, and the public-facing performance measures dashboard will be made available on the Region's website. We invite you to follow the progress of the plan and view the performance dashboard through the Regional website at **niagararegion.ca/priorities**.

"You cannot be everything to everyone. If you decide to go north, you cannot go south at the same time."

— Jeroen De Flanderl

Niagara Region

This report was prepared by Niagara Regional staff from the Internal Control and Organizational Performance division.