Lakefront Utilities Inc.

2022 Cost of Service Application

EB-2021-0039

Rates Effective: January 1, 2022

Date Filed: April 30, 2021

Lakefront Utilities Inc.
207 Division St.
P.O. Box 577
Cobourg, ON
K9A 4L3

EXHIBIT 2 – RATE BASE

EB-2021-0039

Table of Contents

2.2.1 RATE BASE

As outlined in Exhibit 1, LUI has adopted Modified International Financial Reporting Standards (MIFRS). The rate base value presented within this Application have been reported using this methodology.

The net fixed assets used to determine rate base includes distribution assets only. Controllable expenses for the purpose of the working capital calculation in Section 2.3 include operations and maintenance, billing and collecting and administration expenses, all of which are discussed in detail in Exhibit 4. LUI has applied the 7.5% default working capital allowance in accordance with the OEB letter dated June 3, 2015, Allowance for Working Capital for Electricity Distribution Rate Applications.

LUI has calculated its 2022 test year rate base to be $23,132,083. This rate base has also been used to determine the proposed revenue requirement found in Exhibit 6. Table 2.0 below represents LUI's Rate Base calculations for the Test Year.

Table 2.0: 2022 Rate Base

Rate Base and Working Capital Allowance		
Particulars	**Test Year 2022 (MIFRS)**	
Opening Balance	19,991,980	
Ending Balance	20,850,030	
Average Balance		$20,421,005
Allowance for Working Capital		**$2,711,078**
Total Rate Base		**$23,132,083**

Expenses for Working Capital	
Particulars	**Test Year 2022 (MFRS)**
Distribution Expenses - Operation	707,393
Distribution Expenses - Maintenance	312,541
Billing and Collecting	580,283
Community Relations	19,757
Administrative and General Expenses	1,199,520
Taxes other than Income Taxes	58,058
Sub-account LEAP Funding	6,213
Total Eligible Distribution Expenses	**2,883,765**
Power Supply Expenses	33,263,943
Total Expenses for Working Capital	**36,147,708**
Working Capital Factor	7.50%
Total Working Capital Allowance	**2,711,078**

2.2.1.1 OVERVIEW

Table 2.1 below presents Lakefront's Rate Base calculations for all required years include the 2022 Test Year.

Table 2.1: Rate Base Trend

Particulars	MIFRS Last Board Approved	MIFRS 2017	MIFRS 2018	MIFRS 2019	MIFRS 2020	MIFRS 2021	MIFRS 2022
Net Capital Assets in Service:							
Opening Balance	16,703,034	17,272,610	18,909,049	18,728,285	18,832,227	19,577,033	19,991,980
Ending Balance	17,272,610	18,909,049	18,728,285	18,832,227	19,577,033	19,991,980	20,850,030
Average Balance	16,987,822	18,090,830	18,818,667	18,780,256	19,204,630	19,784,507	20,421,005
Working Capital Allowance	2,552,431	2,361,003	2,141,376	2,416,004	2,692,507	2,648,983	2,711,078
Total Rate Base	**19,540,253**	**20,451,833**	**20,960,043**	**21,196,261**	**21,897,138**	**22,433,489**	**23,132,083**

Expenses for Working Capital	CGAAP Last Board Approved	CGAAP 2017	CGAAP 2018	CGAAP 2019	NEWGAAP 2020	NEWGAAP 2021	NEWGAAP 2022
Eligible Distribution Expenses:							
3500-Distribution Expenses - Operation	525,404	574,731	646,650	680,237	753,224	667,624	707,393
3550-Distribution Expenses - Maintenance	195,787	260,745	343,942	305,444	304,062	307,241	312,541
3650-Billing and Collecting	566,316	572,056	489,721	531,084	554,625	562,378	580,283
3700-Community Relations	20,219	15,276	21,564	16,141	17,215	19,474	19,757
3800-Administrative and General Expenses	1,058,304	961,070	1,103,498	1,086,604	1,057,725	1,127,745	1,199,520
6105-Taxes other than Income Taxes	62,359	59,800	57,970	56,399	55,042	57,200	58,058
6205-Sub-account LEAP Funding	5,850	5,988	5,900	5,850	5,850	5,850	6,213
Total Eligible Distribution Expenses	2,434,239	2,449,667	2,669,245	2,681,758	2,747,743	2,747,511	2,883,765
3350-Power Supply Expenses	31,598,177	29,030,375	25,882,435	29,531,634	33,152,355	32,572,257	33,263,943
Total Expenses for Working Capital	34,032,416	31,480,042	28,551,680	32,213,392	35,900,098	35,319,768	36,147,708
Working Capital factor	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Total Working Capital	**2,552,431**	**2,361,003**	**2,141,376**	**2,416,004**	**2,692,507**	**2,648,983**	**2,711,078**

RATE BASE VARIANCE ANALYSIS

The following paragraphs and Table 2.2 – 2017 BA to 2017 Actual to Table 2.7 – 2021-2022 Rate Base Variances provide a narrative on the changes that have driven the increase in rate base since LUI's 2017 Board Approved Cost of Service Application.

As outlined in Exhibit #1, LUI's materiality threshold is $50,000.

LUI has provided the following variances on the change in Rate Base:

1. 2017 Actual (MIFRS) against 2017 Board Approved (MIFRS).
2. 2018 Actual (MIFRS) against 2017 Actual (MIFRS).
3. 2019 Actual (MIFRS) against 2018 Actual (MIFRS).
4. 2020 Actual (MIFRS) against 2019 Actual (MIFRS).
5. 2021 Bridge Year (MIFRS) against 2020 Actual (MIFRS).
6. 2022 Test Year (MIFRS) against 2021 Bridge Year (MIFRS).

Table 2.2: 2017 Actual to 2017 Board Approved Rate Base Variance

	MIFRS			
Particulars	**2017**	**Last Board Approved**	**Variance**	**%**
Net Capital Assets in Service:				
Opening Balance	17,272,610	16,703,034	569,576	3.41%
Ending Balance	18,909,049	17,272,610	1,636,439	9.47%
Average Balance	18,090,830	16,987,822	1,103,008	6.49%
Working Capital Allowance	2,361,003	2,552,431	(191,428)	(7.50%)
Total Rate Base	**20,451,833**	**19,540,253**	**911,580**	**4.67%**

Expenses for Working Capital	MIFRS			
Eligible Distribution Expenses:	**2017**	**Last Board Approved**	**Variance**	**%**
3500-Distribution Expenses - Operation	574,731	525,404	49,327	9.39%
3550-Distribution Expenses - Maintenance	260,745	195,787	64,959	33.18%
3650-Billing and Collecting	572,056	566,316	5,740	1.01%
3700-Community Relations	15,276	20,219	(4,943)	(24.45%)
3800-Administrative and General Expenses	961,069	1,058,304	(97,235)	(9.19%)
6105-Taxes other than Income Taxes	59,800	62,359	(2,559)	(4.10%)
6205-Sub-account LEAP Funding	5,988	5,850	138	2.35%
Total Eligible Distribution Expenses	2,449,666	2,434,239	15,427	0.63%
3350-Power Supply Expenses	29,030,375	31,598,177	(2,567,802)	(8.13%)
Total Expenses for Working Capital	31,480,041	34,032,416	(2,552,375)	(7.50%)
Working Capital factor	7.50%	7.50%	0	0.00%
Total Working Capital	**2,361,003**	**2,552,431**	**(191,428)**	**(7.50%)**

The total Rate Base in 2017 of $20,451,833 was $911,580 or 4.67% greater than 2017 Board Approved. The main reason for the variances are:

1. Total capital additions in 2017 was $2,157,652 compared to $1,599,590 Board Approved. Further, the 2016 additions were $2,961,424 compared to $1,692,800 as indicated in the 2017 Cost of Service Application. Additional analysis is provided in section 2.2.2.2.

2. Eligible distribution expenses increased by $15,427 which is immaterial.

3. The decrease in power supply expenses of $2,567,802 is primarily due to a decrease in power purchased of $1,860,771. The decrease is consistent with the decrease in kWh usage in 2017 compared to 2017 Board Approved. The 2017 Board Approved kWh usage was 241,290,276 in 2017 compared to actual usage of 228,612,532 kWh, a decrease of approximately 5%. Further, the rate used to calculate the power supply in the 2017 Cost of Service was $0.1069 ($/kWh) compared to the average global adjustment rate of $0.1005 ($/kWh).

Table 2.3: 2018 Actual to 2017 Actual Rate Base Variance

	MIFRS			
Particulars	**2018**	**2017**	**Variance**	**%**
Net Capital Assets in Service:				
Opening Balance	18,909,049	17,272,610	1,636,439	9.47%
Ending Balance	18,728,285	18,909,049	(180,764)	(0.96%)
Average Balance	18,818,667	18,090,830	727,838	4.02%
Working Capital Allowance	2,141,376	2,361,003	(219,627)	(9.30%)
Total Rate Base	**20,960,043**	**20,451,833**	**508,211**	**2.48%**

Expenses for Working Capital	MIFRS			
Eligible Distribution Expenses:	**2018**	**2017**	**Variance**	**%**
3500-Distribution Expenses - Operation	646,650	574,731	71,919	12.51%
3550-Distribution Expenses - Maintenance	343,942	260,745	83,197	31.91%
3650-Billing and Collecting	489,721	572,056	(82,335)	(14.39%)
3700-Community Relations	21,564	15,276	6,288	41.16%
3800-Administrative and General Expenses	1,103,498	961,069	142,428	14.82%
6105-Taxes other than Income Taxes	57,970	59,800	(1,830)	(3.06%)
6205-Sub-account LEAP Funding	5,900	5,988	(88)	(1.46%)
Total Eligible Distribution Expenses	2,669,245	2,449,666	219,579	8.96%
3350-Power Supply Expenses	25,882,435	29,030,375	(3,147,940)	(10.84%)
Total Expenses for Working Capital	28,551,680	31,480,041	(2,928,361)	(9.30%)
Working Capital factor	7.5%	7.5%	-	0.00%
Total Working Capital	**2,141,376**	**2,361,003**	**(219,627)**	**(9.30%)**

The total Rate Base in 2018 of $20,960,043 was $508,211 or 2.48% greater than 2017. The main reason for the variances are:

1. Average net capital asset balance increased from 2017 as a result of 2018 additions ($831,076) less 2018 amortization ($1,011,840).

2. Total eligible distribution expenses increased by $219,579 which is detailed further in Exhibit #4.

3. The decrease in power supply expenses of $3,147,940 is primarily due to a decrease in power purchased of $3,278,042. The power purchases is influenced by the global adjustment rate and the 2018 average rate decreased from 2017 by 8.70%, consistent with the overall decrease in power supply expense of 10.84%.

Table 2.4: 2019 Actual to 2018 Actual Rate Base Variance

	MIFRS			
Particulars	**2019**	**2018**	**Variance**	**%**
Net Capital Assets in Service:				
Opening Balance	18,728,285	18,909,049	(180,764)	(0.96%)
Ending Balance	18,832,227	18,728,285	103,942	0.55%
Average Balance	18,780,256	18,818,667	(38,411)	(0.20%)
Working Capital Allowance	2,416,004	2,141,376	274,628	12.82%
Total Rate Base	**21,196,260**	**20,960,043**	**236,217**	**1.13%**

Expenses for Working Capital	MIFRS			
Eligible Distribution Expenses:	**2019**	**2018**	**Variance**	**%**
3500-Distribution Expenses - Operation	680,237	646,650	33,587	5.19%
3550-Distribution Expenses - Maintenance	305,444	343,942	(38,498)	(11.19%)
3650-Billing and Collecting	531,084	489,721	41,362	8.45%
3700-Community Relations	16,141	21,564	(5,423)	(25.15%)
3800-Administrative and General Expenses	1,086,604	1,103,498	(16,894)	(1.53%)
6105-Taxes other than Income Taxes	56,399	57,970	(1,571)	(2.71%)
6205-Sub-account LEAP Funding	5,850	5,900	(50)	(0.85%)
Total Eligible Distribution Expenses	2,681,758	2,669,245	12,513	0.47%
3350-Power Supply Expenses	29,531,634	25,882,435	3,649,199	14.10%
Total Expenses for Working Capital	32,213,392	28,551,680	3,661,712	12.82%
Working Capital factor	7.50%	7.50%	0	0.00%
Total Working Capital	**2,416,004**	**2,141,376**	**274,628**	**12.82%**

The total Rate Base in 2019 of $21,196,260 was $236,217 or 1.13% greater than 2018. The main reason for the variances are:

1. Average net capital asset balance increased from 2018 as a result of 2019 additions ($1,121,065) less 2019 amortization ($1,017,124).

2. Total eligible distribution expenses increased by $12,513 which is immaterial.

3. The increase in power supply expenses of $3,649,199 is primarily due to an increase of $3,985,894 in power purchased. Similar to the decrease in from 2018 to 2017, the average global adjustment rate in 2019 increased by 18.99%. The remaining decrease was due to a decrease in both Network Charges and Connection charges, the result of a decrease in rates in 2019.

Table 2.5: 2020 Actual to 2019 Actual Rate Base Variance

	MIFRS			
Particulars	**2020**	**2019**	**Variance**	**%**
Net Capital Assets in Service:				
Opening Balance	18,832,227	18,728,285	103,942	0.55%
Ending Balance	19,577,033	18,832,227	744,806	3.95%
Average Balance	19,204,630	18,780,256	424,374	2.26%
Working Capital Allowance	2,692,507	2,416,004	276,503	11.44%
Total Rate Base	**21,897,137**	**21,196,260**	**700,877**	**3.31%**

Expenses for Working Capital	MIFRS			
Eligible Distribution Expenses:	**2020**	**2019**	**Variance**	**%**
3500-Distribution Expenses - Operation	753,224	680,237	72,987	10.73%
3550-Distribution Expenses - Maintenance	304,062	305,444	(1,382)	(0.45%)
3650-Billing and Collecting	554,625	531,084	23,541	4.43%
3700-Community Relations	17,215	16,141	1,074	6.65%
3800-Administrative and General Expenses	1,057,725	1,086,604	(28,879)	(2.66%)
6105-Taxes other than Income Taxes	55,042	56,399	(1,357)	(2.41%)
6205-Sub-account LEAP Funding	5,850	5,850	0	0.00%
Total Eligible Distribution Expenses	2,747,743	2,681,758	65,985	2.46%
3350-Power Supply Expenses	33,152,355	29,531,634	3,620,721	12.26%
Total Expenses for Working Capital	35,900,098	32,213,392	3,686,706	11.44%
Working Capital factor	7.50%	7.50%	0	0.00%
Total Working Capital	**2,692,507**	**2,416,004**	**276,503**	**11.44%**

The total Rate Base in 2020 of $21,897,137 was $700,877 or 3.31% greater than 2019. The main reason for the variances are:

1. Average net capital asset balance increased from 2019 as a result of 2020 additions ($1,840,532) less 2020 amortization ($1,095,725).

2. Total eligible distribution expenses increased by $65,985 and is detailed further in Exhibit #4.

3. The increase in power supply expenses of $3,620,721 is primarily due to changes in power purchased of $3,433,278. The increase in power purchases is consistent with the increased average global adjustment rate of 9.56%. The remaining increase was due to an increase in both Network Charges and Connection charges, the result of an increase in 2020.

Table 2.6: 2021 Bridge Year to 2020 Actual Rate Base Variance

	MIFRS			
Particulars	**2021**	**2020**	**Variance**	**%**
Net Capital Assets in Service:				
Opening Balance	19,577,033	18,832,227	744,806	3.95%
Ending Balance	19,991,980	19,577,033	414,947	2.12%
Average Balance	19,784,507	19,204,630	579,877	3.02%
Working Capital Allowance	2,648,983	2,692,507	(43,524)	(1.62%)
Total Rate Base	**22,433,490**	**21,897,137**	**536,353**	**2.45%**

Expenses for Working Capital	MIFRS			
Eligible Distribution Expenses:	**2021**	**2020**	**Variance**	**%**
3500-Distribution Expenses - Operation	667,624	753,224	(85,600)	(11.36%)
3550-Distribution Expenses - Maintenance	307,241	304,062	3,178	1.05%
3650-Billing and Collecting	562,378	554,625	7,753	1.40%
3700-Community Relations	19,474	17,215	2,259	13.12%
3800-Administrative and General Expenses	1,127,745	1,057,725	70,020	6.62%
6105-Taxes other than Income Taxes	57,200	55,042	2,158	3.92%
6205-Sub-account LEAP Funding	5,850	5,850	0	0.00%
Total Eligible Distribution Expenses	2,747,511	2,747,743	(232)	(0.01%)
3350-Power Supply Expenses	32,572,257	33,152,355	(580,098)	(1.75%)
Total Expenses for Working Capital	35,319,768	35,900,098	(580,330)	(1.62%)
Working Capital factor	7.50%	7.50%	0.00%	0.00%
Total Working Capital	**2,648,983**	**2,692,507**	**(43,524)**	**(1.62%)**

The total Rate Base in 2021 of $22,433,490 is forecast to be $536,353 or 2.45% greater than 2020. The main reason for the variances are:

1. Average net capital asset balance increased from 2020 as a result of forecast 2021 additions ($1,562,500) less 2021 amortization ($1,096,728).

2. Total eligible distribution expenses decreased by $232 which is immaterial.

3. The decrease in power supply expenses of $580,098 is primarily due to a decrease in power purchased of $818,836, the result of a projected decrease in consumption of a approximately 1.00%.

Table 2.7: 2022 Test Year to 2021 Bridge Year Rate Base Variance

	MIFRS			
Particulars	**2022**	**2021**	**Variance**	**%**
Net Capital Assets in Service:				
Opening Balance	19,991,980	19,577,033	414,947	2.12%
Ending Balance	20,850,030	19,991,980	858,050	4.29%
Average Balance	20,421,005	19,784,507	636,498	3.22%
Working Capital Allowance	2,711,078	2,648,983	62,095	2.34%
Total Rate Base	**23,132,083**	**22,433,490**	**698,593**	**3.11%**

Expenses for Working Capital	MIFRS			
Eligible Distribution Expenses:	**2022**	**2021**	**Variance**	**%**
3500-Distribution Expenses - Operation	707,393	667,624	39,769	5.96%
3550-Distribution Expenses - Maintenance	312,541	307,241	5,301	1.73%
3650-Billing and Collecting	580,283	562,378	17,905	3.18%
3700-Community Relations	19,757	19,474	283	1.45%
3800-Administrative and General Expenses	1,199,520	1,127,745	71,775	6.36%
6105-Taxes other than Income Taxes	58,058	57,200	858	1.50%
6205-Sub-account LEAP Funding	6,213	5,850	363	6.21%
Total Eligible Distribution Expenses	2,883,765	2,747,511	136,254	4.96%
3350-Power Supply Expenses	33,263,943	32,572,257	691,687	2.12%
Total Expenses for Working Capital	36,147,708	35,319,768	827,940	2.34%
Working Capital factor	7.50%	7.50%	0	0.00%
Total Working Capital	**2,711,078**	**2,648,983**	**62,095**	**2.34%**

The total Rate Base in 2022 of $23,132,083 is forecast to be $698,593 or 3.11% greater than 2021. The main reason for the variances are:

1. Average net capital asset balance increases from 2021 as a result of forecast 2022 additions ($1,860,000) less 2022 amortization ($1,001,950).

2. Total eligible distribution expenses increased by $136,254 which is documented in Exhibit #4.

3. The increase in power supply expenses of $691,687 which is due to fluctuations in customer usage.

FIXED ASSET CONTINUITY SCHEDULES

This schedule presents a continuity schedule LUI's investment in capital assets, the associated accumulated amortization and the net book value for each capital USoA account for 2017 to 2020 Actuals, 2021 Bridge Year, and 2022 Test Year. The opening and closing balances of gross assets and accumulated depreciation correspond to the fixed asset continuity statements. The net book value balances, excluding work in progress, are the balances included in the rate base calculation.

LUI attests that the OEB Appendices 2-BA continuity statements presented at the next page reconcile with the calculated depreciation expense under Exhibit 4 – Operating Costs and presented by asset account. LUI also attests that the net book value balances reported on Appendix 2-BA and balances reconcile with the rate base calculation. An Excel workbook containing fixed asset continuity schedule and depreciation and amortization expense schedules (i.e. OEB Appendices 2-BA and 2-C) is filed in conjunction with this application, separate from the remainder of the Chapter 2 Appendices. LUI has not applied for an ACM or ICM in the years between its 2017 Cost of Service and this application.

Information on year-over-year variances and explanation where variances are greater than the materiality threshold are summarized in Table 2.28 to Table 2.33, with detailed project spending by year included in OEB Appendix 2-AA and additional information provided in the DSP, included as Appendix A.

LUI does not have any Asset Retirement Obligations related to decommissioning or asset retirement obligations.

Table 2.8: 2017 Fixed Asset Continuity Schedule

Year 2017 CGAAP - with changes to policies

			Cost				Accumulated Depreciation				
CCA Class	OEB	Description	Opening Balance	Additions	Disposals	Closing Balance	Opening Balance	Additions	Disposals	Closing Balance	Net Book Value
12	1611	Computer Software (Formally known as Account 1925)	$ 677,113	$ -	$ -	$ 677,113	$ 480,787	$ 79,904	$ -	$ 560,691	$ 116,422
CEC	1612	Land Rights (Formally known as Account 1906 and 1806)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N/A	1805	Land	$ 219,284	$ -	$ -	$ 219,284	$ -	$ -	$ -	$ -	$ 219,284
47	1808	Buildings	$ 1,233,492	$ 24,811	$ -	$ 1,258,303	$ 272,654	$ 31,526	$ -	$ 304,180	$ 954,123
13	1810	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1815	Transformer Station Equipment >50 kV	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1820	Distribution Station Equipment <50 kV	$ 4,487,132	$ 889,463	$ -	$ 5,376,595	$ 1,962,604	$ 95,944	$ -	$ 2,058,548	$ 3,318,046
47	1825	Storage Battery Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 2,798,688	$ 481,275	$ -	$ 3,279,963	$ 456,884	$ 74,153	$ -	$ 531,037	$ 2,748,926
47	1835	Overhead Conductors & Devices	$ 6,211,670	$ 303,421	$ -	$ 6,515,092	$ 1,532,404	$ 91,142	$ -	$ 1,623,546	$ 4,891,546
47	1840	Underground Conduit	$ 1,122,678	$ 1,854	$ -	$ 1,124,532	$ 334,042	$ 30,141	$ -	$ 364,183	$ 760,349
47	1845	Underground Conductors & Devices	$ 3,734,216	$ 37,284	$ -	$ 3,771,500	$ 2,372,787	$ 92,791	$ -	$ 2,465,578	$ 1,305,922
47	1850	Line Transformers	$ 5,931,572	$ 246,488	$ -	$ 6,178,060	$ 3,158,584	$ 165,051	$ -	$ 3,323,635	$ 2,854,425
47	1855	Services (Overhead & Underground)	$ 1,066,172	$ 170,642	$ -	$ 1,236,815	$ 240,242	$ 29,763	$ -	$ 270,005	$ 966,810
47	1860	Meters			$ -	$ -		$ -	$ -	$ -	$ -
47	1860	Meters (Smart Meters)	$ 2,334,752	$ 100,197	$ -	$ 2,434,948	$ 660,237	$ 159,594	$ -	$ 819,831	$ 1,615,117
N/A	1905	Land	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1908	Buildings & Fixtures	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
13	1910	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 107,326	$ -	$ -	$ 107,326	$ 61,100	$ 10,442	$ -	$ 71,542	$ 35,784
8	1915	Office Furniture & Equipment (5 years)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	1920	Computer Equipment - Hardware	$ 151,023	$ 32,115	$ -	$ 183,138	$ 97,182	$ 23,233	$ -	$ 120,415	$ 62,723
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
45.1	1920	Computer Equip.-Hardware(Post Mar. 19/07)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	1930	Transportation Equipment	$ 1,526,739	$ 40,795	$ -	$ 1,567,534	$ 925,469	$ 188,250	$ -	$ 1,113,719	$ 453,815
8	1935	Stores Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1940	Tools, Shop & Garage Equipment	$ 616,397	$ 6,842	$ -	$ 623,239	$ 283,665	$ 57,906	$ -	$ 341,571	$ 281,669
8	1945	Measurement & Testing Equipment	$ 22,346	$ -	$ -	$ 22,346	$ 13,448	$ 2,225	$ -	$ 15,673	$ 6,673
8	1950	Power Operated Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1955	Communications Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1955	Communication Equipment (Smart Meters)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1960	Miscellaneous Equipment	$ 350,548	$ -	$ -	$ 350,548	$ 40,361	$ 35,001	$ -	$ 75,362	$ 275,186
47	1970	Load Management Controls Customer Premises	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1975	Load Management Controls Utility Premises	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1980	System Supervisor Equipment	$ 337,130	$ 24,891	$ -	$ 362,022	$ 44,395	$ 17,479	$ -	$ 61,874	$ 300,148
47	1985	Miscellaneous Fixed Assets	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1990	Other Tangible Property	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1995	Contributions & Grants	-$ 3,122,796	-$ 202,427	$ -	-$ 3,325,223	-$ 950,604	-$ 116,702	$ -	-$ 1,067,306	-$ 2,257,917
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Sub-Total	**$ 29,805,482**	**$ 2,157,652**	**$ -**	**$ 31,963,134**	**$ 11,986,242**	**$ 1,067,843**	**$ -**	**$ 13,054,085**	**$ 18,909,049**
		Less Socialized Renewable Energy Generation Investments (input as negative)Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 29,805,482**	**$ 2,157,652**	**$ -**	**$ 31,963,134**	**$ 11,986,242**	**$ 1,067,843**	**$ -**	**$ 13,054,085**	**$ 18,909,049**

Table 2.9: 2018 Fixed Asset Continuity Schedule

Year 2018 **CGAAP - with changes to policies**

			Cost				Accumulated Depreciation				
CCA Class	OEB	Description	Opening Balance	Additions	Disposals	Closing Balance	Opening Balance	Additions	Disposals	Closing Balance	Net Book Value
12	1611	Computer Software (Formally known as Account 1925)	$ 677,113	$ -	$ -	$ 677,113	$ 560,691	-$ 79,143	$ -	$ 481,548	$ 195,565
CEC	1612	Land Rights (Formally known as Account 1906 and 1806)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N/A	1805	Land	$ 219,284	$ -	$ -	$ 219,284	$ -	$ -	$ -	$ -	$ 219,284
47	1808	Buildings	$ 1,258,303	$ 15,066	$ -	$ 1,273,369	$ 304,180	$ 31,925	$ -	$ 336,105	$ 937,264
13	1810	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1815	Transformer Station Equipment >50 kV	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1820	Distribution Station Equipment <50 kV	$ 5,376,595	$ -	$ -	$ 5,376,595	$ 2,058,548	$ 105,827	$ -	$ 2,164,376	$ 3,212,219
47	1825	Storage Battery Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 3,279,963	$ 365,006	$ -	$ 3,644,969	$ 531,037	$ 83,557	$ -	$ 614,593	$ 3,030,375
47	1835	Overhead Conductors & Devices	$ 6,515,092	$ 267,191	$ -	$ 6,782,283	$ 1,623,546	$ 133,198	$ -	$ 1,756,743	$ 5,025,539
47	1840	Underground Conduit	$ 1,124,532	$ 3,220	$ -	$ 1,127,752	$ 364,183	$ 29,366	$ -	$ 393,549	$ 734,202
47	1845	Underground Conductors & Devices	$ 3,771,500	$ 54,293	$ -	$ 3,825,793	$ 2,465,578	$ 94,100	$ -	$ 2,559,678	$ 1,266,115
47	1850	Line Transformers	$ 6,178,060	$ 135,343	$ -	$ 6,313,403	$ 3,323,635	$ 170,505	$ -	$ 3,494,140	$ 2,819,263
47	1855	Services (Overhead & Underground)	$ 1,236,815	$ 60,713	$ -	$ 1,297,528	$ 270,005	$ 31,867	$ -	$ 301,871	$ 995,656
47	1860	Meters	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1860	Meters (Smart Meters)	$ 2,434,948	$ 160,947	$ -	$ 2,595,896	$ 819,831	$ 168,298	$ -	$ 988,129	$ 1,607,767
N/A	1905	Land	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1908	Buildings & Fixtures	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
13	1910	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 107,326	$ -	$ -	$ 107,326	$ 71,542	$ 10,387	$ -	$ 81,929	$ 25,397
8	1915	Office Furniture & Equipment (5 years)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	1920	Computer Equipment - Hardware	$ 183,138	$ 22,567	$ -	$ 205,705	$ 120,415	$ 24,157	$ -	$ 144,572	$ 61,134
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
45.1	1920	Computer Equip.-Hardware(Post Mar. 19/07)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	1930	Transportation Equipment	$ 1,567,534	$ 37,909	$ -	$ 1,605,443	$ 1,113,719	$ 169,295	$ -	$ 1,283,015	$ 322,429
8	1935	Stores Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1940	Tools, Shop & Garage Equipment	$ 623,239	$ 28,140	$ -	$ 651,380	$ 341,571	$ 59,060	$ -	$ 400,630	$ 250,749
8	1945	Measurement & Testing Equipment	$ 22,346	$ -	$ -	$ 22,346	$ 15,673	$ 2,225	$ -	$ 17,898	$ 4,448
8	1950	Power Operated Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1955	Communications Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1955	Communication Equipment (Smart Meters)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1960	Miscellaneous Equipment	$ 350,548	$ -	$ -	$ 350,548	$ 75,362	$ 35,001	$ -	$ 110,363	$ 240,185
47	1970	Load Management Controls Customer Premises	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1975	Load Management Controls Utility Premises	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1980	System Supervisor Equipment	$ 362,022	$ 39,532	$ -	$ 401,553	$ 61,874	$ 19,089	$ -	$ 80,963	$ 320,590
47	1985	Miscellaneous Fixed Assets	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1990	Other Tangible Property	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1995	Contributions & Grants	-$ 3,325,223	-$ 358,852	$ -	-$ 3,684,075	-$ 1,067,306	-$ 76,873	$ -	-$ 1,144,179	-$ 2,539,896
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Sub-Total	**$ 31,963,134**	**$ 831,076**	**$ -**	**$ 32,794,210**	**$ 13,054,085**	**$ 1,011,840**	**$ -**	**$ 14,065,925**	**$ 18,728,285**
		Less Socialized Renewable Energy Generation Investments (input as negative)Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 31,963,134**	**$ 831,076**	**$ -**	**$ 32,794,210**	**$ 13,054,085**	**$ 1,011,840**	**$ -**	**$ 14,065,925**	**$ 18,728,285**

Table 2.10: 2019 Fixed Asset Continuity Schedule

Year 2019 CGAAP - with changes to policies

CCA Class	OEB	Description	Cost: Opening Balance	Cost: Additions	Cost: Disposals	Cost: Closing Balance	Accumulated Depreciation: Opening Balance	Accumulated Depreciation: Additions	Accumulated Depreciation: Disposals	Accumulated Depreciation: Closing Balance	Net Book Value
12	1611	Computer Software (Formally known as Account 1925)	$ 677,113	$ -	-$ 28,665	$ 648,448	$ 481,548	-$ 94,642	-$ 28,665	$ 358,242	$ 290,206
CEC	1612	Land Rights (Formally known as Account 1906 and 1806)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N/A	1805	Land	$ 219,284	$ -	$ -	$ 219,284	$ -	$ -	$ -	$ -	$ 219,284
47	1808	Buildings	$ 1,273,369	$ 8,348	$ -	$ 1,281,717	$ 336,105	$ 32,159	$ -	$ 368,264	$ 913,453
13	1810	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1815	Transformer Station Equipment >50 kV	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1820	Distribution Station Equipment <50 kV	$ 5,376,595	$ -	$ -	$ 5,376,595	$ 2,164,376	$ 105,827	$ -	$ 2,270,203	$ 3,106,392
47	1825	Storage Battery Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 3,644,969	$ 402,390	-$ 6,718	$ 4,040,641	$ 614,593	$ 92,083	-$ 6,718	$ 699,958	$ 3,340,682
47	1835	Overhead Conductors & Devices	$ 6,782,283	$ 230,646	$ -	$ 7,012,928	$ 1,756,743	$ 138,724	$ -	$ 1,895,467	$ 5,117,461
47	1840	Underground Conduit	$ 1,127,752	$ 1,425	$ -	$ 1,129,177	$ 393,549	$ 29,413	$ -	$ 422,962	$ 706,214
47	1845	Underground Conductors & Devices	$ 3,825,793	$ 300,224	-$ 5,217	$ 4,120,800	$ 2,559,678	$ 99,164	-$ 5,217	$ 2,653,624	$ 1,467,175
47	1850	Line Transformers	$ 6,313,403	$ 71,257	-$ 17,229	$ 6,367,431	$ 3,494,140	$ 173,457	-$ 17,229	$ 3,650,368	$ 2,717,063
47	1855	Services (Overhead & Underground)	$ 1,297,528	$ 43,550	$ -	$ 1,341,078	$ 301,871	$ 32,826	$ -	$ 334,698	$ 1,006,380
47	1860	Meters	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1860	Meters (Smart Meters)	$ 2,595,896	$ 137,409	$ -	$ 2,733,305	$ 988,129	$ 178,244	$ -	$ 1,166,373	$ 1,566,932
N/A	1905	Land	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1908	Buildings & Fixtures	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
13	1910	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 107,326	$ -	-$ 501	$ 106,825	$ 81,929	$ 8,994	-$ 501	$ 90,422	$ 16,403
8	1915	Office Furniture & Equipment (5 years)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	1920	Computer Equipment - Hardware	$ 205,705	$ 48,748	-$ 45,922	$ 208,531	$ 144,572	$ 26,762	-$ 45,922	$ 125,411	$ 83,119
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
45.1	1920	Computer Equip.-Hardware(Post Mar. 19/07)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	1930	Transportation Equipment	$ 1,605,443	$ -	-$ 116,371	$ 1,489,073	$ 1,283,015	$ 163,903	-$ 116,371	$ 1,330,547	$ 158,525
8	1935	Stores Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1940	Tools, Shop & Garage Equipment	$ 651,380	$ 13,959	-$ 33,580	$ 631,758	$ 400,630	$ 55,976	-$ 33,580	$ 423,026	$ 208,732
8	1945	Measurement & Testing Equipment	$ 22,346	$ -	$ -	$ 22,346	$ 17,898	$ 2,225	$ -	$ 20,122	$ 2,224
8	1950	Power Operated Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1955	Communications Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1955	Communication Equipment (Smart Meters)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1960	Miscellaneous Equipment	$ 350,548	$ -	$ -	$ 350,548	$ 110,363	$ 35,001	$ -	$ 145,364	$ 205,184
47	1970	Load Management Controls Customer Premises	$ -	$ -	$ -	$ -	$ -		$ -	$ -	$ -
47	1975	Load Management Controls Utility Premises	$ -	$ -	$ -	$ -	$ -		$ -	$ -	$ -
47	1980	System Supervisor Equipment	$ 401,553	$ -	$ -	$ 401,553	$ 80,963	$ 20,078	$ -	$ 101,041	$ 300,512
47	1985	Miscellaneous Fixed Assets	$ -	$ -	$ -	$ -	$ -		$ -	$ -	$ -
47	1990	Other Tangible Property	$ -	$ -	$ -	$ -	$ -		$ -	$ -	$ -
47	1995	Contributions & Grants	-$ 3,684,075	-$ 136,890	$ -	-$ 3,820,965	-$ 1,144,179	-$ 83,070	$ -	-$ 1,227,248	-$ 2,593,716
	etc.			$ -	$ -	$ -			$ -	$ -	$ -
	etc.			$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.			$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.			$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.			$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.			$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.			$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.			$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.			$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.			$ -	$ -	$ -		$ -	$ -	$ -	$ -
		Sub-Total	**$ 32,794,210**	**$ 1,121,065**	**-$ 254,205**	**$ 33,661,071**	**$ 14,065,925**	**$ 1,017,124**	**-$ 254,205**	**$ 14,828,844**	**$ 18,832,227**
		Less Socialized Renewable Energy Generation Investments (input as negative)Less Socialized Renewable Energy Generation Investments (input as negative)		$ -	$ -	$ -		$ -	$ -	$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 32,794,210**	**$ 1,121,065**	**-$ 254,205**	**$ 33,661,071**	**$ 14,065,925**	**$ 1,017,124**	**-$ 254,205**	**$ 14,828,844**	**$ 18,832,227**

Table 2.11: 2020 Fixed Asset Continuity Schedule

Year 2020 **CGAAP - with changes to policies**

			Cost				Accumulated Depreciation				
CCA Class	**OEB**	**Description**	**Opening Balance**	**Additions**	**Disposals**	**Closing Balance**	**Opening Balance**	**Additions**	**Disposals**	**Closing Balance**	**Net Book Value**
12	1611	Computer Software (Formally known as Account 1925)	$ 648,448	$ -	$ -	$ 648,448	$ 358,242	$ 30,548	$ -	$ 388,790	$ 259,658
CEC	1612	Land Rights (Formally known as Account 1906 and 1806)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N/A	1805	Land	$ 219,284	$ -	$ -	$ 219,284	$ -	$ -	$ -	$ -	$ 219,284
47	1808	Buildings	$ 1,281,717	$ 8,513	$ -	$ 1,290,230	$ 368,264	$ 32,328	$ -	$ 400,592	$ 889,638
13	1810	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1815	Transformer Station Equipment >50 kV	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1820	Distribution Station Equipment <50 kV	$ 5,376,595	$ 22,807	$ -	$ 5,399,402	$ 2,270,203	$ 97,391	$ -	$ 2,367,594	$ 3,031,808
47	1825	Storage Battery Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 4,040,641	$ 397,287	$ -	$ 4,437,928	$ 699,958	$ 100,968	$ -	$ 800,927	$ 3,637,001
47	1835	Overhead Conductors & Devices	$ 7,012,928	$ 290,460	$ -	$ 7,303,389	$ 1,895,467	$ 143,461	$ -	$ 2,038,928	$ 5,264,461
47	1840	Underground Conduit	$ 1,129,177	$ 433,704	$ -	$ 1,562,880	$ 422,962	$ 33,764	$ -	$ 456,726	$ 1,106,154
47	1845	Underground Conductors & Devices	$ 4,120,800	$ 431,187	$ -	$ 4,551,987	$ 2,653,624	$ 109,613	$ -	$ 2,763,237	$ 1,788,750
47	1850	Line Transformers	$ 6,367,431	$ 263,322	$ -	$ 6,630,753	$ 3,650,368	$ 178,236	$ -	$ 3,828,604	$ 2,802,149
47	1855	Services (Overhead & Underground)	$ 1,341,078	$ 91,383	$ -	$ 1,432,460	$ 334,698	$ 34,053	$ -	$ 368,750	$ 1,063,710
47	1860	Meters	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1860	Meters (Smart Meters)	$ 2,733,305	$ 89,220	$ -	$ 2,822,525	$ 1,166,373	$ 185,798	$ -	$ 1,352,171	$ 1,470,354
N/A	1905	Land	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1908	Buildings & Fixtures	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
13	1910	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 106,825	$ -	$ -	$ 106,825	$ 90,422	$ 7,199	$ -	$ 97,621	$ 9,205
8	1915	Office Furniture & Equipment (5 years)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	1920	Computer Equipment - Hardware	$ 208,531	$ 19,587	$ -	$ 228,118	$ 125,411	$ 28,566	$ -	$ 153,977	$ 74,140
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
45.1	1920	Computer Equip.-Hardware(Post Mar. 19/07)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	1930	Transportation Equipment	$ 1,489,073		$ -	$ 1,489,073	$ 1,330,547	$ 90,135	$ -	$ 1,420,682	$ 68,390
8	1935	Stores Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1940	Tools, Shop & Garage Equipment	$ 631,758	$ 10,470	$ -	$ 642,228	$ 423,026	$ 51,956	$ -	$ 474,982	$ 167,246
8	1945	Measurement & Testing Equipment	$ 22,346	$ -	$ -	$ 22,346	$ 20,122	$ 2,225	$ -	$ 22,347	-$ 1
8	1950	Power Operated Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1955	Communications Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1955	Communication Equipment (Smart Meters)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1960	Miscellaneous Equipment	$ 350,548	$ 50,825	$ -	$ 401,374	$ 145,364	$ 37,542	$ -	$ 182,907	$ 218,467
47	1970	Load Management Controls Customer Premises	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1975	Load Management Controls Utility Premises	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1980	System Supervisor Equipment	$ 401,553	$ -	$ -	$ 401,553	$ 101,041	$ 20,078	$ -	$ 121,119	$ 280,435
47	1985	Miscellaneous Fixed Assets	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1990	Other Tangible Property	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1995	Contributions & Grants	-$ 3,820,965	-$ 268,233	$ -	-$ 4,089,197	-$ 1,227,248	-$ 88,134	$ -	-$ 1,315,382	-$ 2,773,815
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Sub-Total	**$ 33,661,071**	**$ 1,840,532**	**$ -**	**$ 35,501,603**	**$ 14,828,844**	**$ 1,095,726**	**$ -**	**$ 15,924,570**	**$ 19,577,033**
		Less Socialized Renewable Energy Generation Investments (input as negative)Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 33,661,071**	**$ 1,840,532**	**$ -**	**$ 35,501,603**	**$ 14,828,844**	**$ 1,095,726**	**$ -**	**$ 15,924,570**	**$ 19,577,033**

Table 2.12: 2021 Fixed Asset Continuity Schedule

Year 2021 **CGAAP - with changes to policies**

			Cost				Accumulated Depreciation				
CCA Class	**OEB**	**Description**	**Opening Balance**	**Additions**	**Disposals**	**Closing Balance**	**Opening Balance**	**Additions**	**Disposals**	**Closing Balance**	**Net Book Value**
12	1611	Computer Software (Formally known as Account 1925)	$ 648,448	$ -	$ -	$ 648,448	$ 388,790	$ 30,548	$ -	$ 419,338	$ 229,110
CEC	1612	Land Rights (Formally known as Account 1906 and 1806)	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
N/A	1805	Land	$ 219,284		$ -	$ 219,284	$ -	$ -	$ -	$ -	$ 219,284
47	1808	Buildings	$ 1,290,230	$ 10,000	$ -	$ 1,300,230	$ 400,592	$ 32,496	$ -	$ 433,088	$ 867,142
13	1810	Leasehold Improvements	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1815	Transformer Station Equipment >50 kV	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1820	Distribution Station Equipment <50 kV	$ 5,399,402	$ 214,500	$ -	$ 5,613,902	$ 2,367,594	$ 100,027	$ -	$ 2,467,621	$ 3,146,281
47	1825	Storage Battery Equipment	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 4,437,928	$ 536,000	$ -	$ 4,973,928	$ 800,927	$ 111,338	$ -	$ 912,265	$ 4,061,663
47	1835	Overhead Conductors & Devices	$ 7,303,389	$ 222,000	$ -	$ 7,525,389	$ 2,038,928	$ 148,120	$ -	$ 2,187,047	$ 5,338,341
47	1840	Underground Conduit	$ 1,562,880	$ -	$ -	$ 1,562,880	$ 456,726	$ 38,101	$ -	$ 494,827	$ 1,068,053
47	1845	Underground Conductors & Devices	$ 4,551,987	$ 23,000	$ -	$ 4,574,987	$ 2,763,237	$ 116,101	$ -	$ 2,879,338	$ 1,695,648
47	1850	Line Transformers	$ 6,630,753	$ 159,500	$ -	$ 6,790,253	$ 3,828,604	$ 184,277	$ -	$ 4,012,881	$ 2,777,372
47	1855	Services (Overhead & Underground)	$ 1,432,460	$ 285,000	$ -	$ 1,717,460	$ 368,750	$ 37,474	$ -	$ 406,225	$ 1,311,235
47	1860	Meters	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1860	Meters (Smart Meters)	$ 2,822,525	$ 55,000	$ -	$ 2,877,525	$ 1,352,171	$ 190,605	$ -	$ 1,542,776	$ 1,334,749
N/A	1905	Land	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1908	Buildings & Fixtures	$ -		$ -	$ -	$ -		$ -	$ -	$ -
13	1910	Leasehold Improvements	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 106,825	$ -	$ -	$ 106,825	$ 97,621	$ 5,597	$ -	$ 103,218	$ 3,608
8	1915	Office Furniture & Equipment (5 years)	$ -		$ -	$ -	$ -		$ -	$ -	$ -
10	1920	Computer Equipment - Hardware	$ 228,118	$ 37,500	$ -	$ 265,618	$ 153,977	$ 29,824	$ -	$ 183,801	$ 81,817
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ -		$ -	$ -	$ -		$ -	$ -	$ -
45.1	1920	Computer Equip.-Hardware(Post Mar. 19/07)	$ -		$ -	$ -	$ -		$ -	$ -	$ -
10	1930	Transportation Equipment	$ 1,489,073	$ 110,000	$ -	$ 1,599,073	$ 1,420,682	$ 63,938	$ -	$ 1,484,621	$ 114,452
8	1935	Stores Equipment	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1940	Tools, Shop & Garage Equipment	$ 642,228	$ 10,000	$ -	$ 652,228	$ 474,982	$ 48,481	$ -	$ 523,463	$ 128,765
8	1945	Measurement & Testing Equipment	$ 22,346		$ -	$ 22,346	$ 22,347		$ -	$ 22,347	-$ 1
8	1950	Power Operated Equipment	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1955	Communications Equipment	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1955	Communication Equipment (Smart Meters)	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1960	Miscellaneous Equipment	$ 401,374	$ -	-$ 50,825	$ 350,549	$ 182,907	$ 32,460	$ -	$ 215,366	$ 135,183
47	1970	Load Management Controls Customer Premises	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1975	Load Management Controls Utility Premises	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1980	System Supervisor Equipment	$ 401,553	$ -	$ -	$ 401,553	$ 121,119	$ 20,078	$ -	$ 141,196	$ 260,357
47	1985	Miscellaneous Fixed Assets	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1990	Other Tangible Property	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1995	Contributions & Grants	-$ 4,089,197	-$ 100,000	$ -	-$ 4,189,197	-$ 1,315,382	-$ 92,737	$ -	-$ 1,408,119	-$ 2,781,078
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		Sub-Total	**$ 35,501,603**	**$ 1,562,500**	**-$ 50,825**	**$ 37,013,278**	**$ 15,924,570**	**$ 1,096,728**	**$ -**	**$ 17,021,298**	**$ 19,991,980**

Table 2.13: 2022 Fixed Asset Continuity Schedule

Year 2022 **CGAAP - with changes to policies**

CCA Class	OEB	Description	Cost: Opening Balance	Cost: Additions	Cost: Disposals	Cost: Closing Balance	Accumulated Depreciation: Opening Balance	Accumulated Depreciation: Additions	Accumulated Depreciation: Disposals	Accumulated Depreciation: Closing Balance	Net Book Value
12	1611	Computer Software (Formally known as Account 1925)	$ 648,448		$ -	$ 648,448	$ 419,338	$ 30,548	$ -	$ 449,886	$ 198,562
CEC	1612	Land Rights (Formally known as Account 1906 and 1806)	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
N/A	1805	Land	$ 219,284		$ -	$ 219,284	$ -	$ -	$ -	$ -	$ 219,284
47	1808	Buildings	$ 1,300,230	$ 10,000	$ -	$ 1,310,230	$ 433,088	$ 32,610	$ -	$ 465,697	$ 844,532
13	1810	Leasehold Improvements	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1815	Transformer Station Equipment >50 kV	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1820	Distribution Station Equipment <50 kV	$ 5,613,902	$ 80,000	$ -	$ 5,693,902	$ 2,467,621	$ 103,300	$ -	$ 2,570,920	$ 3,122,981
47	1825	Storage Battery Equipment	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 4,973,928	$ 983,000	$ -	$ 5,956,928	$ 912,265	$ 127,672	$ -	$ 1,039,936	$ 4,916,991
47	1835	Overhead Conductors & Devices	$ 7,525,389	$ 457,000	$ -	$ 7,982,389	$ 2,187,047	$ 145,048	$ -	$ 2,332,095	$ 5,650,294
47	1840	Underground Conduit	$ 1,562,880	$ -	$ -	$ 1,562,880	$ 494,827	$ 38,101	$ -	$ 532,928	$ 1,029,952
47	1845	Underground Conductors & Devices	$ 4,574,987	$ -	$ -	$ 4,574,987	$ 2,879,338	$ 77,410	$ -	$ 2,956,748	$ 1,618,239
47	1850	Line Transformers	$ 6,790,253	$ 60,000	$ -	$ 6,850,253	$ 4,012,881	$ 138,597	$ -	$ 4,151,478	$ 2,698,775
47	1855	Services (Overhead & Underground)	$ 1,717,460	$ 290,000	$ -	$ 2,007,460	$ 406,225	$ 42,702	$ -	$ 448,927	$ 1,558,534
47	1860	Meters	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1860	Meters (Smart Meters)	$ 2,877,525	$ 30,000	$ -	$ 2,907,525	$ 1,542,776	$ 193,438	$ -	$ 1,736,214	$ 1,171,310
N/A	1905	Land	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1908	Buildings & Fixtures	$ -		$ -	$ -	$ -		$ -	$ -	$ -
13	1910	Leasehold Improvements	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 106,825		$ -	$ 106,825	$ 103,218	$ 2,916	$ -	$ 106,134	$ 691
8	1915	Office Furniture & Equipment (5 years)	$ -		$ -	$ -	$ -		$ -	$ -	$ -
10	1920	Computer Equipment - Hardware	$ 265,618	$ 40,000	$ -	$ 305,618	$ 183,801	$ 32,892	$ -	$ 216,693	$ 88,925
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ -		$ -	$ -	$ -		$ -	$ -	$ -
45.1	1920	Computer Equip.-Hardware(Post Mar. 19/07)	$ -		$ -	$ -	$ -		$ -	$ -	$ -
10	1930	Transportation Equipment	$ 1,599,073	$ -	$ -	$ 1,599,073	$ 1,484,621	$ 33,661	$ -	$ 1,518,282	$ 80,791
8	1935	Stores Equipment	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1940	Tools, Shop & Garage Equipment	$ 652,228	$ 10,000	$ -	$ 662,228	$ 523,463	$ 43,345	$ -	$ 566,809	$ 95,419
8	1945	Measurement & Testing Equipment	$ 22,346		$ -	$ 22,346	$ 22,347		$ -	$ 22,347	-$ 1
8	1950	Power Operated Equipment	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1955	Communications Equipment	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1955	Communication Equipment (Smart Meters)	$ -		$ -	$ -	$ -		$ -	$ -	$ -
8	1960	Miscellaneous Equipment	$ 350,549	$ -	$ -	$ 350,549	$ 215,366	$ 34,870	$ -	$ 250,236	$ 100,313
47	1970	Load Management Controls Customer Premises	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1975	Load Management Controls Utility Premises	$ -		$ -	$ -	$ -		$ -	$ -	$ -
47	1980	System Supervisor Equipment	$ 401,553	$ -	$ -	$ 401,553	$ 141,196	$ 20,078	$ -	$ 161,274	$ 240,279
47	1985	Miscellaneous Fixed Assets	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1990	Other Tangible Property	$ -		$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1995	Contributions & Grants	-$ 4,189,197	-$ 100,000	$ -	-$ 4,289,197	-$ 1,408,119	-$ 95,237	$ -	-$ 1,503,356	-$ 2,785,841
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
	etc.		$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
			$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
		Sub-Total	**$ 37,013,278**	**$ 1,860,000**	**$ -**	**$ 38,873,278**	**$ 17,021,298**	**$ 1,001,950**	**$ -**	**$ 18,023,248**	**$ 20,850,030**

2.2.1.2 GROSS ASSETS – PROPERTY PLANT AND EQUIPMENT AND ACCUM. DEPREC

LUI chose to break down and categorize LUI's assets into four categories: Distribution Plant, General Plant, Contributions and Grants, and Work In Progress (WIP). In accordance with the Uniform System of Accounts (USoA), LUI has included Gross Assets as follows:

- Distribution Equipment: Includes all the standard distribution assets in the filed including poles, transformers, conduit, and meters (USoA 1830 to 1855).
- Transmission Stations: Includes all LUI assets related to operating the distribution stations (USoA 1820).
- Systems Equipment: Includes the SCADA system and all the automated switches and reclosures (USoA 1980).
- Land and Buildings: Includes the main office and the garage (USoA 1808).
- Vehicles: Are line trucks, service trucks, and trailers (USoA 1930).
- Computer Assets: Include investments in software systems and computer hardware (USoA 1611 and 1920).
- Other Assets: Includes office furniture, and tools (USoA 1915 and 1940).
- Contributed Capital: Include USoA accounts 1995 and 2440 – this account includes all contributions in aid of capital that LUI has received or forecast to be received as per the Distribution System Code (DSC) and;
- WIP: This account includes all costs related to assets that are not considered in-service as of December 31st of the applicable fiscal year. Costs are transferred out of WIP and into the appropriate category above once designated in-service.

Table 2.14 categorizes LUI's assets into the four categories according to USoA.

Table 2.14: Gross Asset Breakdown by Function

Description	2017 Board Approved	2017	2018	2019	2020	2021 Bridge Year	2022 Test Year
Gross Assets							
Distribution Equipment	23,874,985	24,540,909	25,587,623	26,745,359	28,741,921	30,022,421	31,842,421
Transmission Stations	4,546,415	5,376,595	5,376,595	5,376,595	5,399,402	5,613,902	5,693,902
Systems Equipment	616,430	734,916	774,447	774,447	825,273	774,448	774,448
Land and Buildings	1,442,834	1,477,587	1,492,653	1,501,001	1,509,514	1,519,514	1,529,514
Vehicles	1,469,767	1,567,534	1,605,443	1,489,073	1,489,073	1,599,073	1,599,073
Computer Assets	863,110	860,251	882,818	856,978	876,565	914,065	954,065
Other Assets	724,318	730,565	758,706	738,584	749,053	759,053	769,053
Contributed Capital	(3,053,879)	(3,325,223)	(3,684,075)	(3,820,965)	(4,089,197)	(4,189,197)	(4,289,197)
Total	30,483,980	31,963,134	32,794,210	33,661,071	35,501,603	37,013,278	38,873,278
Accumulated Depreciation							
Distribution Equipment	9,635,064	9,397,814	10,108,705	10,823,450	11,609,343	12,435,359	13,198,327
Transmission Stations	2,038,420	2,058,548	2,164,376	2,270,203	2,367,594	2,467,621	2,570,920
Systems Equipment	135,933	152,909	209,224	266,527	326,372	378,909	433,857
Land and Buildings	302,759	304,180	336,105	368,264	400,592	433,088	465,697
Vehicles	1,056,485	1,113,719	1,283,015	1,330,547	1,420,682	1,484,621	1,518,282
Computer Assets	684,016	681,106	626,120	483,653	542,767	603,139	666,578
Other Assets	416,815	413,113	482,559	513,448	572,603	626,681	672,943
Contributed Capital	(1,058,122)	(1,067,306)	(1,144,179)	(1,227,248)	(1,315,382)	(1,408,119)	(1,503,356)
Total	13,211,370	13,054,085	14,065,925	14,828,844	15,924,570	17,021,298	18,023,248
Net Book Value							
Distribution Equipment	14,239,921	15,143,095	15,478,918	15,921,909	17,132,578	17,587,062	18,644,095
Transmission Stations	2,507,995	3,318,046	3,212,219	3,106,392	3,031,808	3,146,281	3,122,981
Systems Equipment	480,497	582,006	565,223	507,920	498,901	395,539	340,591
Land and Buildings	1,140,075	1,173,407	1,156,548	1,132,737	1,108,922	1,086,426	1,063,816
Vehicles	413,282	453,815	322,429	158,525	68,390	114,452	80,791
Computer Assets	179,094	179,145	256,698	373,325	333,798	310,927	287,487
Other Assets	307,503	317,453	276,146	225,135	176,450	132,372	96,111
Contributed Capital	(1,995,757)	(2,257,917)	(2,539,896)	(2,593,716)	(2,773,815)	(2,781,078)	(2,785,841)
Total	17,272,610	18,909,049	18,728,285	18,832,227	19,577,033	19,991,980	20,850,030
Work-in-Progress (CWIP)	50,000	53,398	177,782	479,662	816,879	380,000	380,000

A detailed breakdown by major plant account for each functionalized plant item, accompanied by a description in the test year is provided in section 2.2.2.2.

2.2.1.3 ALLOWANCE FOR WORKING CAPITAL

Lakefront Utilities Inc. has used the 7.5% Allowance Approach for the purpose of calculating its Allowance for Working Capital for the 2022 Test Year. This was done in accordance with the letter issued by the Board on June 3, 2015 for a rate of 7.5% of the sum of:

1. Cost of Power.
2. Operations.
3. Maintenance.
4. Billing and Collecting.
5. Community Relations, and
6. Administration and General.

LUI attest that the Cost of Power is determined by the split between RPP and non-RPP customers based on actual data, using most recent RPP prices, using current UTR.

LUI was not previously directed by the OEB to undertake a lead/lag study and is not proposing to use a lead lag study in order to determine its Working Capital Allowance. LUI has chosen to follow the Board's June 3, 2015 letter which provided two options for the calculation of the allowance for working capital:

1. The 7.5% allowance approach; or
2. The filing of a lead/lag study.

LUI calculated the cost of power for the 2021 Bridge Year and the 2022 Test Year based on the results of the load forecast discussed in detail in Exhibit 3. The calculations include the most recent approved Uniform Transmission Rate (UTRs), Smart Metering Entity Charges, and regulatory charges. LUI will update the electricity prices in its cost of power forecast during the interrogatory phase of the proceeding and based on the most Regulated Price Plan Report issued prior to the Board's Decision in the Application.

The sale of energy is a flow through revenue, and the cost of power is a flow through expense. Energy sales and cost of power expense are presented in the table below. LUI records no profit or loss resulting from the flow through energy revenues and expenses. Any temporary variances are included in the RSVA account balances.

The components of LUI's cost of power are summarized in Table 2.15 and detailed in Table 2.16 to 2.22. These tables replicate the information included in OEB Appendix 2-Z, which has been populated in Excel version of the OEB Chapter 2 Appendices workbook filed with the Application.

Table 2.15: Summary of Cost of Power

Particulars	2017 Board Approved	2017	2018	2019	2020	2021 Bridge Year	2022 Test Year
Power Purchased	26,936,930	25,076,159	21,798,117	25,784,011	29,217,289	28,398,453	27,785,708
Wholesale Market Services	1,234,412	913,243	944,303	917,741	833,225	956,581	942,992
Network Charges	1,539,827	1,423,623	1,529,550	1,369,526	1,470,622	1,517,823	1,446,226
Connection Charges	1,175,616	1,123,826	1,207,540	1,086,696	1,248,454	1,263,886	1,204,202
Low Voltage Charges	337,034	308,676	335,983	304,521	312,010	334,675	1,782,826
Ontario Electricity Support Program	277,113	90,297	0	0	0	0	0
Smart Meter Entity Charge	97,245	94,551	66,942	69,140	70,755	100,839	101,990
Total Cost of Power Expenses	31,598,177	29,030,376	25,882,435	29,531,634	33,152,355	32,572,257	33,263,943

Table 2.16: Calculation of Commodity

Determinaton of Commodity

Customer Class Name		Last Actual KWh	non-RPP	RPP
Residential		76,102,272	19,025,568	57,076,704
General Service < 50 kW		33,194,524	8,298,631	24,895,893
General Service 50-2999 kW		106,071,560	26,517,890	79,553,670
General Service 3000-4999 kW		19,292,259	4,823,065	14,469,194
Street Lighting		1,080,612	270,153	810,459
Sentinel Lighting		44,222	11,056	33,167
Unmetered Scattered Load		611,429	152,857	458,572
Total		**236,396,879**	**59,099,220**	**177,297,659**
%		**100.00%**	**25.00%**	**75.00%**

Forecast Price

HOEP ($/MWh)			$20.09	
Global Adjustment ($/MWh)			$106.94	
Adjustments				
Total ($/MWh)			**$127.03**	**$128.03**
$/kWh			**$0.12703**	**$0.12803**
%			25.00%	75.00%
Rate	**$0.1481**		**0.0201**	**0.1280**

LUI uses the split between the RPP and non-RPP to determine the weighted average price, as illustrated in Table 2.16 above. The weighted average is then applied to the projected 2022 Load Forecast to determine the commodity to be included in the Cost of Power, as shown in in Table 2.17.

Table 2.17: Power Purchased

Power Purchased (volumes for the bridge and test year are automatically loss adjusted)

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
Residential	kWh	4006	4705	78,686,508	$0.1481	$7,950,878	77,567,927	$0.1481	$7,837,851
General Service < 50 kW	kWh	4010	4705	34,321,724	$0.1481	$3,468,039	33,833,818	$0.1481	$3,418,738
General Service 50-2999 kW	kWh	4035	4705	109,673,475	$0.1481	$11,081,956	108,114,394	$0.1481	$10,924,419
General Service 3000-4999 kW	kWh	4035	4705	19,947,374	$0.1481	$2,015,582	19,663,809	$0.1481	$1,986,930
Street Lighting	kWh	4010	4705	1,117,307	$0.1481	$112,898	1,101,424	$0.1481	$111,293
Sentinel Lighting	kWh	4010	4705	45,724	$0.1481	$4,620	45,074	$0.1481	$4,555
Unmetered Scattered Load	kWh	4025	4705	632,192	$0.1481	$63,880	623,205	$0.1481	$62,972
Total				**244,424,304**		**$24,697,854**	**240,949,650**		**$24,346,757**

The power purchased is calculated in the same manner as has been previously approved by the OEB in LUI's previous Cost of Service application as well as other applications.

Table 2.18: Class A – non-RPP Global Adjustment

Class A - non-RPP Global Adjustment

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
General Service 50-2999 kW	kWh	4035	4707	11,646,689	$0.2756	$3,209,336	11,527,353	$0.2756	$3,176,453
General Service 3000-4999 kW	kWh	4035	4707	4,986,844	$0.2756	$1,374,164	4,915,952	$0.2756	$1,354,629
Total				**16,633,532**		**$4,583,500**	**16,443,306**		**$4,531,082**

Table 2.19: Class B – non-RPP Global Adjustment

Class B - non-RPP Global Adjustment

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
Residential	kWh	4006	4707	19,671,627	$0.1069	$2,103,684	19,391,982	$0.10694	$2,073,779
General Service < 50 kW	kWh	4010	4707	8,580,431	$0.1069	$917,591	8,458,455	$0.10694	$904,547
General Service 50-2999 kW	kWh	4035	4707	15,771,680	$0.1069	$1,686,623	15,501,245	$0.10694	$1,657,703
General Service 3000-4999 kW	kWh	4035	4707	0	$0.1069	$0	0	$0.10694	$0
Street Lighting	kWh	4010	4707	279,327	$0.1069	$29,871	275,356	$0.10694	$29,447
Sentinel Lighting	kWh	4010	4707	11,431	$0.1069	$1,222	11,269	$0.10694	$1,205
Unmetered Scattered Load	kWh	4025	4707	158,048	$0.1069	$16,902	155,801	$0.10694	$16,661
Total						**$4,755,894**	**43,794,107**		**$4,683,342**

Table 2.20: Transmission Network and Connection

Transmission - Network (volumes for the bridge and test year are automatically loss adjusted)

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
Residential	kWh	4066	4714	78,686,508	$0.00650	$511,462	77,567,927	$0.0062	$483,816
General Service < 50 kW	kWh	4066	4714	34,321,724	$0.00600	$205,930	33,833,818	$0.0058	$194,799
General Service 50-2999 kW	kW	4066	4714	276,979	$2.40630	$666,494	274,141	$2.3091	$633,006
General Service 3000-4999 kW	kW	4066	4714	46,149	$2.69140	$124,207	48,547	$2.5826	$125,379
Street Lighting	kW	4066	4714	2,861	$1.81490	$5,192	2,831	$1.7416	$4,931
Sentinel Lighting	kW	4066	4714	131	$1.82370	$239	130	$1.7500	$227
Unmetered Scattered Load	kWh	4066	4714	632,192	$0.00680	$4,299	623,205	$0.0065	$4,067
Total				**113,966,544**		**$1,517,823**	**112,350,599**		**$1,446,226**

Transmission - Connection (volumes for the bridge and test year are automatically loss adjusted)

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
Residential	kWh	4068	4716	78,686,508	$0.00550	$432,776	77,567,927	$0.0053	$409,283
General Service < 50 kW	kWh	4068	4716	34,321,724	$0.00490	$168,176	33,833,818	$0.0047	$159,047
General Service 50-2999 kW	kW	4068	4716	276,979	$1.97490	$547,005	274,141	$1.8946	$519,394
General Service 3000-4999 kW	kW	4068	4716	46,149	$2.32940	$107,501	48,547	$2.2347	$108,489
Street Lighting	kW	4068	4716	2,861	$1.52680	$4,367	2,831	$1.4647	$4,147
Sentinel Lighting	kW	4068	4716	131	$1.55870	$204	130	$1.4954	$194
Unmetered Scattered Load	kWh	4068	4716	632,192	$0.00610	$3,856	623,205	$0.0059	$3,647
Total				**113,966,544**		**$1,263,886**	**112,350,599**		**$1,204,202**

The Transmission Network charges are calculated in the OEB's RTSR model. The Rates are applied to the 2022 Load Forecast to determine the amount to be included in the Cost of Power. The RTSR model is filed in conjunction with this application. The transmission network charges included in the Cost of Power for 2022 is project at $1,446,226. The Transmission Connection charges are also calculated in the OEB's RTSR model and are projected to be $1,204,202. The rates are applied to the 2022 Load Forecast to determine the amount to be included in the Cost of Power. The RTSR model is filed in conjunction with this application.

Table 2.21: Wholesale Market Service

Wholesale Market Service (volumes for the bridge and test year are automatically loss adjusted)

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
Residential	kWh	4062	4708	78,686,508	$0.00300	$236,060	77,567,927	$0.0030	$232,704
General Service < 50 kW	kWh	4062	4708	34,321,724	$0.00300	$102,965	33,833,818	$0.0030	$101,501
General Service 50-2999 kW	kWh	4062	4708	109,673,475	$0.00300	$329,020	108,114,394	$0.0030	$324,343
General Service 3000-4999 kW	kWh	4062	4708	19,947,374	$0.00300	$59,842	19,663,809	$0.0030	$58,991
Street Lighting	kWh	4062	4708	1,117,307	$0.00300	$3,352	1,101,424	$0.0030	$3,304
Sentinel Lighting	kWh	4062	4708	45,724	$0.00300	$137	45,074	$0.0030	$135
Unmetered Scattered Load	kWh	4062	4708	632,192	$0.00300	$1,897	623,205	$0.0030	$1,870
Total				**244,424,304**		**$733,273**	**240,949,650**		**$722,849**

On December 10,2020, the OEB released Decision and Order for the Wholesale Market Service (WMS) and the Rural or Remote Electricity Rate Protection (RRRP) charges effective January 1, 2021. The Board's decision is summarized as follows:

- The WMS rate used by rate-regulated distributors to bill their customers shall be $0.003 per kilowatt-hour, effective January 1, 2020. For Class B customers, a CBR component of $0.0004 per kilowatt-hour shall be added to the WMS rate for a total of $0.0034 per kilowatt. For Class A customers, distributors shall bill the actual CBR costs to Class A customers in proportion to their contribution to the peak.

- The RRRP rate used by rate-regulated distributors to bill their customers shall be $0.0005 per kilowatt-hour, effective January 1, 2020.

Consistent with this order, LUI has applied the Board Approved WMS of $0.0030 rate to its 2022 Load Forecast to include $722,849 in its Cost of Power.

Table 2.22: Class A CBR

Class A CBR (volumes for the bridge and test year are automatically loss adjusted)

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
General Service 50-2999 kW	kWh			11,646,689	$0.00020	$2,329	11,527,353	$0.00020	$2,305
General Service 3000-4999 kW	kWh			4,986,844	$0.00020	$997	4,915,952	$0.00020	$983
Total				**16,633,532**		**$3,327**	**16,443,306**		**$3,289**

Table 2.23: Class B CBR

Wholesale Market Service - Class B CBR (volumes for the bridge and test year are automatically loss adjusted)

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
Residential	kWh	4062	4708	78,686,508	$0.00040	$31,475	77,567,927	$0.0004	$31,027
General Service < 50 kW	kWh	4062	4708	34,321,724	$0.00040	$13,729	33,833,818	$0.0004	$13,534
General Service 50-2999 kW	kWh	4062	4708	109,673,475	$0.00040	$43,869	108,114,394	$0.0004	$43,246
General Service 3000-4999 kW	kWh	4062	4708	19,947,374	$0.00040	$7,979	19,663,809	$0.0004	$7,866
Street Lighting	kWh	4062	4708	1,117,307	$0.00040	$447	1,101,424	$0.0004	$441
Sentinel Lighting	kWh	4062	4708	45,724	$0.00040	$18	45,074	$0.0004	$18
Unmetered Scattered Load	kWh	4062	4708	632,192	$0.00040	$253	623,205	$0.0004	$249
Total				**244,424,304**		**$97,770**	**240,949,650**		**$96,380**

Table 2.24: Remote Electricity Rate Protection

Rural Rate Protection (volumes for the bridge and test year are automatically loss adjusted)

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
Residential	kWh	4062	4730	78,686,508	$0.00050	$39,343	77,567,927	$0.00050	$38,784
General Service < 50 kW	kWh	4062	4730	34,321,724	$0.00050	$17,161	33,833,818	$0.00050	$16,917
General Service 50-2999 kW	kWh	4062	4730	109,673,475	$0.00050	$54,837	108,114,394	$0.00050	$54,057
General Service 3000-4999 kW	kWh	4062	4730	19,947,374	$0.00050	$9,974	19,663,809	$0.00050	$9,832
Street Lighting	kWh	4062	4730	1,117,307	$0.00050	$559	1,101,424	$0.00050	$551
Sentinel Lighting	kWh	4062	4730	45,724	$0.00050	$23	45,074	$0.00050	$23
Unmetered Scattered Load	kWh	4062	4730	632,192	$0.00050	$316	623,205	$0.00050	$312
Total				**244,424,304**		**$122,212**	**240,949,650**		**$120,475**

LUI has applied the Board Approved RRRP rate of $0.0005/kWh to its 2022 Load Forecast to include $120,475 in its Cost of Power.

Table 2.25: Smart Meter Entity

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Per bill	Amount	Volume	Rate ($/kWh)	Amount
Residential	kWh			9,497	$0.79000	$90,027	9,611	$0.7900	$91,111
General Service < 50 kW	kWh			1,140	$0.79000	$10,812	1,148	$0.7900	$10,878
Total				**10,637**		**$100,839**	**10,758**		**$101,990**

LUI has applied the Board Approved SME charge of $0.79 per customer per month to its 2022 Customer Forecast to include $101,990 in its Cost of Power.

Table 2.26: Low Voltage Charges

Low Voltage Charges to be added to power supply expense for bridge and test year

Customer Class Name		Revenue	Expense	2021			2022		
		USoA#	USoA#	Volume	Rate ($/kWh)	Amount	Volume	Rate ($/kWh)	Amount
Residential	kWh	4075	4750	78,686,508	$0.00140	$110,161	77,567,927	$0.0074	$573,914
General Service < 50 kW	kWh	4075	4750	34,321,724	$0.00120	$41,186	33,833,818	$0.0066	$223,023
General Service 50-2999 kW	kW	4075	4750	276,979	$0.49330	$136,634	274,141	$2.6567	$728,317
General Service 3000-4999 kW	kW	4075	4750	46,149	$0.58190	$26,854	48,547	$3.1336	$152,128
Street Lighting	kW	4075	4750	2,861	$0.38140	$1,091	2,831	$2.0539	$5,815
Sentinel Lighting	kW	4075	4750	45,724	$0.38930	$17,800	45,074	$2.0969	$94,515
Unmetered Scattered Load	kWh	4075	4750	632,192	$0.00150	$948	623,205	$0.0082	$5,114
Total				**114,012,137**		**$334,675**	**$112,395,543**		**$1,782,826**

LUI incurs low voltage charges from Hydro One and is embedded to Hydro One. In Exhibit 8, LUI proposes low voltage service rates. LUI applied the 2020 kW charged by Hydro One and allocated the charge based on Transmission-Connection revenue by rate class. LUI has estimated the low voltage charge to be an average of 2017 to 2020.

Table 2.27: OESP

	2021			2022	
Customer Class Name	**RPP**	**OER Credit**	**Customer Class Name**	**RPP**	**OER Credit**
Residential	$8,644,153	($1,832,560)	Residential	$8,843,746	($1,874,874)
General Service < 50 kW	$3,715,627	($787,713)	General Service < 50 kW	$3,788,582	($803,179)
General Service 50-2999 kW	$11,864,516	($2,515,277)	General Service 50-2999 kW	$12,108,187	($2,566,936)
General Service 3000-4999 kW	$2,167,664	($459,545)	General Service 3000-4999 kW	$2,235,182	($473,859)
Street Lighting	$118,542	($25,131)	Street Lighting	$120,153	($25,472)
Sentinel Lighting	$18,207	($3,860)	Sentinel Lighting	$75,662	($16,040)
Unmetered Scattered Load	$69,381	($14,709)	Unmetered Scattered Load	$71,285	($15,112)
Total	**$26,598,091**	**($5,638,795)**	**Total**	**$27,242,798**	**($5,775,473)**

2.2.2 CAPITAL EXPENDITURES

Included in this section are:

1. Distribution System Plan
2. Capital Expenditure Summary and Variance Analysis
3. New Policy Options for Funding Capital
4. Addition of ACM/ICM Assets to Rate Base
5. Capitalization Policy
6. Capitalization of Overhead
7. Costs of Eligible Investments for Distributors
8. Service Quality

2.2.2.1 DISTRIBUTION SYSTEM PLAN

LUI's DSP describes how LUI's proposed capital investments for the 2022-2026 period are informed by its asset management process, considering of the OEB's Renewed Regulatory Framework, coordination with third parties, the results of customer engagement, and the findings of the Asset Condition Assessment. The DSP is co-authored by LUI staff and METSCO, who also completed an Asset Condition Assessment.

In accordance with section 2.2.2.1 of the filing requirements, LUI has filed its DSP as a stand-alone document, included in Appendix B. LUI's Asset Condition Assessment is included in Appendix A.

2.2.2.2 CAPITAL EXPENDITURES SUMMARY AND VARIANCE ANALYSIS

Table 2.14 above provides a summary of the capital expenditures over the past five historical years, including the 2017 OEB-Approved amount, as well as the Bridge Year, and the Test Year.

Included in Table 2.28 to 2.33 is explanations of year-over-year variances and an explanation of the variance between the 2017 OEB-approved capital expenditure amount compared to the actual expenditures for the year.

Table 2.28: 2017 Board Approved vs 2017 Actual

Description	2017 Board Approved	2017 Actual	Variance - $	Variance - %
Gross Assets				
Distribution Equipment	23,874,985	24,540,909	665,924	2.79%
Transmission Stations	4,546,415	5,376,595	830,180	18.26%
Systems Equipment	616,430	734,916	118,486	19.22%
Land and Buildings	1,442,834	1,477,587	34,753	2.41%
Vehicles	1,469,767	1,567,534	97,767	6.65%
Computer Assets	863,110	860,251	(2,859)	(0.33%)
Other Assets	724,318	730,565	6,247	0.86%
Contributed Capital	(3,053,879)	(3,325,223)	(271,344)	8.89%
Total	30,483,980	31,963,134	1,479,154	4.85%
Accumulated Depreciation				
Distribution Equipment	9,635,064	9,397,814	(237,250)	(2.46%)
Transmission Stations	2,038,420	2,058,548	20,128	0.99%
Systems Equipment	135,933	152,909	16,976	12.49%
Land and Buildings	302,759	304,180	1,421	0.47%
Vehicles	1,056,485	1,113,719	57,234	5.42%
Computer Assets	684,016	681,106	(2,910)	(0.43%)
Other Assets	416,815	413,113	(3,702)	(0.89%)
Contributed Capital	(1,058,122)	(1,067,306)	(9,184)	0.87%
Total	13,211,370	13,054,085	(157,285)	(1.19%)
Net Book Value				
Distribution Equipment	14,239,921	15,143,095	903,174	6.34%
Transmission Stations	2,507,995	3,318,046	810,051	32.30%
Systems Equipment	480,497	582,006	101,509	21.13%
Land and Buildings	1,140,075	1,173,407	33,332	2.92%
Vehicles	413,282	453,815	40,533	9.81%
Computer Assets	179,094	179,145	51	0.03%
Other Assets	307,503	317,453	9,950	3.24%
Contributed Capital	(1,995,757)	(2,257,917)	(262,160)	13.14%
Total	17,272,610	18,909,049	1,636,439	9.47%
Work-in-Progress (CWIP)	50,000	53,398	3,398	6.80%

The overall difference between the 2017 Board Approved amount and the actual 2017 amount is $1,479,154, an increase of 4.85%. The major variances are:

Distribution Equipment: $665,924

- Multiple overhead rebuilds were completed in 2017 (Daintry Crescent, Ewing Street, Mackechnie Crescent, Willow Crescent, and James St.). The projects related to replacement of existing overhead infrastructure which has reached its end of life 4.16kV to 27.6kV conversion, and the elimination of Kerr St. Station F20 feeder.

Transmission Stations: $830,180

- Completion of the Durham St. substation was more than expected, as well there was additional costs associated with the Victoria St. substation rebuild. Both projects included the replacement of existing oil re-closers, primary feeder cables, 4kV riser poles, 44kV termination pole, and station transformer. The existing oil reclosers were replaced with new solid di-electric reclosers with electronic relaying as well as SCADA monitoring and control. The station transformers had reached its end of life and Lakefront had seen an increased in unplanned costs creating reliability issues.

Systems Equipment: $118,486

- Lakefront began the process of implementing an outage management system (OMS). The OMS system has the coordinates of every smart meter and transformer within LUI's service territory and is able to identify specific areas that are disconnected due to an outage. The information will also be pushed onto Lakefront's website, social media, and Lakefront's mobile application to inform and update customers in real time regarding response and estimated restoration time.

Vehicles: $97,767

- Lakefront's 2017 Cost of Service included the purchase of a bucket truck in 2016 of $280,000 and the replacement of a service truck in 2017 of $35,000. The actual vehicle replacements were as follows:
  - Purchase of a new Chevrolet Volt for $34,569 in 2016
  - Replacement of a service vehicle for $40,795 in 2017
  - Purchase of a new bucket truck for $335,009 in 2017

  Consequently, the increase of $97,767 is due to the purchase of the Chevrolet Volt of $34,569 and the difference between the planned vs actual capital expenditure of the bucket truck of $55,009.

Table 2.29: 2017 Actual vs 2018 Actual

Description	2017 Actual	2018 Actual	Variance - $	Variance - %
Gross Assets				
Distribution Equipment	24,540,909	25,587,623	1,046,714	4.27%
Transmission Stations	5,376,595	5,376,595	0	0.00%
Systems Equipment	734,916	774,447	39,532	5.38%
Land and Buildings	1,477,587	1,492,653	15,066	1.02%
Vehicles	1,567,534	1,605,443	37,909	2.42%
Computer Assets	860,251	882,818	22,567	2.62%
Other Assets	730,565	758,706	28,140	3.85%
Contributed Capital	(3,325,223)	(3,684,075)	(358,852)	10.79%
Total	31,963,134	32,794,210	831,076	2.60%
Accumulated Depreciation				
Distribution Equipment	9,397,814	10,108,705	710,890	7.56%
Transmission Stations	2,058,548	2,164,376	105,827	5.14%
Systems Equipment	152,909	209,224	56,315	36.83%
Land and Buildings	304,180	336,105	31,925	10.50%
Vehicles	1,113,719	1,283,015	169,295	15.20%
Computer Assets	681,106	626,120	(54,986)	(8.07%)
Other Assets	413,113	482,559	69,447	16.81%
Contributed Capital	(1,067,306)	(1,144,179)	(76,873)	7.20%
Total	13,054,085	14,065,925	1,011,840	7.75%
Net Book Value				
Distribution Equipment	15,143,095	15,478,918	335,824	2.22%
Transmission Stations	3,318,046	3,212,219	(105,827)	(3.19%)
Systems Equipment	582,006	565,223	(16,783)	(2.88%)
Land and Buildings	1,173,407	1,156,548	(16,859)	(1.44%)
Vehicles	453,815	322,429	(131,386)	(28.95%)
Computer Assets	179,145	256,698	77,553	43.29%
Other Assets	317,453	276,146	(41,306)	(13.01%)
Contributed Capital	(2,257,917)	(2,539,896)	(281,979)	12.49%
Total	18,909,049	18,728,285	(180,764)	(0.96%)
Work-in-Progress (CWIP)	53,398	177,782	124,384	232.94%

The overall difference between the 2017 Actual amount and the actual 2018 amount is $830,076, an increase of 2.60%. The major variances are:

Distribution Equipment: $1,046,715

- Additional capital upgrades of because of Bell Fibe installations. Lakefront staff performed capital upgrades as requested by Bell during the installation of Fibe throughout Cobourg. The capital upgrades were contributed capital.

- Overhead rebuilds were completed in 2018 (Westwood Drive, King St. – Victoria St. to Kensington St, Colborne). Westwood Dr was related to replacement of existing OH infrastructure, and 4.16kV to 27.6kV conversion. King St. – Victoria St to Kensington St was related to replacement of existing overhead infrastructure which had reached its end of life. The circuits on King St are the only tie points between the two stations in Colborne, further increasing the importance of the upgrade.

Contributed Capital: ($358,852)

- Contributed capital associated with Bell Fibe installations.

Table 2.30: 2018 Actual vs 2019 Actual

Description	2018 Actual	2019 Actual	Variance - $	Variance - %
Gross Assets				
Distribution Equipment	25,587,623	26,745,359	1,157,736	4.52%
Transmission Stations	5,376,595	5,376,595	0	0.00%
Systems Equipment	774,447	774,447	0	0.00%
Land and Buildings	1,492,653	1,501,001	8,348	0.56%
Vehicles	1,605,443	1,489,073	(116,371)	(7.25%)
Computer Assets	882,818	856,978	(25,840)	(2.93%)
Other Assets	758,706	738,584	(20,122)	(2.65%)
Contributed Capital	(3,684,075)	(3,820,965)	(136,890)	3.72%
Total	32,794,210	33,661,071	866,861	2.64%
Accumulated Depreciation				
Distribution Equipment	10,108,705	10,823,450	714,745	7.07%
Transmission Stations	2,164,376	2,270,203	105,827	4.89%
Systems Equipment	209,224	266,527	57,303	27.39%
Land and Buildings	336,105	368,264	32,159	9.57%
Vehicles	1,283,015	1,330,547	47,532	3.70%
Computer Assets	626,120	483,653	(142,467)	(22.75%)
Other Assets	482,559	513,448	30,889	6.40%
Contributed Capital	(1,144,179)	(1,227,248)	(83,070)	7.26%
Total	14,065,925	14,828,844	762,919	5.42%
Net Book Value				
Distribution Equipment	15,478,918	15,921,909	442,991	2.86%
Transmission Stations	3,212,219	3,106,392	(105,827)	(3.29%)
Systems Equipment	565,223	507,920	(57,303)	(10.14%)
Land and Buildings	1,156,548	1,132,737	(23,811)	(2.06%)
Vehicles	322,429	158,525	(163,903)	(50.83%)
Computer Assets	256,698	373,325	116,627	45.43%
Other Assets	276,146	225,135	(51,011)	(18.47%)
Contributed Capital	(2,539,896)	(2,593,716)	(53,820)	2.12%
Total	18,728,285	18,832,227	103,942	0.55%
Work-in-Progress (CWIP)	177,782	479,662	301,880	169.80%

The overall difference between the 2018 actual amount and the actual 2019 amount is $866,861, an increase of 2.64%. The major variances are:

Distribution Equipment: $1,157,736

- Completion of overhead rebuilds for Albert St. (Hibernia St. to Third St.), Albert St. (Bagot St. to Hibernia St.), University Avenue, and King St. (Colborne). The projects involved the replacement of existing underground infrastructure which had reached its end of life and the requirement to reduce loading on Orr St. Station for contingency. The projects also converted the existing infrastructure to be supplied from the preferred 27.6 kV distribution system.

- Inspections of poles and comprehensive data collection provided Lakefront with a better understanding of the conditions of poles throughout its service territory. Based on pole testing, Lakefront removed poles that were deemed hazardous, replacing specific poles as required versus rebuilding the whole line.

Vehicles: ($116,371)

- During 2019, Lakefront reviewed assets that were fully amortized and no longer in use. The assets had a net book value of nil, have the cost and accumulated amortization were removed on the capital asset continuity schedule and adjusted in the general ledger. The credit of $116,371 is the result of the review of vehicles that were fully amortized and had previously been eliminated from assets.

Contributed Capital: ($136,890)

- Increase mainly due to additional underground primary work completed on Orr St., Munroe St. and 116 Veronica St. which were customer-initiated projects and therefore contributed capital.

Table 2.31: 2019 Actual vs 2020 Actual

Description	2019 Actual	2020 Actual	Variance - $	Variance - %
Gross Assets				
Distribution Equipment	26,745,359	28,741,921	1,996,563	7.47%
Transmission Stations	5,376,595	5,399,402	22,807	0.42%
Systems Equipment	774,447	825,273	50,825	6.56%
Land and Buildings	1,501,001	1,509,514	8,513	0.57%
Vehicles	1,489,073	1,489,073	0	0.00%
Computer Assets	856,978	876,565	19,587	2.29%
Other Assets	738,584	749,053	10,470	1.42%
Contributed Capital	(3,820,965)	(4,089,197)	(268,233)	7.02%
Total	33,661,071	35,501,603	1,840,532	5.47%
Accumulated Depreciation				
Distribution Equipment	10,823,450	11,609,343	785,893	7.26%
Transmission Stations	2,270,203	2,367,594	97,391	4.29%
Systems Equipment	266,527	326,372	59,844	22.45%
Land and Buildings	368,264	400,592	32,328	8.78%
Vehicles	1,330,547	1,420,682	90,135	6.77%
Computer Assets	483,653	542,767	59,114	12.22%
Other Assets	513,448	572,603	59,155	11.52%
Contributed Capital	(1,227,248)	(1,315,382)	(88,134)	7.18%
Total	14,828,844	15,924,570	1,095,726	7.39%
Net Book Value				
Distribution Equipment	15,921,909	17,132,578	1,210,669	7.60%
Transmission Stations	3,106,392	3,031,808	(74,583)	(2.40%)
Systems Equipment	507,920	498,901	(9,019)	(1.78%)
Land and Buildings	1,132,737	1,108,922	(23,815)	(2.10%)
Vehicles	158,525	68,390	(90,135)	(56.86%)
Computer Assets	373,325	333,798	(39,527)	(10.59%)
Other Assets	225,135	176,450	(48,685)	(21.62%)
Contributed Capital	(2,593,716)	(2,773,815)	(180,099)	6.94%
Total	18,832,227	19,577,033	744,806	3.95%
Work-in-Progress (CWIP)	479,662	816,879	337,217	70.30%

The overall difference between the actual 2019 amount and the actual 2020 amount is $1,840,532, an increase of 5.47%. The major variances are:

Distribution Equipment: $1,996,563

- Completion of Pebble Beach: The project was the replacement of existing backyard constructed underground infrastructure which had reached its end of life, the requirement to reduce loading on Orr St. station for contingency, converting from 4.16kV to 27.6kV system and the elimination of the Kerr St. substation.

- Based on pole testing and asset condition assessment, Lakefront removed poles that were end of life and deemed hazardous.

- Completion of the 44kV right of way for Kerr St. – Division St to D'Arcy St. The project was initiated by the Town of Cobourg and is considered contributed capital.

Contributed Capital: $268,233

- Increase mainly due to funds received from the Town of Cobourg for completion of the 44kv right of way for Kerr St. – Division St to D'Arcy St.

Table 2.32: 2020 Actual vs 2021 Bridge Year

Description	2020 Actual	2021 Bridge Year	Variance - $	Variance - %
Gross Assets				
Distribution Equipment	28,741,921	30,022,421	1,280,500	4.46%
Transmission Stations	5,399,402	5,613,902	214,500	3.97%
Systems Equipment	825,273	774,448	(50,825)	(6.16%)
Land and Buildings	1,509,514	1,519,514	10,000	0.66%
Vehicles	1,489,073	1,599,073	110,000	7.39%
Computer Assets	876,565	914,065	37,500	4.28%
Other Assets	749,053	759,053	10,000	1.34%
Contributed Capital	(4,089,197)	(4,189,197)	(100,000)	2.45%
Total	35,501,603	37,013,278	1,511,675	4.26%
Accumulated Depreciation				
Distribution Equipment	11,609,343	12,435,359	826,017	7.12%
Transmission Stations	2,367,594	2,467,621	100,027	4.22%
Systems Equipment	326,372	378,909	52,537	16.10%
Land and Buildings	400,592	433,088	32,496	8.11%
Vehicles	1,420,682	1,484,621	63,938	4.50%
Computer Assets	542,767	603,139	60,372	11.12%
Other Assets	572,603	626,681	54,078	9.44%
Contributed Capital	(1,315,382)	(1,408,119)	(92,737)	7.05%
Total	15,924,570	17,021,298	1,096,728	6.89%
Net Book Value				
Distribution Equipment	17,132,578	17,587,062	454,483	2.65%
Transmission Stations	3,031,808	3,146,281	114,473	3.78%
Systems Equipment	498,901	395,539	(103,362)	(20.72%)
Land and Buildings	1,108,922	1,086,426	(22,496)	(2.03%)
Vehicles	68,390	114,452	46,062	67.35%
Computer Assets	333,798	310,927	(22,872)	(6.85%)
Other Assets	176,450	132,372	(44,078)	(24.98%)
Contributed Capital	(2,773,815)	(2,781,078)	(7,263)	0.26%
Total	19,577,033	19,991,980	414,947	2.12%
Work-in-Progress (CWIP)	816,879	380,000	(436,879)	(53.48%)

The overall difference between the actual 2020 amount and the 2021 Bridge Year amount is $1,511,675, an increase of 4.26%. The major variances are:

Distribution Equipment: $1,280,500

- Completion of King St. East – College St. to D'Arcy St. The poles and transformers reached end of life and the current 4.16 kV being reconstructed to 27.6 kV standard. The capital work also facilitates the continuation of the 4.16 kV to 27.6 kV voltage conversion program, the installation of 20 new poles and remove 26 existing poles, and replacement of 4 pole mounted transformers.

- Victoria Street Station – Station Egress. The capital work corrects the current aerial trespass without easement on next-door property. Further, the existing two pole lines are being consolidated into one pole line and to correct a safety hazard where 44 kV circuits are currently constructed under 27.6 kV circuits. The capital work provides room for future planned feeder egress as well as updating the critical feeder circuits for reliability improvement.

- Victoria Street – Station to Ontario. The capital work includes replacement of existing poles at end of life. Further, the existing two pole lines are being consolidated into one pole line and corrects a safety hazard where 44 kV circuits are currently constructed under 27.6 kV circuits.

Transmission Stations: $214,500

- Completion of the Elgin St. – D'Arcy St. to Birchwood Road capital project. The project will replace the overhead assets and includes an allocation of capital work related to transmission stations.

Vehicles: $110,000

- The 2021 increase of $110,000 is due to the replacement of a 2012 pickup truck and a 2008 dump truck. Both vehicles are fully amortized and repairs and maintenance have increased significantly for both vehicles.

Contributed Capital: $100,000

- The increase in contributed capital in 2021 is an estimate based on the prior years' average annual contributed capital amount.

Table 2.33: 2021 Bridge Year vs 2022 Test Year

Description	2021 Bridge Year	2022 Test Year	Variance - $	Variance - %
Gross Assets				
Distribution Equipment	30,022,421	31,842,421	1,820,000	6.06%
Transmission Stations	5,613,902	5,693,902	80,000	1.43%
Systems Equipment	774,448	774,448	0	0.00%
Land and Buildings	1,519,514	1,529,514	10,000	0.66%
Vehicles	1,599,073	1,599,073	0	0.00%
Computer Assets	914,065	954,065	40,000	4.38%
Other Assets	759,053	769,053	10,000	1.32%
Contributed Capital	(4,189,197)	(4,289,197)	(100,000)	2.39%
Total	37,013,278	38,873,278	1,860,000	5.03%
Accumulated Depreciation				
Distribution Equipment	12,435,359	13,198,327	762,967	6.14%
Transmission Stations	2,467,621	2,570,920	103,300	4.19%
Systems Equipment	378,909	433,857	54,947	14.50%
Land and Buildings	433,088	465,697	32,610	7.53%
Vehicles	1,484,621	1,518,282	33,661	2.27%
Computer Assets	603,139	666,578	63,440	10.52%
Other Assets	626,681	672,943	46,262	7.38%
Contributed Capital	(1,408,119)	(1,503,356)	(95,237)	6.76%
Total	17,021,298	18,023,248	1,001,950	5.89%
Net Book Value				
Distribution Equipment	17,587,062	18,644,095	1,057,033	6.01%
Transmission Stations	3,146,281	3,122,981	(23,300)	(0.74%)
Systems Equipment	395,539	340,591	(54,947)	(13.89%)
Land and Buildings	1,086,426	1,063,816	(22,610)	(2.08%)
Vehicles	114,452	80,791	(33,661)	(29.41%)
Computer Assets	310,927	287,487	(23,440)	(7.54%)
Other Assets	132,372	96,111	(36,262)	(27.39%)
Contributed Capital	(2,781,078)	(2,785,841)	(4,763)	0.17%
Total	19,991,980	20,850,030	858,050	4.29%
Work-in-Progress (CWIP)	380,000	380,000	0	0.00%

The overall difference between the 2021 Bridge Year amount and the 2022 Test Year amount is $1,860,000, an increase of 5.03%. The major variances are:

Distribution Equipment: $1,820,000

- As part of its Overhead Replacement program, LUI plans to replace overhead assets which exhibit signs of deterioration consistent with end-of-life criteria as defined by the utility’s asset management standards. Over a five-year period beginning in 2021, LUI plans to replace existing overhead infrastructure on Elgin St. in Cobourg that has reached end of life and is in poor condition. This project is the second phase of a five-phase program to replace all overhead infrastructure along Elgin Street. It will address the assets from Birchwood to Chipping Park. The project is aimed at maintaining the safety and reliability of the distribution system while mitigating the cost impacts to customers.

- As part of its Overhead Replacement program, LUI plans to replace overhead assets which exhibit signs of deterioration consistent with end-of-life criteria as defined by the utility's asset management standards. This project is the second phase of a two-year program with some replacement work being undertaken in 2021. It will address the assets from 25-89 Parliament Street. The project is aimed at maintaining the safety and reliability of the distribution system while mitigating the cost impacts to customers.

- As part of its Overhead Renewal Programs, LUI plans to replace existing overhead infrastructure on Victoria St in Colborne that has reached end-of-life and is in poor condition, with an increased risk of failure. The project addresses overhead assets from King Street to Arthur Street. This is a main circuit line out of Victoria St Station and is the only line which has a feeder tie to Durham St Station. The project is aimed at maintaining the safety and reliability of the distribution system while mitigating the cost impacts to customers.

Transmission Stations: $80,000

- The increase is due to the Brook F5 feeder and Kerr St. Right of Way Pole Line. The project replaces the existing poles on Kerr St. Right of Way that have reached end-of-life. The project will allow Lakefront to utilize the full station capacity from the Brook Road Substation, in the event of a loss of a feeder and also allow for partially offloading Victoria Station transformer which is in poor condition.

Contributed Capital: $100,000

- The increase in contributed capital in 2022 is an estimate based on the prior years average annual contributed capital amount.

Table 2.34 (OEB Appendix 2-AB) below provides a summary of historical capital expenditures for the past five years. The table is categorized into the DSP categories.

Table 2.34: OEB Appendix 2-AB

2022

CATEGORY	Historical Period (previous plan[1] & actual)														
	2017			2018			2019			2020			2021		
	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual[2]	Var
	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%
System Access	180	400	122.2%	120	215	79.2%	120	223	85.8%	180	51	-71.7%	200	100	-50.0%
System Renewal	1,220	1,620	32.8%	1,420	480	-66.2%	1,100	827	-24.8%	970	591	-39.1%	1,470	745	-49.3%
System Service	250	33	-86.8%	75	40	-46.7%	120	-	-100.0%	50	1,109	2118.0%	50	550	1000.0%
General Plant	120	105	-12.5%	155	96	-38.1%	430	71	-83.5%	500	89	-82.2%	200	168	-16.0%
TOTAL EXPENDITURE	1,770	2,158	21.9%	1,770	831	-53.1%	1,770	1,121	-36.7%	1,700	1,840	8.2%	1,920	1,563	-18.6%
Capital Contributions			--			--			--			--			--
Net Capital Expenditures			--			--			--			--			--
System O&M	$ 745	$ 835	12.1%	$ 797	$ 991	24.3%	$ 853	$ 986	15.6%	$ 912	$ 1,057	15.9%	$ 976	$ 975	-0.1%

Forecast Period (planned)				
2022	2023	2024	2025	2026
$ '000				
75	318	244	330	336
1,200	1,131	869	1,173	1,195
525	315	242	327	333
60	131	574	135	138
1,860	1,895	1,929	1,965	2,002
100	-			
1,860	1,894	1,929	1,965	2,002
$ 1,020	$ 1,039	$ 1,058	$ 1,078	$ 1,098

2.2.2.3 POLICY OPTIONS FOR THE FUNDING OF CAPITAL

LUI is not proposing any special or different approach to funding its capital expenditures.

2.2.2.4 ADDITION OF ACM/ICM ASSETS TO RATE BASE

LUI has not historically applied for a rate adder to recover an investment through the OEB's Advanced Capital Module (ACM) or Incremental Capital Module (ICM). As such, section 2.2.2.4 of the Filing Requirements is not applicable.

2.2.2.5 CAPITALIZATION POLICY

LUI's capitalization policy is in accordance with the use of modified IFRS accounting basis and has not changed since its last Cost of Service in 2017. LUI's capitalization policy has been provided in Appendix C.

2.2.2.6 CAPITALIZATION OF OVERHEAD

In accordance with the move to "modified IFRS" accounting basis effective January 1, 2013, indirect overhead costs, such as general and administrative costs that are not directly attributable to an asset, are no longer being capitalized.

As outlined in 2.2.2.6, where internal resources are used in the construction of an asset, labour is charged to capital at a fully loaded (or burden) labour rate. LUI uses direct wages, employee benefits, and directly attributable overhead costs to calculate the fully loaded labour rates. These rates are then used in the allocation of labour to both OM&A and PP&E. The following table shows the average percentages applied to base wages for employee benefits and directly attributable overhead costs.

Table 2.35: Burden Costs

Year	Burden Rate
2016 Actual	91%
2017 Actual	88%
2018 Actual	83%
2019 Actual	79%
2020 Actual	60%
2021 Bridge Year	80%
2022 Test Year	80%

The primary driver fluctuations in the burden rates are a trend in increasing pension and post-retirement benefit costs.

Indirect overhead costs, such as general and administration costs that are not directly attributable to an asset, are not, nor have they ever been capitalized. As such, Appendix 2-D is not applicable.

2.2.2.7 COSTS OF ELIGIBLE INVESTMENTS FOR THE CONNECTION OF QUALIFYING GENERATION FACILITIES

LUI attests that it has not included any costs or included any Investments to Connect Qualifying Generation Facilities in its capital costs or in its Distribution System Plan. As such, details of any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement are not applicable in this case.

LUI is not considering incremental conservation initiatives in order to defer or avoid future infrastructure projects as part of distribution system planning processes nor is it planning on applying for funding through distribution rates to pursue activities such as energy efficiency programs, demand response programs, energy storage programs, generation facility, etc. Accordingly, Appendices 2-FA through 2-FC of the Excel version of the Chapter 2 Appendices filed with the Application contain zero values.

While LUI is not forecasting the above types of investments at this time, LUI will consider "non-wires solutions" when evaluating project alternatives, as discussed in the DSP.

2.2.2.8 SERVICE QUALITY

LUI records and reports annually on the Service Quality Requirements and System Reliability Indicators listed in Sections 2.1.4.1 and 2.1.4.2 of the OEB's Electricity Reporting and Record Keeping Requirements. LUI's 2016-2020 results are populated in Appendix 2-G of the Chapter 2 Appendices and are reproduced in Table 2.36 and 2.37 below.

LUI's performance and targets with respect to all OEB scorecard and other measures are discussed in detail in Exhibit #1, Section 5 of the Business Plan, and Section 2.3 of the DSP.

Table 2.36: OEB App 2-G ESQR Results

Indicator	OEB Minimum Standard	2016	2017	2018	2019	2020
Low Voltage Connections	90.00%	98.50%	99.44%	98.99%	97.57%	91.17%
High Voltage Connections	90.00%	N/A	N/A	N/A	N/A	N/A
Telephone Accessibility	65.00%	91.20%	91.95%	95.47%	94.10%	82.27%
Appointments Met	90.00%	99.00%	100.00%	99.09%	100.00%	100.00%
Written Response to Enquiries	80.00%	87.80%	100.00%	100.00%	98.97%	96.69%
Emergency Urban Response	80.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Emergency Rural Response	80.00%	N/A	N/A	N/A	N/A	N/A
Telephone Call Abandon Rate	10.00%	0.60%	0.25%	3.93%	1.05%	0.62%
Appointment Scheduling	90.00%	96.20%	96.65%	98.65%	97.01%	97.13%
Rescheduling a Missed Appointment	100.00%	N/A	N/A	N/A	N/A	N/A
Reconnection Performance Standard	85.00%	95.70%	100.00%	100.00%	100.00%	100.00%
Micro-embedded Generation Facilities	90.00%	100.00%	100.00%	100.00%	N/A	N/A

LUI's historical ESQR results have consistently met or exceeded the OEB minimum standard. In the 2016 to 2020 period, LUI did not connect any high voltage services, did not receive emergency calls in urban areas, and did not miss any appointments. As a result, the measures are reports as N/A. All results in Table 2.36 are consistent with LIU's 2.1.4.1 RRR filings and the three Service Quality metrics included in LUI's scorecard.

Table 2.37: OEB App 2-G SAIDI and SAFI Results

Year	Includes outages cuased by loss of supply		Excludes outages caused by loss of supply	
	SAIDI	SAIFI	SAIDI	SAIFI
2016	0.67	0.37	0.67	0.37
2017	0.45	0.18	0.32	0.17
2018	0.53	0.27	0.32	0.12
2019	3.39	1.51	0.76	0.68
2020	6.57	2.64	4.69	1.54

A detailed discussion of LUI's historical reliability performance, reliability trending, and discussion of Major Event Days is provided in Section 2.3.1.3 of the DSP.

The SAIDI and SAIFI results included in LUI's historical ESQR results have consistently met or exceeded the OEB minimum standard from 2016 to 2019. Although SAIDI and SAIFI for 2020 exceeded Lakefront's Distributor target, Lakefront's 2020 SAIDI and SAIFI are below industry average. Further, Lakefront experienced two major outages in July 2020 as a result of defective equipment at its Victoria St. station substation and its Brook Rd. substation. Excluding both major outages, Lakefront's 2020 SAIDI and SAIFI results are 0.30 and 0.35, respectively,

APPENDIX

Appendix A	Asset Condition Assessment
Appendix B	Distribution System Plan
Appendix C	Capitalization Policy

APPENDIX A – ASSET CONDITION ASSESSMENT

METSCO

MAKING IT POSSIBLE

<page left blank intentionally>

Lakefront Utilities Inc.

ASSET CONDITION ASSESSMENT FINAL REPORT 2020

Prepared by

METSCO MAKING IT POSSIBLE

METSCO Report no. 19-229-001-R0

April 22, 2020

Disclaimer

This 2020 report has been prepared by METSCO Energy Solutions Inc. ("METSCO") for Lakefront Utilities Inc. ("LUI"). Neither LUI, nor METSCO, nor any other person acting on their behalf makes any warranty, expressed or implied, or assumes any legal responsibility for the accuracy of any information or for the completeness or usefulness of any process disclosed or results presented, or accepts liability for the use, or damages resulting from the use, thereof. Any reference in this report to any specific process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement or recommendation by LUI or METSCO.

Asset Condition Assessment Report 2020

Final Report

April 2020

Experts:

Kurtis Martin-Sturmey, P.Eng.
Project Lead, Engineering & Planning

Expert Support: **Shanon Lo**
Analyst, Asset Management Analytics

Approved By:

Robert Otal, P.Eng.
Director, Asset Management & Analytics

Revision History

2020-04-22	R0	Final	SL	KMS	RO
2020-03-16	D1	Issued for Review	SL	KMS	RO
Date	**Rev.**	**Status**	**By**	**Checked**	**Approval**

Executive Summary

Context of the Study

Lakefront Utilities Inc. ("LUI") is an electricity distributor operating a system made up of 7 substations and over 210 km of medium-voltage distribution lines delivering electricity to approximately 10,000 residential and commercial customers in the Town of Cobourg and Village of Colborne. LUI engaged METSCO Energy Solutions Inc. ("METSCO") to prepare a comprehensive Asset Condition Assessment ("ACA") study for the assets comprising LUI's distribution system. The ACA is required as one of the key inputs for the preparation of LUI's five-year Distribution System Plan ("DSP"), developed in accordance with the filing requirements for electricity distributors enacted by the Ontario Energy Board ("OEB").

Scope of the Study

METSCO's work included interviews with LUI subject matter experts to define the Health Indices appropriate for the asset types, review and consolidation of the client's data sets, analysis of LUI's asset records to calculate the Health Index values, and preparation of the final document. In total METSCO assessed and calculated Health Index values for the following asset classes:

- Distribution Wood Poles
- Distribution Concrete Poles
- Distribution Composite Poles
- Overhead Primary Conductors
- Underground Primary Cables
- Distribution Transformers
- Distribution Switchgear
- Overhead Switches
- Station Power Transformers
- Station Switchgears
- Station Circuit Breakers
- Station Switches
- Station Service Transformers
- Station Battery Banks and Chargers
- Station Power Cables
- Station Facilities

All asset condition data used in the study is maintained by LUI as part of its regular asset management practices. The ACA results are based on condition data recorded by LUI and its contractors up to the end of March 2020. This information was provided to METSCO between December 2019 and April 2020.

Methodology and Findings

For all asset classes that underwent assessment, METSCO used a consistent scale of asset health from Very Good to Very Poor. The numerical Health Index ("HI") corresponding to each condition category serves as an indicator of an asset's remaining life, expressed as a percentage. Table 0-1 presents the HI ranges corresponding to each condition score, along with their corresponding implications as to the follow-up actions required by the asset manager at LUI.

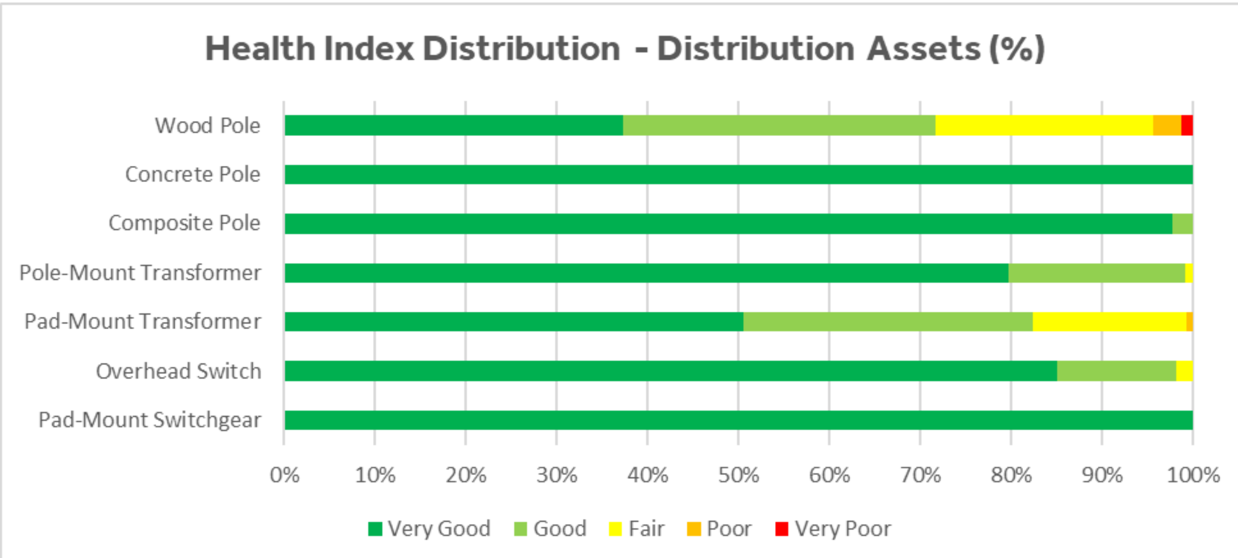
Table 0-1: Health Index Ranges and Corresponding Implications for the Asset Condition

Health Index Score (%)	Condition	Description	Implications
[85-100]	Very Good	Some evidence of aging or minor deterioration of a limited number of components	Normal Maintenance
[70-85)	Good	Significant Deterioration of some components	Normal Maintenance
[50-70)	Fair	Widespread significant deterioration or serious deterioration of specific components	Increase diagnostic testing; possible remedial work or replacement needed depending on the unit's criticality
[30-50)	Poor	Widespread serious deterioration	Start the planning process to replace or rehabilitate, considering the risk and consequences of failure
[0-30)	Very Poor	Extensive serious deterioration	The asset has reached its end-of-life; immediately assess risk and replace or refurbish based on assessment

Using this scale, METSCO calculated the HI for every asset in the scope of the assessment using the applicable and available "condition parameters" – individual characteristics of the state of an asset's components. Each condition parameter has its own sub-scale of assessment and a weighting contribution that represents the percentage in the overall HI made up by the particular parameter. METSCO's findings for each asset class were developed using this methodology, as described in more detail in Section 3 and Section 4.

The consolidated results of the ACA for distribution assets are summarized in Figure 0-1. The HI is not calculated for any distribution asset with a Data Availability Indicator ("DAI") less than 70% (i.e., less than 70% of the condition parameters – by weight – are available for that asset). The HI results for assets with a known HI were divided into ten-year bands and extrapolated to the unknown set within those bands.

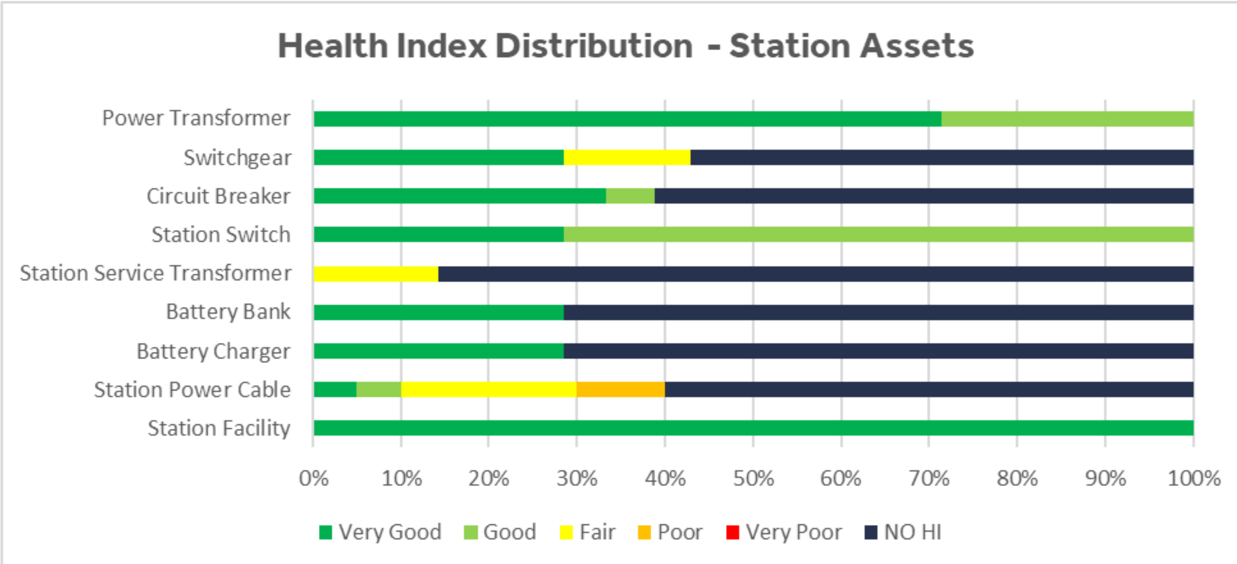
Figure 0-1: Distribution Asset Health Index Results



As Figure 0-1 indicates, the majority of LUI's distribution assets falls into the condition category of Fair or better condition. There are, however, a number of wood poles and pad-mount transformers found to be in Poor or Very Poor condition which should be assessed for replacement or refurbishment.

Figure 0-2 summarizes the ACA results for LUI's station assets. Due to the much smaller asset population compared to distribution assets, the HI results for station assets are not extrapolated when the DAI is insufficient to calculate a valid HI. As such, the DAI threshold use for station assets is 65% and several assets in Figure 0-2 do not meet this threshold.

Figure 0-2: Station Asset Health Index Results



As Figure 0-2 indicates, almost all of LUI's station assets fall into Fair condition or better, with the exception of two station power cables rated as Poor condition.

Table 0-2 presents the numerical HI summary for each asset class. The HI distribution is based on the total population count of a given asset class. For each asset class, the population, average HI, average DAI, and HI distribution are listed.

Table 0-2: Asset Condition Assessment Overall results

Asset Class	Population	Health Index Distribution (%)						Average Health Index	Average DAI
		Very Good	Good	Fair	Poor	Very Poor	No HI		
Distribution Assets									
Wood Pole	2925	37.39%	34.26%	23.99%	3.09%	1.26%		79.11%	73.78%
Concrete Pole	28	100.00%	0.00%	0.00%	0.00%	0.00%		95.16%	100.00%
Composite Pole	185	97.84%	2.16%	0.00%	0.00%	0.00%		94.16%	100.00%
Overhead Primary Conductor	147 km	Age Only							22.70%
Underground Primary Cable	60 km	Age Only							1.88%
Pole-Mount Transformer	630	79.68%	19.57%	0.75%	0.00%	0.00%		91.45%	89.76%
Pad-Mount Transformer	534	50.61%	31.83%	16.92%	0.65%	0.00%		85.78%	60.37%
Overhead Switch	1635	85.06%	13.15%	1.79%	0.00%	0.00%		89.97%	83.57%
Pad-Mount Switchgear	18	100.00%	0.00%	0.00%	0.00%	0.00%		100.00%	100.00%
Station Assets									
Power Transformer	7	71.43%	28.57%	0.00%	0.00%	0.00%	0.00%	88.26%	86.73%
Switchgear	7	28.57%	0.00%	14.29%	0.00%	0.00%	57.14%	84.62%	42.86%
Circuit Breaker	18	33.33%	5.56%	0.00%	0.00%	0.00%	61.11%	94.76%	32.41%
Station Switch	7	28.57%	71.43%	0.00%	0.00%	0.00%	0.00%	81.17%	84.00%
Service Transformer	7	0.00%	0.00%	14.29%	0.00%	0.00%	85.71%	68.75%	19.64%
Battery Bank	7	28.57%	0.00%	0.00%	0.00%	0.00%	71.43%	100.00%	28.57%
Battery Charger	7	28.57%	0.00%	0.00%	0.00%	0.00%	71.43%	95.83%	29.87%
Station Power Cable	20	5.00%	5.00%	20.00%	10.00%	0.00%	60.00%	56.88%	61.00%
Station Facility	7	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	100.00%

LUI's Current Health Index Maturity and Continuous Improvement

Overall, LUI's asset data collection practices are sufficiently robust to enable calculation of the recommended ACA that is consistent with industry best practices. LUI would benefit from enhanced documentation of its asset inspection and maintenance practices using mobile workforce tools connected to a Centralized Maintenance Management System.

In certain cases, such as underground primary cable and overhead distribution transformers, there are opportunities for LUI to introduce additional variables that can provide further insight into the degradation level of a given asset class. For example, there remain a few instances where select recommended parameter data is not collected or is not available across a large enough portion of the population, resulting in certain condition parameters being excluded from the formulation. However, such instances represent relative exceptions rather than the rule, enabling METSCO to classify LUI's HI formulation as being closely aligned with best practices.

While the existing framework provides LUI with a significant volume of data, certain procedural and technological enhancements could further the granularity of its asset condition data and facilitate calculation of a greater proportion of numerical degradation scores. To this end, Section 5 of this study includes a set of METSCO's recommendations for incremental data collection enhancements that LUI can consider going forward based on its assessment of their relative cost-benefit tradeoffs. METSCO prioritized the individual items according to the significance of the additional insights they would enable LUI to generate.

In providing these recommendations, METSCO is cognizant of the fact that regulated utilities are facing cost constraints across numerous facets of their operations, while contending with the effects of aging infrastructure, changing climate, evolving customer needs, and many other priorities. As such, an adoption of any incremental enhancement to the existing asset data collection practices must be grounded in management's assessment of the incremental value of such enhancements, relative to the opportunity cost of advancements elsewhere in the utility's operations. METSCO makes this observation to highlight its position that the sole fact of a gap between a utility's current process state and the industry best practices need not necessarily indicate that an action to remedy that gap is required in short order.

Table of Contents

List of Figures

List of Tables

1 Introduction

METSCO Energy Solutions Inc. ("METSCO") is an industry expert in Asset Condition Assessment ("ACA") and Asset Management ("AM") practices due to our extensive experience in conducting ACAs, developing AM plans, and implementing AM frameworks for transmission and distribution utilities across North America. METSCO's collective record of experience in these areas is among the most extensive in the world, with our AM frameworks gaining acceptance across multiple regulatory jurisdictions. A selection of METSCO's past projects is attached as Appendix A to this report.

Lakefront Utilities Inc. ("LUI") is an electricity distributor operating in the Town of Cobourg and Village of Colborne. LUI engaged METSCO to prepare a comprehensive ACA study for the assets comprising LUI's electrical system. The ACA is required as one of the key inputs for the preparation of LUI's five-year Distribution System Plan, prepared in accordance with the filing requirements enacted by the Ontario Energy Board ("OEB"). The study's primary objective is to objectively determine the condition of LUI's assets as a key step in the capital expenditure process for renewal investments. Supplementary objectives include preparing the ACA results to be used for LUI's upcoming rate filing as well as to continuously improve LUI's AM framework.

A unique ACA methodology is applied to each asset class deployed within LUI's system. The adoption of the ACA methodology requires identifying end-of-life criteria for various components associated with each asset type, followed by periodic asset inspections and recording of asset condition to identify the assets most at risk at reaching the end-of-life criteria over the planning horizon. Each criterion represents a factor that is influential, to a specific degree, in determining an asset's (or its component's) condition relative to its potential failure. These components and tests are weighted based on their importance in determining the assets' end-of-life.

The assets covered in the report include the following major asset classes:

- Distribution Wood Poles
- Distribution Concrete Poles
- Distribution Composite Poles
- Overhead Primary Conductors
- Underground Primary Cables
- Distribution Transformers
- Distribution Switchgear
- Overhead Switches
- Station Power Transformers

- Station Switchgears
- Station Circuit Breakers
- Station Switches
- Station Service Transformer
- Station Battery Banks and Chargers
- Station Power Cables
- Station Facilities

All the asset condition data is maintained by LUI as part of its regular AM and maintenance practices. All condition information was collected by LUI and its contractors up to the end of November 2019. This data was transmitted to METSCO between December 2019 and March 2020 to complete the ACA.

The report is organized into six sections including this introductory section:

- Section 2 summarizes the ISO 5500X AM standards, discusses how the ACA fits into the overall AM framework; and provides an overview of METSCO's ACA methodology;
- Section 3 summarizes the asset Health Index ("HI") calculation methodology;
- Section 4 provides the Condition Assessment methodology framework and assessment for each of the identified asset classes;
- Section 5 provides METSCO's conclusions; and
- Section 6 summarizes METSCO's recommendations for LUI on data collection improvements for continuous improvement efforts for the ACA.

2 Context of the ACA within AM Planning

The ACA is a key step in developing an asset replacement strategy. By evaluating the current set of available data related to the condition of in-service assets comprising an organization's asset portfolio, condition scores for each asset are determined. The ACA involves the collection, consolidation, and utilization of the results within an organizational AM framework for the purposes of objectively quantifying and managing the risks of its asset portfolio. The level of degradation of an asset, its configuration within the system, and its corresponding likelihood of failure feed directly into the risk evaluation process, which identifies asset candidates for intervention (i.e., replacement or refurbishment). Assets are then grouped into program and project scopes that are evaluated and prioritized.

The ACA is designed to provide insights into the current state of an organization's asset base, the risks associated with identified degradation, approaches to managing this degradation within the current AM framework, and how to best make use of these results to extract the optimal value from the asset portfolio going forward.

2.1 International Standards for AM

The following paragraphs serve as a brief introduction to the ISO standards and provide a brief overview of the applicability of AM standards within an entity.

The industry standard for AM planning is outlined in the ISO 5500X series of standards, which encompass ISO 55000, ISO 55001, and ISO 55002. Each business entity finds itself at one of the three main stages along the AM journey:

1. Exploratory stage - entities looking to establish and set up an AM system;
2. Advancement stage - entities looking to realize more value from an asset base; and
3. Continuous improvement stage - those looking to assess and progressively enhance an AM system already in place for avenues of improvement.

Given that AM is a continuous journey, ISO 5500X remains continuously relevant within an organization; providing an objective, evidence-based framework against which the organizations can assess the managerial decisions relating to their purpose, operating context, and financial constraints over the different stages of their existence.[1]

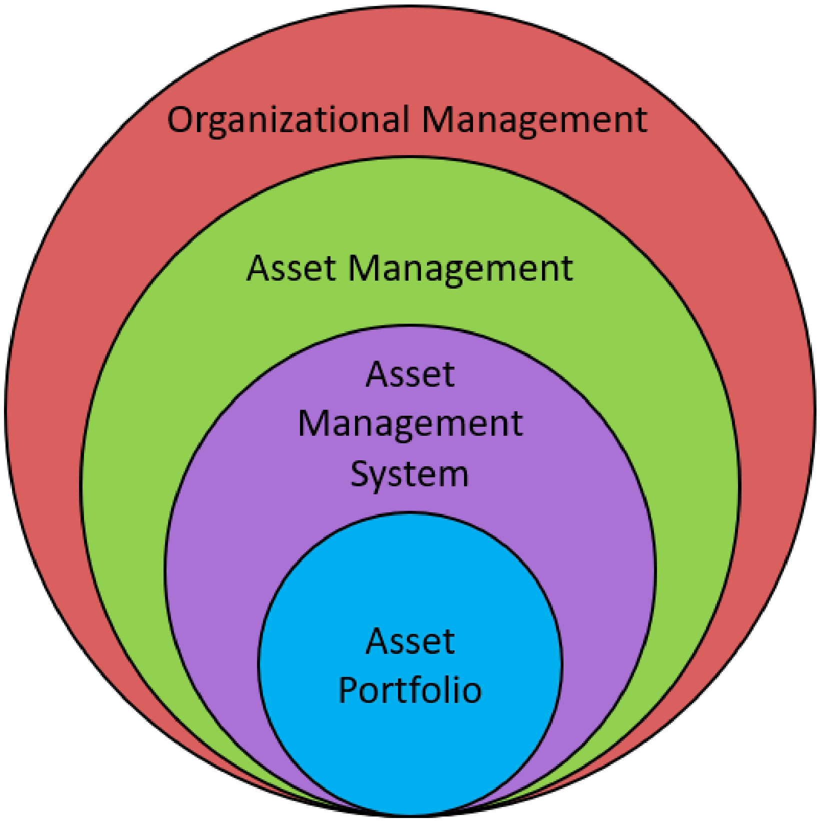
An asset is any item or entity that has a value to the organization. This can be actual or potential value, in a monetary or otherwise intangible sense (e.g., public safety). The hierarchy of an AM framework begins with the asset portfolio, containing all known information regarding the assets, sits as the fundamental core of an organization. The ACA

[1] ISO 55000 – Asset management – Overview, principles and terminology

is the procedure to turn the known condition information into actionable insights based on the level of deterioration.

Around the asset portfolio, the AM system operates and represents a set of interacting elements that establish the policy, objectives, and processes to achieve those objectives. The AM system is encompassed by the AM practices – coordinated activities of the organization to realize maximum value from its assets. Finally, the organizational management organizes and executes the underlying hierarchy.[1]

Figure 2-1: Relationship between key AM terms[1]



2.2 ACA within the AM Process

A well-executed AM strategy hinges on the ability of an organization to classify its assets via comprehensive and extensive data and data collection procedures. This includes but is not limited to: the collection and storage of technical specifications, historical asset performance, projected asset behaviour and degradation, the configuration of an asset or asset-group within the system, the operational relationship of one asset to another, etc. In this way, AM systems should be focused on the techniques and procedures in which data can be most efficiently extracted and stored from its asset base to allow for further analysis and insights to be made. With more asset data on hand, better and more informed decisions can be made to realize greater benefits and reduce the risk across the asset portfolio managed by an organization.[2]

AM is fundamentally grounded in a risk-based evaluation of continued value. The overarching goal of an AM process it to quantify all assets risk by their probability and impact (where possible) and then look to minimize these risks through AM operations and procedures. The ACA quantifies the condition of each asset under study and is an appropriate indicator of its failure probability. Making asset replacement decisions directly based on the ACA results constitutes a condition-based intervention strategy.

AM practices can help quantify and drive strategic decisions. A better understanding of the asset portfolio and how it is performing within an organization will allow for optimal decision-making. This is largely due to best AM practices being a fundamentally risk-based approach, which lends it to be a structured framework for creating financial plans driven by data. AM practices should also have goals in mind when framing asset investments, changes in asset configuration, or acquisition of new assets. This can include better technical compliance, increased safety, increased reliability, or increased financial performance of the asset base. ISO 55002 states explicitly that all asset portfolio improvements should be assessed via a risk-based approach prior to being implemented.[2] The criticality of the asset determines its failure impact. A risk-based asset intervention strategy should consider both the probability and impact in the decision-making process.

2.3 Continuous Improvement in the AM Process

The application of rigorous AM processes can produce multiple types of benefits for an organization including, but not limited to: realized financial profits, better classified and managed risk among assets, better-informed investment decisions, demonstrated compliance among the asset base, increased public and worker safety, and corporate sustainability.[1]

AM processes are ideally integrated throughout the entire organization. This requires a well-documented AM framework that is shared between all relevant agents. In this way, the organization stands to benefit the most from its internal resources, whether it be via technical experts, those operating and maintaining the assets or those with an understanding of the financial operations and constraints on the organization as a whole. As a future-state goal, utilities and other organizations alike should strive to document their AM guiding principles within a Strategic Asset Management Plan ("SAMP"). The SAMP should be used as a guide for the organization to apply its AM principles and practices for its specific use case. Distribution of the SAMP should be well-publicized within an organization and updated on a regular basis, in order to best quantify the most current and

[2] ISO 55002 – Asset management – Management systems – Guidelines for the application of ISO 55001

comprehensive AM practices being implemented. Just as the asset base performance is subject to an in-depth review, the AM process and system should be reviewed with the same rigor.[1]

AM should be regarded as a fluid process. Adopting a framework and an idealized set of practices does not bind the organization or restrict its agency. With time, the goal of any AM system is to continually improve and realize benefits within the organization through better management of its asset portfolio. Continually improved asset data and data collection procedures, updated SAMPs, and further integration into all aspects of an organization's activities as it grows and changes over time should be the goal of any AM framework.[2]

3 Asset Condition Assessment Methodology

3.1 METSCO's Project Execution

METSCO's execution path in completing the ACA study can be is a four-phase procedure:

1. *Initial information gathering*: including initial interviews with LUI staff to investigate system configuration and the prominence of certain asset classes, establish the range of available condition data sources at the beginning of the engagement, and confirm the key assumptions regarding these factors with LUI subject matter experts through a series of interviews.

2. *Database construction* – activities to construct a single database of condition-related information for each LUI asset class using the provided data sources. This includes consolidation of LUI's asset inspection records, databases containing results of technical tests performed by LUI contractors, and the entire database from the Geographic Information System ("GIS").

3. *HI and Data Availability Index ("DAI") calculation* – upon confirming the integrity of its condition dataset along with the accuracy of assumptions made in its preparation, METSCO calculated the Health Indices and DAI for all asset classes. Additional data sources were requested from LUI to improve the accuracy of the asset health calculation if applicable.

4. *Results Reporting* – the final phase of the project scope was the creation of the ACA report.

3.2 Data Sources

To assess the demographics and establish the unit population of LUI's system assets, METSCO was provided with LUI's asset demographic data from its current Geographic Information System ("GIS"). These data came from LUI's corporate asset registries containing information on asset vintage, model, and year of commissioning. The database served as the primary asset library that contained asset nameplate information such as age and unique identifiers.

To assess the condition of LUI's system, METSCO was provided with available asset inspection and maintenance data for the asset classes in scope. Various sources hold records of LUI's inspection and maintenance activities. Most of these data came from primary sources such as equipment inspection forms completed by LUI staff or contractors, or the results of specific tests such as the Dissolved Gas Analysis ("DGA") for station power transformer oil.

Additionally, METSCO was provided with historical operating data for assets that require operating information for the HI calculation. An example of operating data used is the historical loading information for transformers.

3.3 Asset Condition Assessment Methodologies

Prior to completing an ACA, a methodology needs to be selected for the current entity. The four most common methodologies that can be employed to assess the condition of the system health include:

1. Additive models – asset degradation factors and scores are used to independently calculate a score for each individual asset, with the HI representing a weighted average of all individual scores from 0 to 100;
2. Gateway models – select parameters deemed to be most impactful on the asset's overall functionality act as "gates" to drive the overall condition of an asset, by effectively "deflating" the scores of other (less impactful) components;
3. Subtractive models – consider that a relatively Poor condition for any of several major assets within a broader system of assets could act as a sufficient justification to drive investments into the entire system; and
4. Multiplicative models – a HI that dynamically shifts the calculation towards specific degradation factors, if they are a leading indicator to show that an asset is failing.

The additive and gateway models are typically used for assessing individual assets, whereas the subtractive and multiplicative models are typically used for aggregate and composite system-level assessments. The latter models are still in an early stage and require extensive refinement and validation to confirm their applicability. The gateway model assigns gates to criteria or asset subcomponents which are difficult or expensive to replace and maintain, and/or are known to be a major cause of asset malfunctioning. This methodology is commonly used in conjunction with the additive model for major assets such as wood poles, where a "gate" score will act to reduce the HI due to a low recorded score for a given criterion. For example, if the remaining strength of a wood pole is less than 60%, the final HI for that asset is halved.

In general, most distribution utilities employ an additive model with select gateway model elements. METSCO selected this approach when conducting the ACA, which is in alignment with most of LUI's peer utilities.

3.4 Overview of Selected Methodology

3.4.1 Condition Parameters

To calculate the HI for an asset, formulations are developed based on condition parameters that can be expected to contribute to the degradation and eventual failure of that asset. A weight is assigned to each condition parameter to indicate the amount of influence the condition has on the overall health of the asset. Figure 3-1 exemplifies an HI formulation table.

Figure 3-1: HI Formulation Components

Degradation Factor:
The asset aging mechanisms, tests, or failure modes.

Condition Indicator Numerical Score:
The converted numerical score associated with the degradation factor, which corresponds directly with the indicator letter score.

Condition Max Score:
The highest obtainable Score for each degradation factor. (4 x Weight)

#	Degradation Factor	Weight	Condition Indicator Letter Score	Condition Indicator Numerical Score	Condition Max Score
1	Degradation Factor 1	4	A-E	4-0	16
2	Degradation Factor 2	6	A,C,E	4,2,0	24
3	Degradation Factor 3	6	A-E	4-0	24
				Asset Max Score	64

Condition Weight:
The impact of the condition with respect to asset failure and/or the safe operation of the asset. Higher impact results in higher weight

Condition Indicator Letter Score:
The letter grade associated with the degradation factor – this is typically captured from the raw inspection data.

Asset Max Score:
The highest numerical grade that can be assigned to the asset / asset class, given the associated degradation factors and weights.

Condition parameters of the asset are characteristic properties that are used to derive the overall HI. Condition parameters are specific and uniquely graded to each asset class. Additionally, some condition parameters can be comprised of sub-condition parameters. For example, the oil quality condition parameter for a station power transformer is based on multiple sub-condition parameters such as the acidity of the oil, its interfacial tension, dielectric strength, and water content.

The scale used to determine an asset's score for a condition parameter is called the "condition indicator". Each condition parameter is ranked from A to E and each rank corresponds to a numerical grade. In the above example, a condition score of 4 represents the best grade, whereas a condition score of 0 represents the worst grade.

A – 4 Best Condition
B – 3 Normal Wear
C – 2 Requires Remediation
D – 1 Rapidly Deteriorating
E – 0 Beyond Repair

3.4.2 Use of Age as a Condition Parameter

Some industry participants question the appropriateness of including age as a potential condition parameter for calculating asset HI values. At the core of the argument against the use of age in calculating asset condition is the notion that age implies a linear degradation path for an asset that does not always match the actual experience in the field.

While some assets lose their structural integrity faster than would be expected with the passage of time, others, such as those with limited exposure to natural environmental factors, or those that benefitted from regular predictive and corrective maintenance, may retain their original condition for a longer period of time than age-based degradation would imply.

In recognition of the argument as to the limitations of age-based condition scoring, METSCO limits the instances where it relies on only age as a parameter explicitly incorporated into the HI formulation. In some cases, however, the limited number of condition parameters available for calculation of asset health makes age a useful proxy for the important factors that the analysis would not otherwise capture. In other cases, such as when assessing condition of complex equipment containing a number of internal mechanical components that degrade with continuous operation and the state of which cannot be assessed without destructive testing, age represents an important component of asset health calculation irrespective of the number of other factors that may be available for analysis.

3.4.3 Final Health Index Formulation

The final HI, which is a function of the condition scores and weightings, is calculated based on the following formula:

$$HI = \left(\frac{\sum_{i=1} Weight_i * Numerical\ Grade_i}{Total\ Score}\right) x\ 100\%$$

Where *i* corresponds to the condition parameter number, and the HI is a percentage representing the remaining life of the asset.

A gating approach is used for condition parameters that have a significant influence on the health of an asset. If the condition parameter that has been flagged as a gating parameter is below a pre-defined threshold value, the overall HI is reduced by 50%. This approach enables utilities to efficiently flag severely degraded assets through identification of condition parameters acknowledged to be critical indicators of overall asset health.

3.4.4 Health Index Results

METSCO's assessment of asset condition uses a consistent five-point scale along the expected degradation path for every asset, ranging from Very Good to Very Poor. To assign each asset into one of the categories, METSCO constructs an HI formulation for each asset class, which captures information on individual degradation factors contributing to that asset's declining condition over time. Condition scores assigned to each degradation factor are also expressed as numerical or letter grades along with pre-defined scales. The final HI – expressed as a value between 0% and 100% - is a weighted sum of scores of individual degradation factors, with each of the five condition categories (Very Good, Good, Fair, Poor, Very Poor) corresponding to a numerical band. For example, the condition score of Very Good indicates assets with HI values between 100% and 85%, whereas assets found to be in a Very Poor condition score are those with calculated HI values between 0% and 30%. Generating an HI provides a succinct measure of the long-term health of an asset. Table 3-1 presents the HI ranges with the corresponding asset condition, its description as well as implications for maintaining, refurbishing or replacing the asset prior to failure.

Table 3-1: HI Ranges and Corresponding Asset Condition

HI Score (%)	Condition	Description	Implications
[85-100]	Very Good	Some evidence of aging or minor deterioration of a limited number of components	Normal Maintenance
[70-85)	Good	Significant Deterioration of some components	Normal Maintenance
[50-70)	Fair	Widespread significant deterioration or serious deterioration of specific components	Increase diagnostic testing; possible remedial work or replacement needed depending on the unit's criticality
[30-50)	Poor	Widespread serious deterioration	Start the planning process to replace or rehabilitate, considering the risk and consequences of failure
[0-30)	Very Poor	Extensive serious deterioration	The asset has reached its end-of-life; immediately assess risk and replace or refurbish based on assessment

3.5 Data Availability Index

To put the calculation of HI values into the context of available data, METSCO supplemented its HI findings with the calculation of the DAI: a measure of the availability of the condition parameter data for a specific asset weighted by each condition parameter to the HI score. The DAI is calculated by dividing the sum of the weights of the condition parameters available to the total weight of the condition parameters used in the HI formulation for the asset class. The formula is given by:

$$DAI = \left(\frac{\sum_{i=1} Weight_i * \alpha_i}{\sum_{i=1} Weight_i} \right) x\ 100\%$$

Where *i* corresponds to the condition parameter number and α is the availability of coefficient (=1 when data available =0 when data unavailable)

An asset with all condition parameter data available will have a DAI value of 100%, independent of the asset's HI score. Assets with a high DAI will correlate to HI scores that describe the asset condition with a high degree of confidence. For distribution assets – typified by relatively large asset populations – if the DAI for an asset is less than 70%, a valid HI cannot be calculated. The subset of distribution assets without a valid HI are assigned an extrapolated HI value using the valid HI results for assets within the same asset class and ten-year age band. Similarly for station assets – typified by relatively small asset populations – if the DAI for an asset is less than 65%, a valid HI cannot be calculated. HI results for station assets are not extrapolated due to the small population.

4 Health Index Formulations and Results

This section presents the developed HI formulation for each asset class, the calculated scores for HI results, and the data available to perform the study.

4.1 Distribution Assets

4.1.1 Wood Poles

Wood poles are an integral part of any distribution system. They are the support structures for overhead distribution system. The HI for wood poles is calculated by considering a combination of end-of-life criteria summarized in Table 4-1.

Table 4-1: Wood Pole HI Formulation

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Remaining Strength	8	A,B,C,D,E	4,3,2,1,0	32
Wood Rot	6	A,B,C,D,E	4,3,2,1,0	24
Mechanical Defects	4	A,B,C,D,E	4,3,2,1,0	16
Service Age	3	A,B,C,D,E	4,3,2,1,0	12
Out of Plumb	2	A,B,C,D,E	4,3,2,1,0	8
			Total Score	**92**

Wood, being a natural material, has degradation processes that are different from other assets in distribution systems. The most critical degradation process for wood poles involves biological and environmental mechanisms such as fungal decay, wildlife damage, and weather effects which can impact the mechanical strength of the pole. Any loss in the strength of the pole can present additional safety and environmental risks to the public and to LUI. The remaining strength condition parameter is a quantitative measurement that provides adequate evidence of the deterioration of the operational health of the asset.

The HI formulation for wood poles is a combination between the additive and gateway model; with the gateway applied to the remaining strength parameter. When the remaining strength for a pole is below 60%, the final HI for that pole is reduced by half. CSA standard C22.3 no. 1 requires that any pole with a remaining strength less than 60% of its design strength be replace or reinforced[3].

Additional condition parameters include service age, wood rot presence, mechanical defects, and the leaning of wood poles. A visual inspection record notes the degree of wood rot/decay developed on the pole's external surface, internal cross-section and cross-arm sections. The presence of wood rot signifies there is a high moisture content surrounding

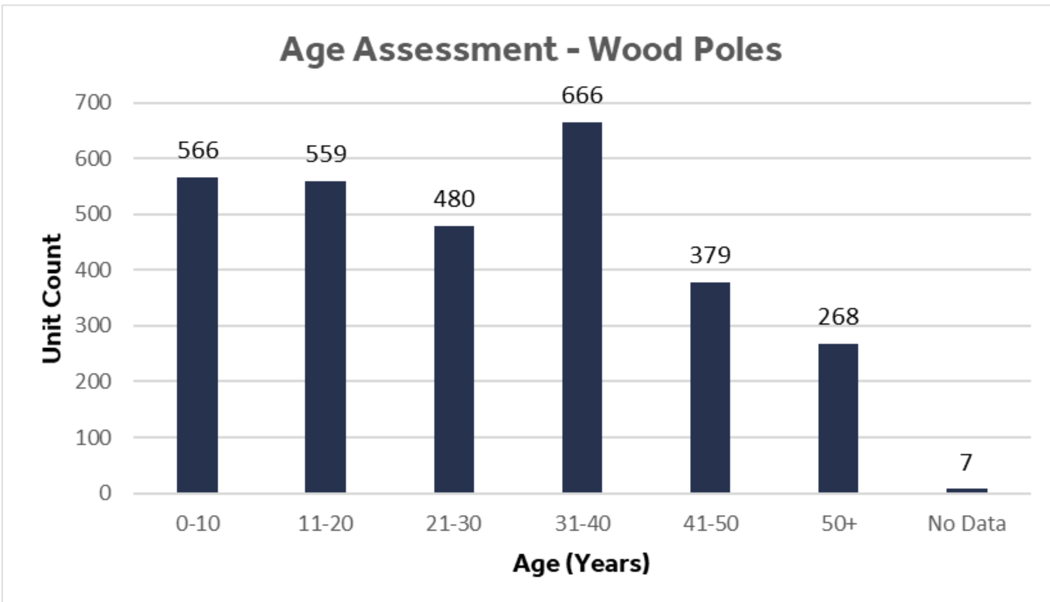
[3] *Overhead Systems*, CAN/CSA C22.3 No.1-15, 2015

the pole and impacts the pole's strength. Additionally, visual inspections note for the following mechanical defects found on wood poles:

- Grounding issues;
- Crossarm issues; and
- Cracking.

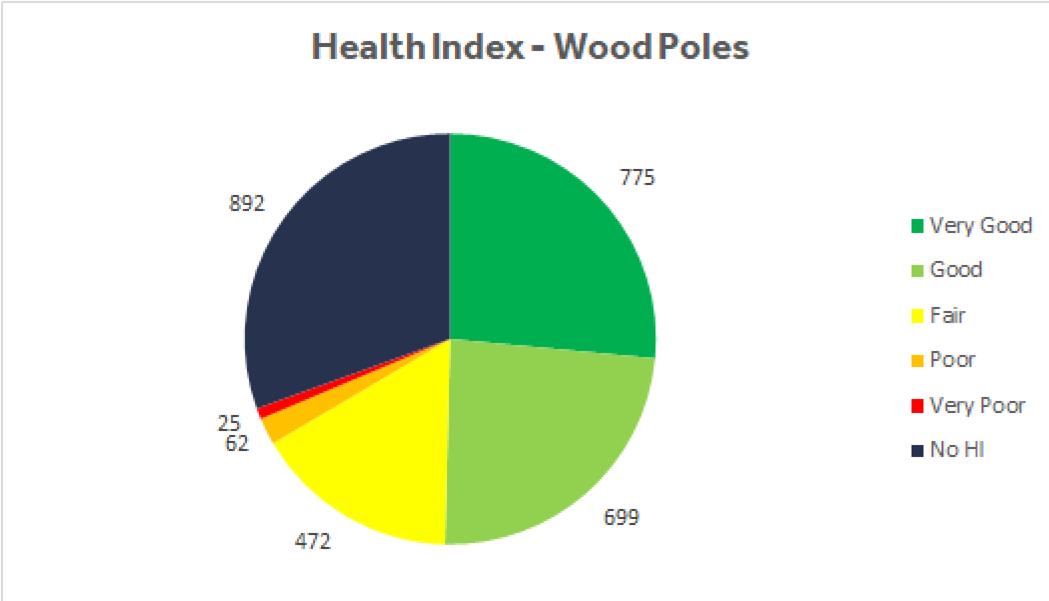
LUI owns 2,925 wood poles within its service territory. Installation date is known for nearly 100% of the total in-service population. Figure 4-1 presents the age distribution for in-service wood poles.

Figure 4-1: Wood Poles Age Demographics



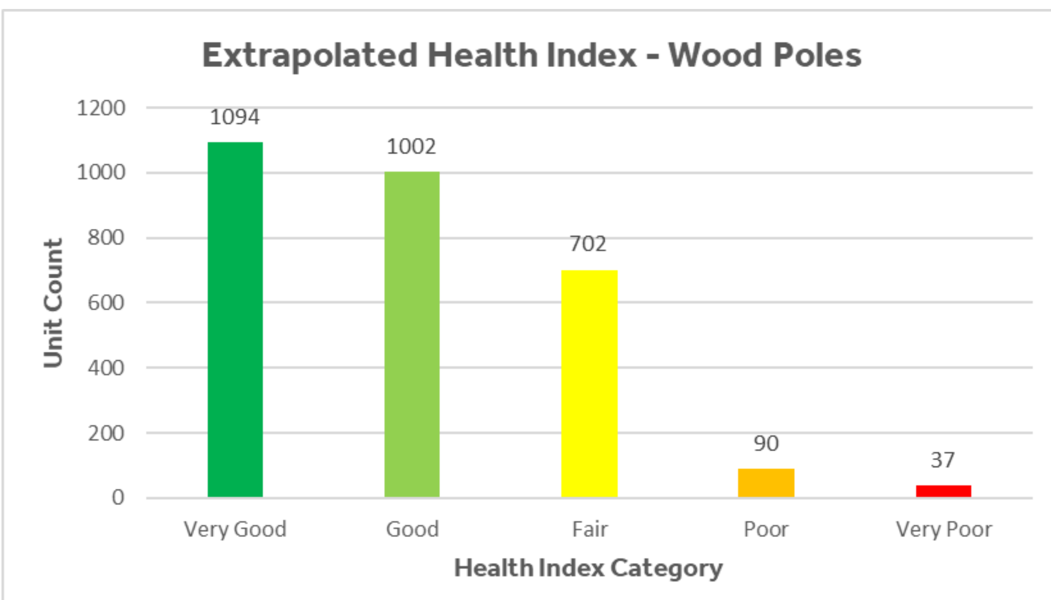
LUI's pole maintenance and nameplate data were used to calculate the HI based on the criteria provided in Table 4-1. As shown in Figure 4-2, a valid HI was calculated for 69% of the wood poles.

Figure 4-2: Wood Pole HI Results



To complete the full analysis, the HI for the remaining 31% of poles has been extrapolated based on the HI distribution with a valid HI score within each ten-year age group. The overall extrapolated HI distribution for wood poles is presented in Figure 4-3. Most of the poles are in Very Good or Good condition with less than 5% of the total population being in Poor or Very Poor condition.

Figure 4-3: Extrapolated Wood Pole HI Results



4.1.2 Concrete Poles

Like wood poles, concrete poles support the overhead distribution system. Concrete poles have a significantly greater strength than typical wood poles and have a longer service life. However, concrete poles are very heavy and are costlier to transport and install, hence fewer are in-service compared to wood poles. The HI for concrete poles is calculated by considering a combination of end-of-life criteria summarized in Table 4-2.

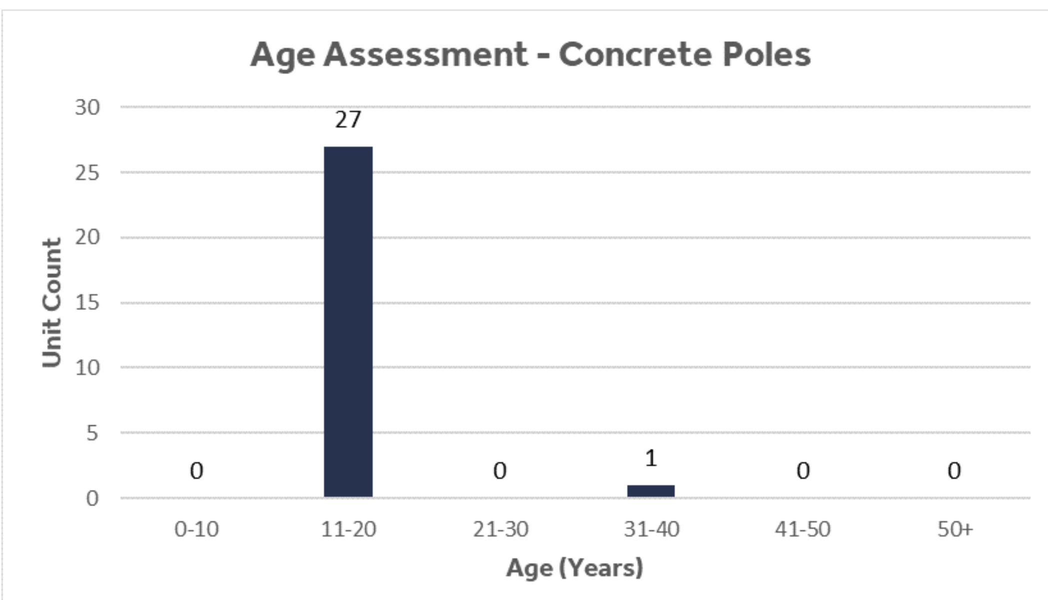
Table 4-2: Concrete Pole HI Formulation

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Rusting/Corrosion/Spalling	8	A,B,C,D,E	4,3,2,1,0	32
Defects	4	A,B,C,D,E	4,3,2,1,0	16
Service Age	3	A,B,C,D,E	4,3,2,1,0	12
Out of Plumb	3	A,B,C,D,E	4,3,2,1,0	12
			Total Score	**72**

Each condition parameter represents a factor critical in determining the asset's condition relative to a potential failure to occur. Aside from service age, condition parameters include defects and evidence of leaning for concrete poles. The HI formulation for concrete poles does not contain a quantitative measure of remaining strength as found with the wood poles. Hence, it is more dependent on visual inspection of defects. Visual inspections note defects related to grounding issues and cracking.

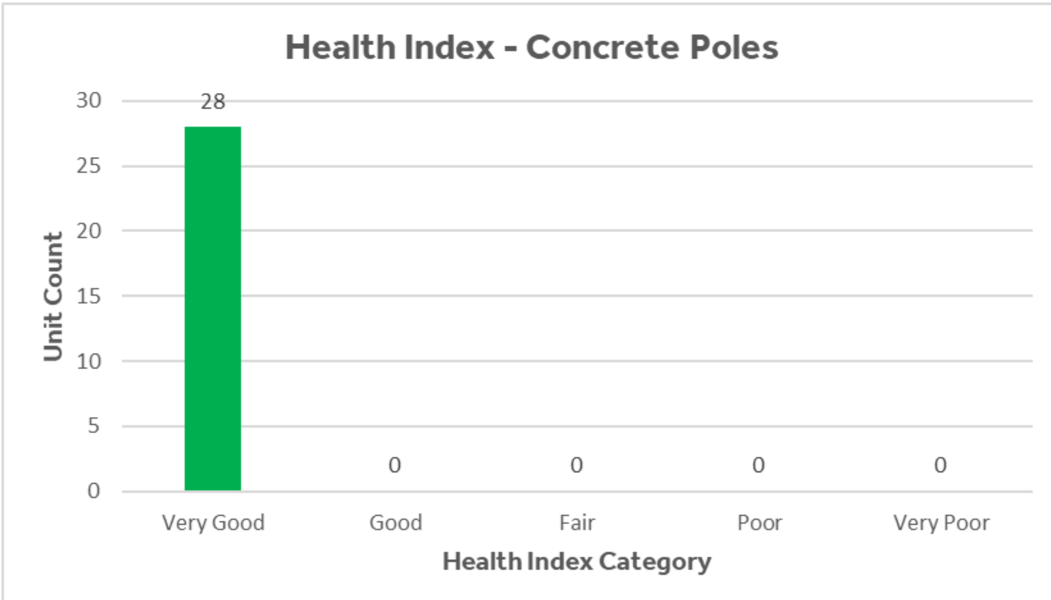
LUI owns 28 concrete poles within its service territory. The installation date is known for the total in-service population. Figure 4-4 presents the age distribution for concrete poles.

Figure 4-4: Concrete Pole Age Demographics



LUI's maintenance and nameplate information was used to calculate the Health Index based on the criteria provided in Table 4-2. The overall Health Index distribution for the concrete poles is presented in Figure 4-5. All the poles are in either Very Good condition.

Figure 4-5: Concrete Poles HI Results



4.1.3 Composite Poles

Like wood poles, composite poles support the overhead distribution system. The HI for concrete poles is calculated by considering a combination of end-of-life criteria summarized in Table 4-2.

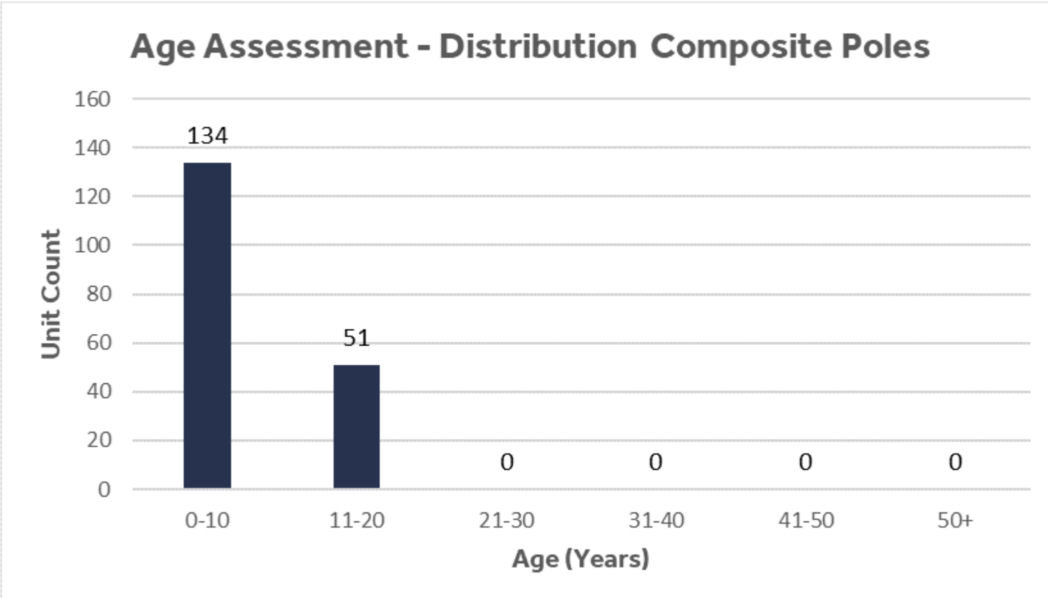
Table 4-3: Concrete Pole HI Formulation

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Defects	6	A,B,C,D,E	4,3,2,1,0	16
Service Age	3	A,B,C,D,E	4,3,2,1,0	12
Out of Plumb	2	A,B,C,D,E	4,3,2,1,0	12
			Total Score	**72**

Each condition parameter represents a factor critical in determining the asset's condition relative to a potential failure to occur. Aside from service age, condition parameters include defects and evidence of leaning for concrete poles. The HI formulation for composite poles does not contain a quantitative measure of remaining strength as found with the wood poles. Hence, it is more dependent on visual inspection of defects. Visual inspections note defects related to grounding issues and cracking.

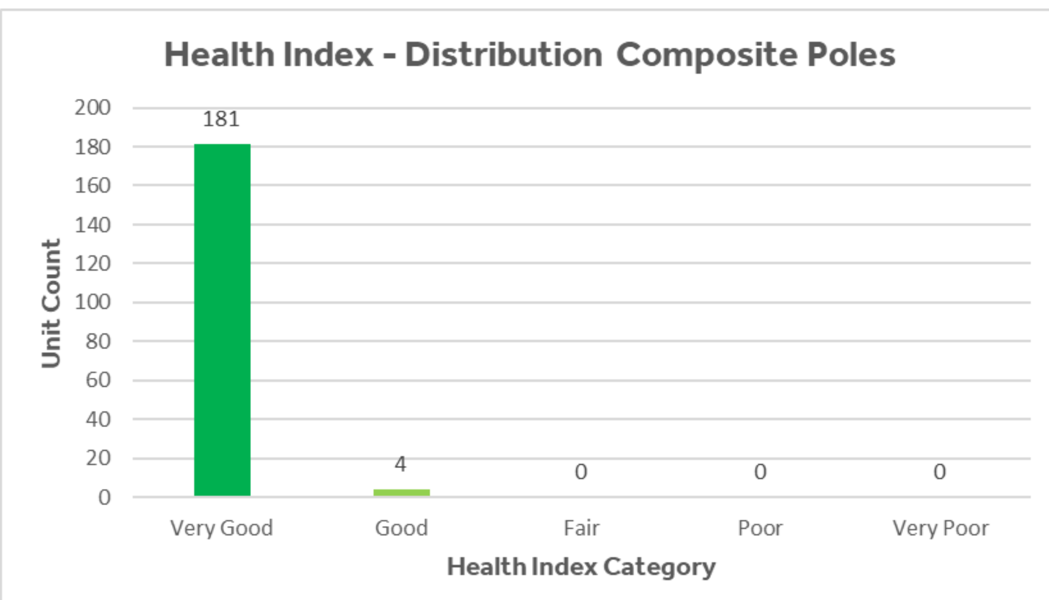
LUI owns 185 composite poles within its service territory. Installation date is known for the total in-service population. Figure 4-6 presents the age distribution for composite poles.

Figure 4-6: Composite Pole Age Demographics



LUI's maintenance and nameplate information was used to calculate the HI results based on the criteria provided in Table 4-2. The overall HI distribution for composite poles is presented in Figure 4-7. All are in either Very Good or Good condition.

Figure 4-7: Composite Poles HI Results

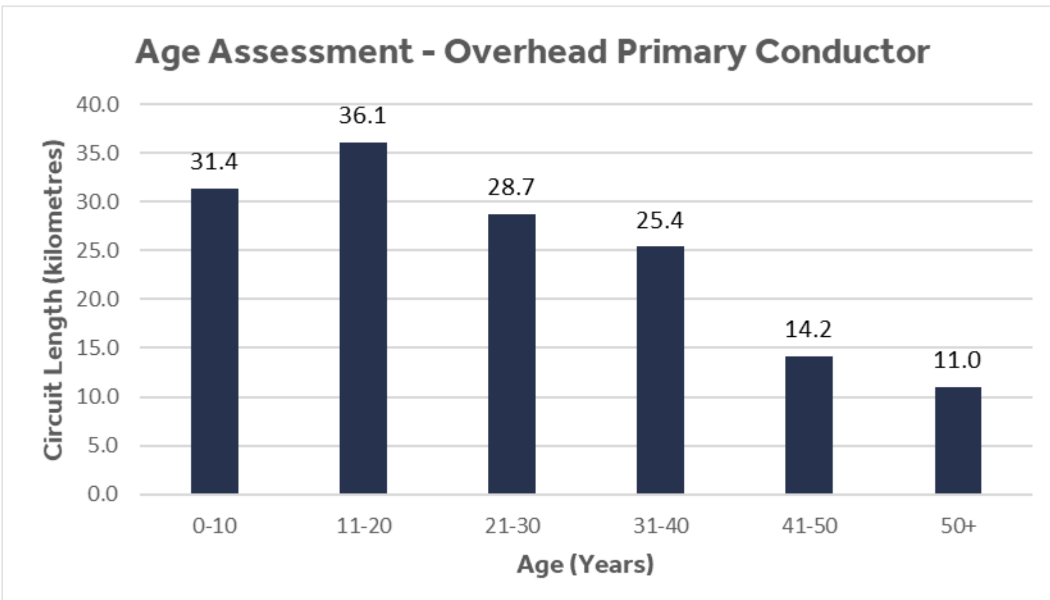


4.1.4 Overhead Primary Conductors

Overhead conductors transmit electricity from substations to customer premises and are supported by poles. Although laboratory tests are available to determine the tensile strength and assess the remaining useful life of conductors, distribution line conductors rarely require testing. An appropriate proxy for the tensile strength of the conductor and to determine the remaining life of the asset is the use of service age.

LUI owns approximately 147 km of overhead primary conductor within its service territory. While LUI's GIS information data contain age for only 23% of the in-service overhead primary conductors, the wood pole age demographics were used to estimate the age for the remaining conductors. Figure 4-8 presents the overall overhead primary conductor age demographics.

Figure 4-8 Overall Overhead Primary Conductor Age Demographics

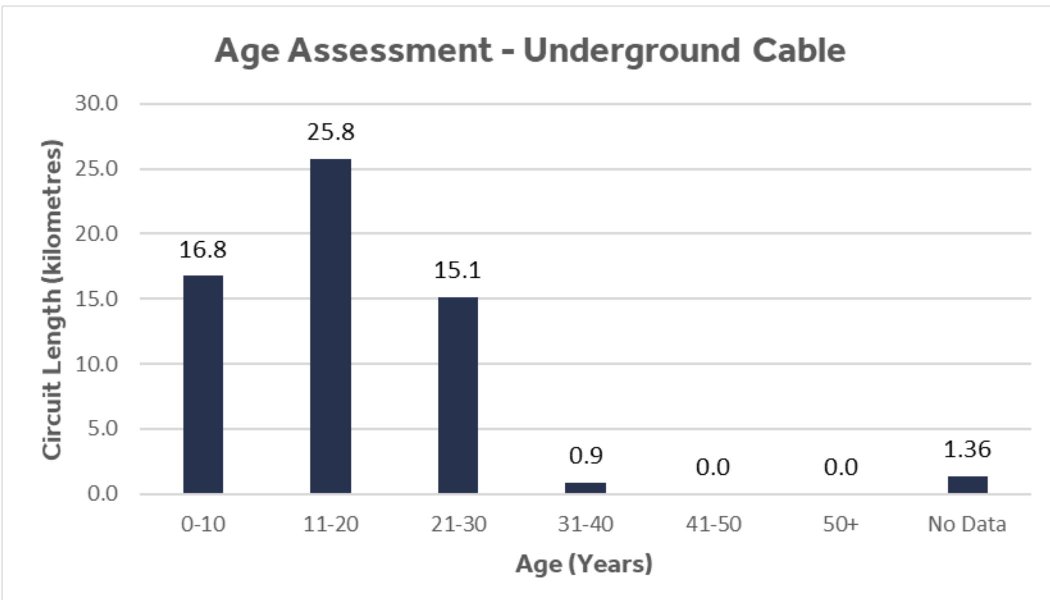


4.1.5 Underground Primary Cables

Like overhead conductors, underground cables also transmit electricity along the electrical distribution system, however, they are located below ground. LUI's underground system typically consists of tree-retardant, cross-linked polyethylene ("TR-XLPE") cables. Compared to overhead lines, can be more reliable since they are not exposed to severe weather conditions, tree contacts, or foreign interference. However, distribution underground cables are more expensive and are one of the more challenging assets in electricity systems from a condition assessment and AM viewpoint. Several test techniques such as partial discharge ("PD") and water tree diagnostic testing have become available over recent years to identify the condition and performance of the asset class. Some tests can be destructive to the asset and hence are used less frequently. Accordingly, the preference is given to non-destructive testing. In the absence of test results, cable age can be used as a proxy for medium-term and long-term planning to predict quantities of cables that are expected to reach end-of-life.

LUI owns approximately 60 km of underground primary cable within its service territory. LUI's GIS does not contain the cable installation year for almost all of its cables (98%). Where installation date was unknown, it was estimated based on the pad-mount transformer age distribution in the corresponding feeder to produce an approximate representation of the age distribution. Figure 4-9 presents the total length of underground primary cables for each age band.

Figure 4-9: Overall Underground Primary Cable Age Demographics



4.1.6 Overhead Distribution (Pole-Mount) Transformers

Overhead (pole-mount) transformers are installed on service poles above ground with the primary function to step down power from the medium-voltage distribution system to the voltage rating for customer use. The HI for pole-mount transformers is calculated by considering a combination of end-of-life criteria summarized in Table 4-4.

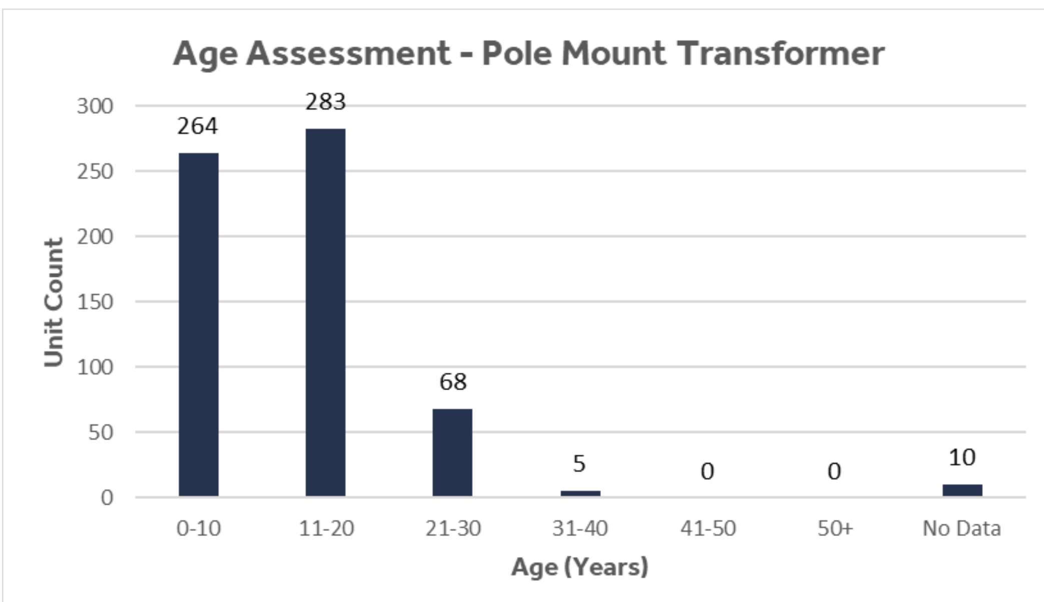
In addition to service age, Infrared ("IR") scan results and peak loading are used as condition parameters. IR scan results can identify hotspots (i.e., high temperatures) on the asset. Hotspots are usually an indication of a defect that would be hard to spot without IR. Pole-mount transformers operating at high temperatures may experience accelerated degradation of the insulation oil and may experience premature failure. With respect to the peak loading condition parameter, load unbalances or peak loading reduces the useful life of a distribution transformer.

Table 4-4: Pole-Mount Transformer HI Formulation

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
IR Scan Results	2	A,C,E	4,2,0	8
Service Age	3	A,B,C,D,E	4,3,2,1,0	12
Peak Loading	3	A,B,C,D,E	4,3,2,1,0	12
			Total Score	**32**

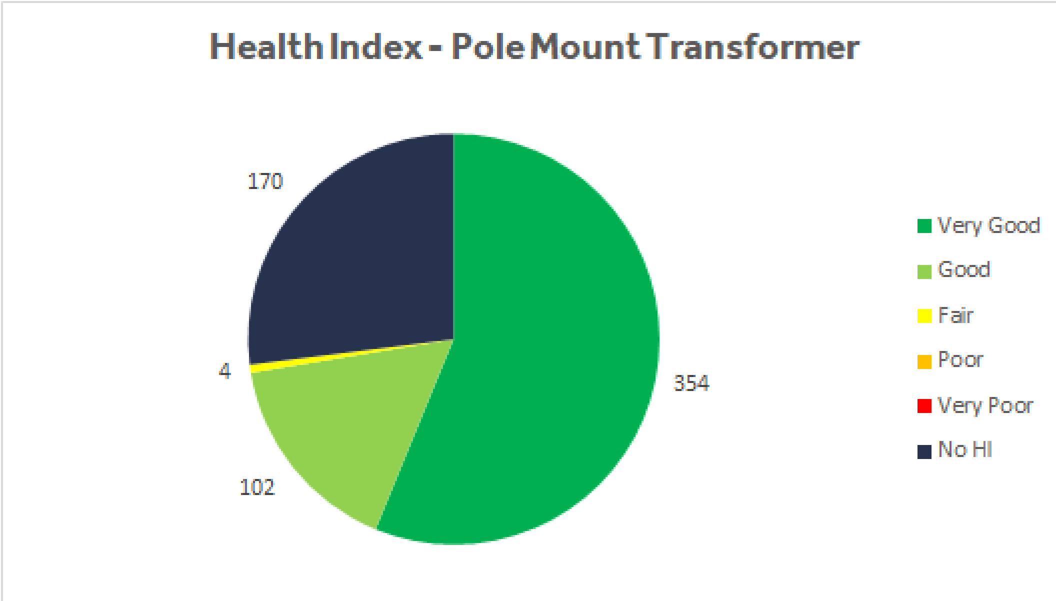
LUI owns 630 pole mount transformers within its service territory. Installation dates are known for 52% of the total in-service population. For unknown installation dates, the age is estimated to be the average age of installed pole-mount transformers on the same street, since communities are often built (or rebuilt) at the same time. In the case where the average age of installed pole-mount transformers on the same street is not available, the average age of installed pole-mount transformers on the same feeder is used. The applied assumption for service age of assets was used in the HI calculation and was confirmed with LUI. Figure 4-10 presents the age distribution for pole-mount transformers.

Figure 4-10: Pole-Mount Transformer Age Demographics



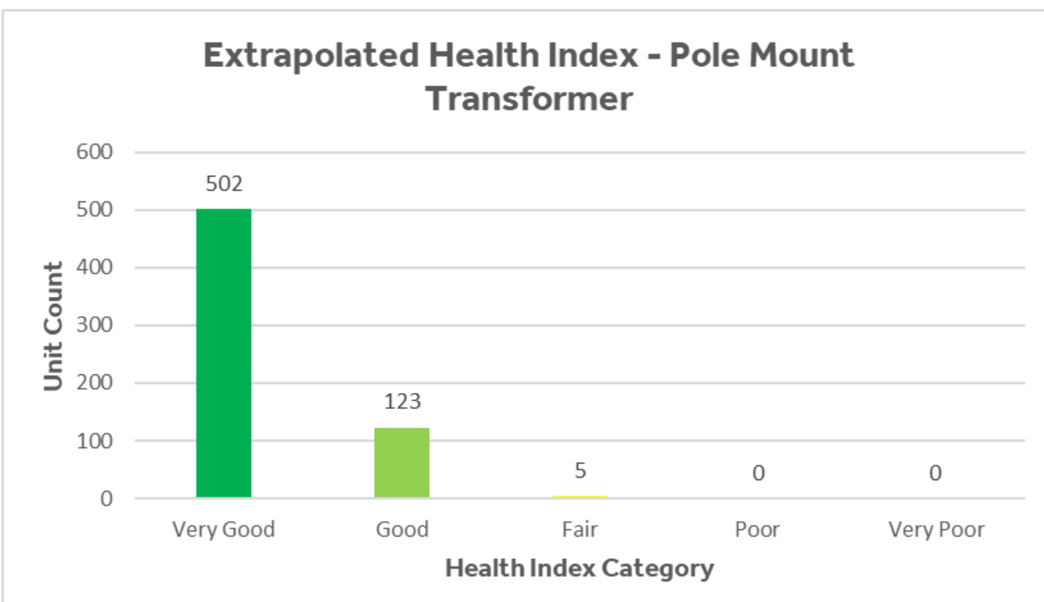
LUI's transformer maintenance records, nameplate information, and operating loading data were used to calculate the HI based on the criteria listed in Table 4-4. A valid HI was calculated for 73% of the overhead transformers.

Figure 4-11: Pole-Mount Transformer HI Results



To complete the full analysis, the HI results for the remaining 27% of pole-mount transformers were extrapolated based on the HI distribution of the asset population with a valid HI score. The overall HI distribution for pole-mount transformers is presented in Figure 4-12. Most of the population is in Very Good or Good condition.

Figure 4-12: Extrapolated Pole-Mount Transformer HI Results



4.1.7 Underground Distribution Transformers

Underground distribution transformers are utilized for similar functionalities as pole-mount transformers. They step down power from the medium-voltage distribution system to the final utilization voltage for the customer; however, they are located below ground or on the ground level. LUI only owns pad-mount distribution transformers (on the ground level).

The HI for underground distribution transformers is calculated by considering a combination of end-of-life criteria summarized in Table 4-5.

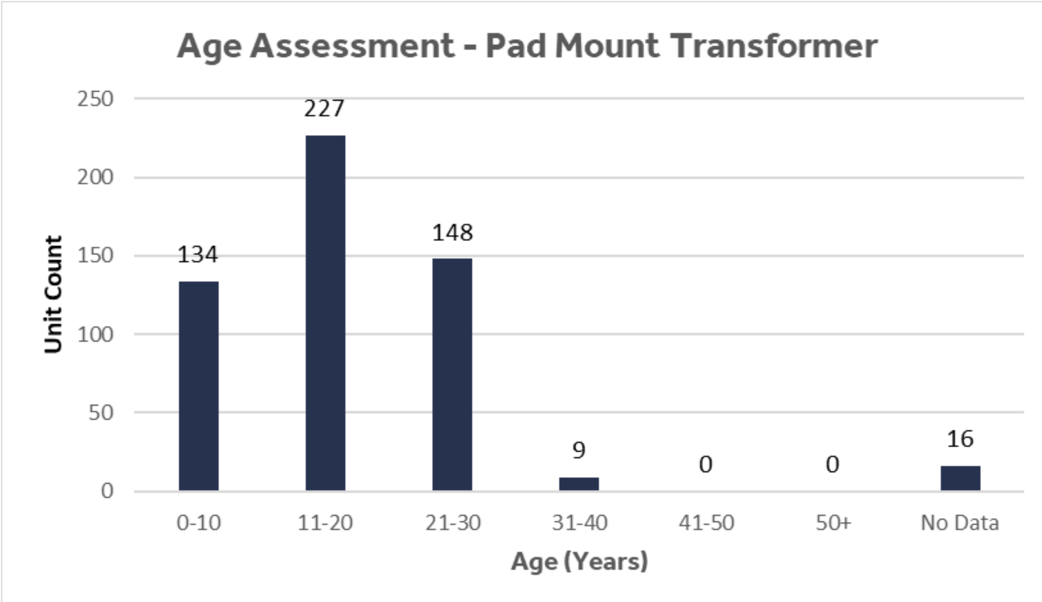
Table 4-5: Underground Distribution Transformer HI Formulation

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Visual Inspection	4	A,B,C,D,E	4,3,2,1,0	16
Condition of the Enclosure	2	A,C,E	4,2,0	8
Service Age	3	A,B,C,D,E	4,3,2,1,0	12
Peak loading	3	A,B,C,D,E	4,3,2,1,0	12
IR Scan Results	1	A,C,E	4,2,0	4
			Total Score	**52**

Visual inspections identify defects related to the presence of oil leaks, vegetation interference, presence of rust, and evidence of animal intrusion. The condition of the enclosure is a stand-alone condition parameter with its own weight since damage to the enclosure can expose the transformer to severe weather conditions and present serious safety concerns to humans should they come into contact with the contents inside. Hence, an enclosure that is deteriorated should be replaced to maintain safety performance. Additionally, peak loading, IR scan results, and service age are used as condition parameters.

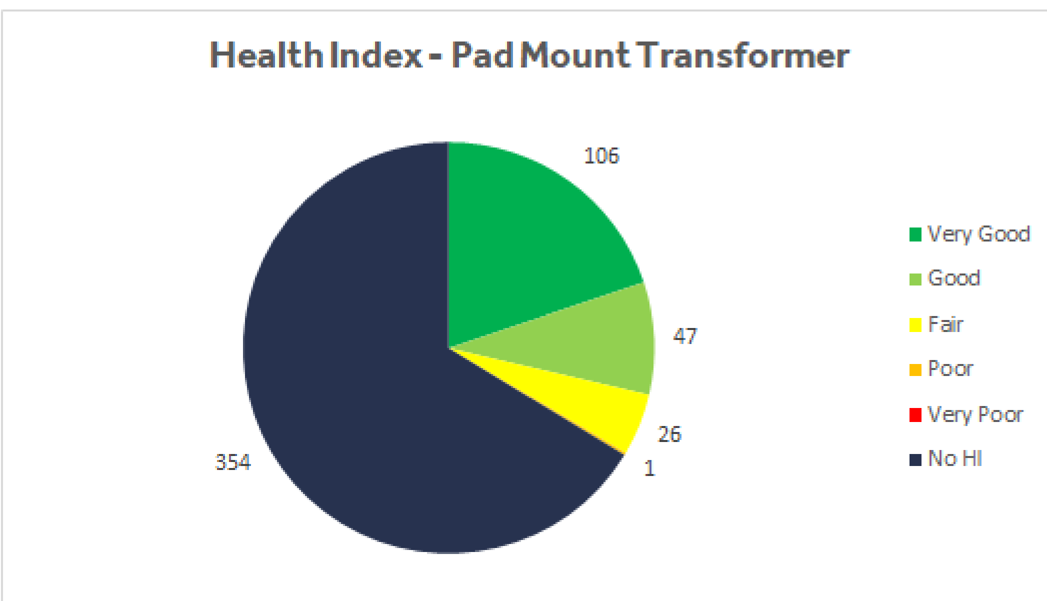
LUI owns 534 pad-mount transformers within its service territory. In the same manner as pole-mount transformers, when the installation date is unknown, it is estimated based on the average age of installed pad-mount transformers on the same street. In the case where the average age of installed pad-mount transformers on the same street is not available, the average age of installed pad-mount transformers on the same feeder is used. The applied assumption for service age of assets was used in the HI calculation and was confirmed with LUI. Figure 4-13 presents the age distribution for pad-mount transformers.

Figure 4-13: Distribution Transformer Age Demographics



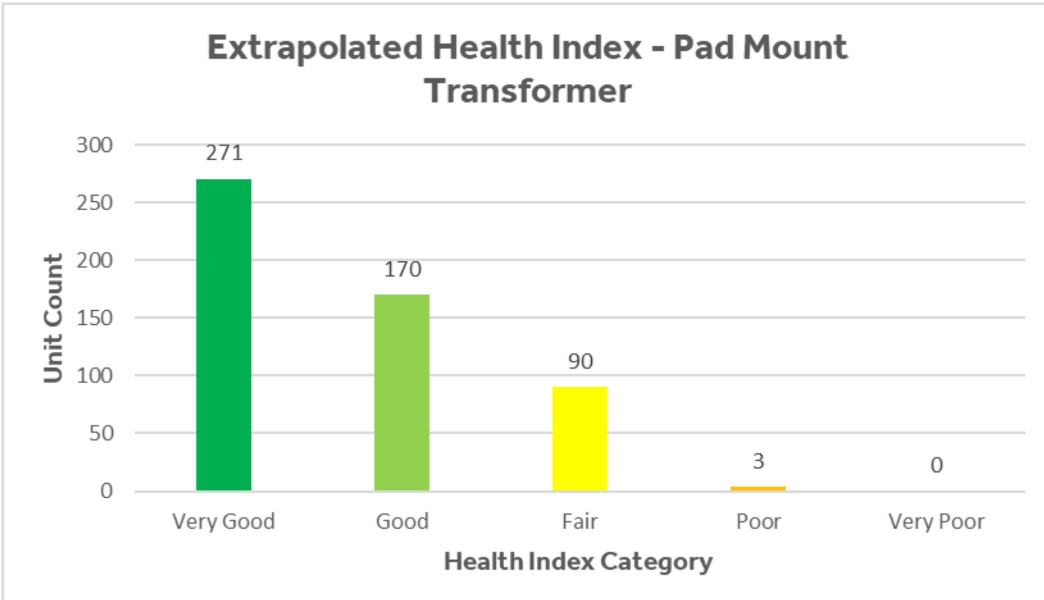
LUI's transformer maintenance records, nameplate information, and operational loading data were used to calculate the HI results based on the criteria provided in Table 4-5. Less than 1% of the underground distribution transformers within LUI's service territory have peak loading percentage greater than 100% which can pose operating restrictions and impact the condition of the assets. The HI distribution is presented in Figure 4-14. A valid HI was calculated for 34% of pad-mount transformer.

Figure 4-14: Pad-mount Transformer HI Results



To complete the full analysis, the HI for the remaining population was extrapolated based on the HI distribution of the asset population with a valid HI score. As illustrated in Figure 4-15, most of the population are in Very Good or Good condition.

Figure 4-15: Extrapolated Pad-mount Transformer HI Results



4.1.8 Overhead Switches

LUI's overhead switch types include fused cut-out, load-break, and air-break switches. Load-break and air-break switches are operated to sectionalize the circuit during a restoration procedure by breaking all three phases of load with a single operation. These switches are operated either manually or from LUI's control room. Fused cut-out switches provide over-current protection during overload conditions or short circuits. The HI for overhead switches is calculated by considering a combination of end-of-life criteria summarized in Table 4-6.

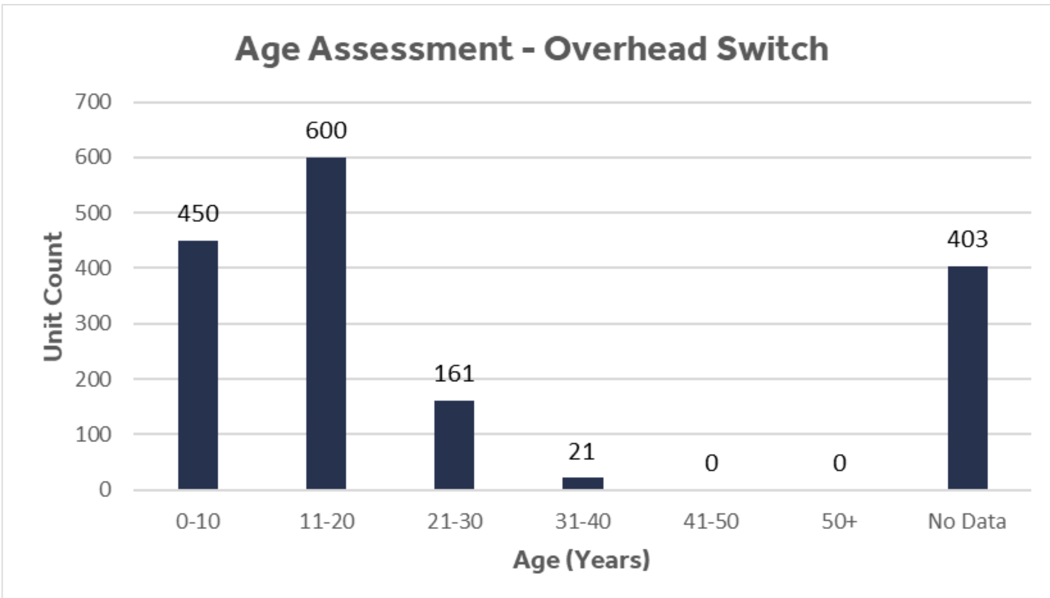
Table 4-6: Overhead Switch HI Formulation

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
IR Scan Results	4	A,B,C,D,E	4,3,2,1,0	16
Service Age	4	A,B,C,D,E	4,3,2,1,0	16
			Total Score	**40**

IR scan results represent an important condition parameter for condition assessment of overhead switches since they identify hotspots (i.e. high temperatures) on the asset. Assets operating continuously at high temperatures can cause accelerated degradation of the asset and may experience premature failure.

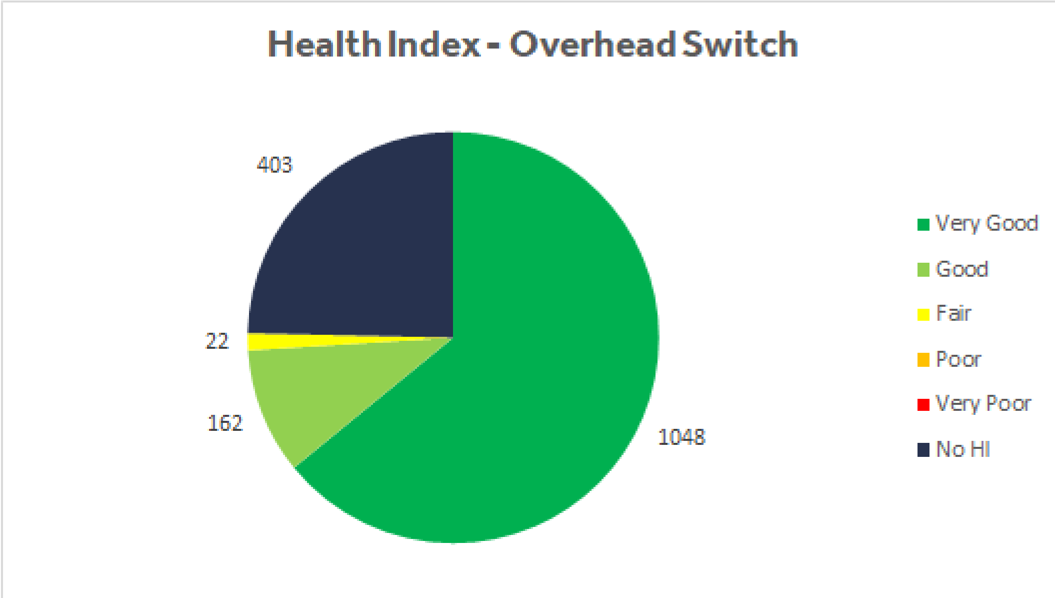
LUI owns 1,635 overhead switches within its service territory. For assets with unknown installation dates, the assumption made was to use the average pole-mount age in the corresponding feeder age as a proxy. This results in 67% of switches having a known installation date. The applied assumption for service age of assets was used in the Health Index calculation and was confirmed with LUI. Figure 4-16 presents the age distribution for overhead switches to show an approximate representation of the age distribution.

Figure 4-16: Overhead Switch Age Demographics



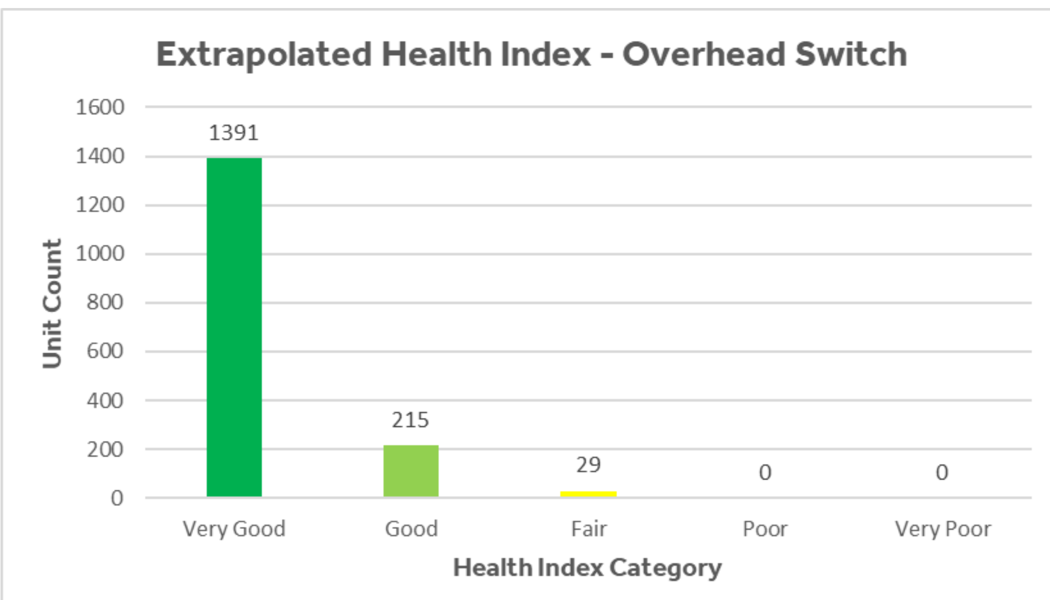
LUI's maintenance records and nameplate information were used to calculate the HI results based on the criteria provided in Table 4-6. A valid HI was calculated for 75% of the overhead switches, as shown in Figure 4-17.

Figure 4-17: Overhead Switch HI Results



To complete the full analysis, the HI for the remaining population was extrapolated based on the HI distribution of the asset population with a valid HI score. As shown in Figure 4-18, most of the switches are in Very Good or Good condition, with less than 2% of the switches in Fair condition.

Figure 4-18: Extrapolated Overhead Switch HI Results



4.1.9 Distribution Switchgear

Distribution switchgear provide the required level of operating flexibility for the underground system. They are employed for controlling, regulating, and isolating the electrical circuit in the underground distribution system. During a fault, switchgear can be used to isolate and the faulted section and restore power to unfaulted parts of the system. Switchgear can also de-energize equipment during maintenance and testing. In some cases they are used to manually or automatically transfer power in distribution circuits from a preferred source to an alternate source. The HI for distribution switchgears is calculated by considering a combination of end-of-life criteria summarized in Table 4-7.

Table 4-7: Switchgear HI Formulation

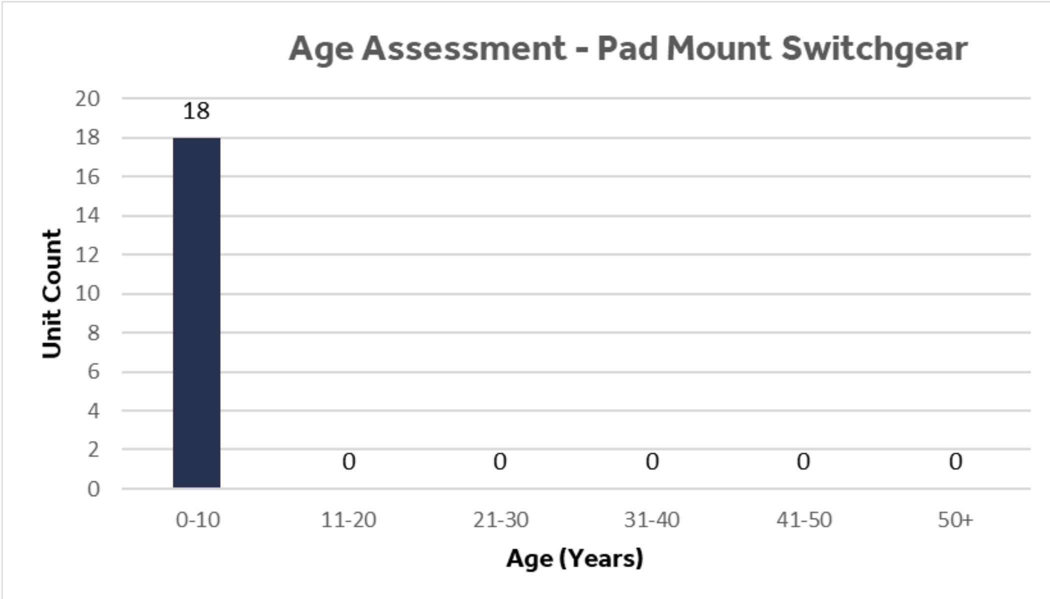
Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
IR Scan Results	8	A,C,E	4,2,0	32
Service Age	4	A,B,C,D,E	4,3,2,1,0	16
Visual Inspection	16	A,C,E	4,2,0	64
			Total Score	**112**

IR scan results represent an important condition parameter for condition assessment of distribution switchgear since they identify hotspots (i.e. high temperatures) on the asset. Assets operating continuously at high temperatures can cause accelerated degradation of the asset and may experience premature failure. It is assumed and confirmed by LUI that switchgear exhibiting high temperatures have since been corrected.

Visual inspections, which indicate the presence of rust or damage and cracks on the enclosure and pad, are an important factor in the assessment of overall asset condition. Damage to the enclosure can expose the switchgear to severe weather conditions and present serious safety concerns to humans should they come into contact with the contents inside. Hence, an enclosure that is deteriorated should be replaced to maintain safety performance. The condition of the pad is important to maintain the stability of the asset to prevent faults. Sometimes pads can be replaced without replacing the whole switchgear.

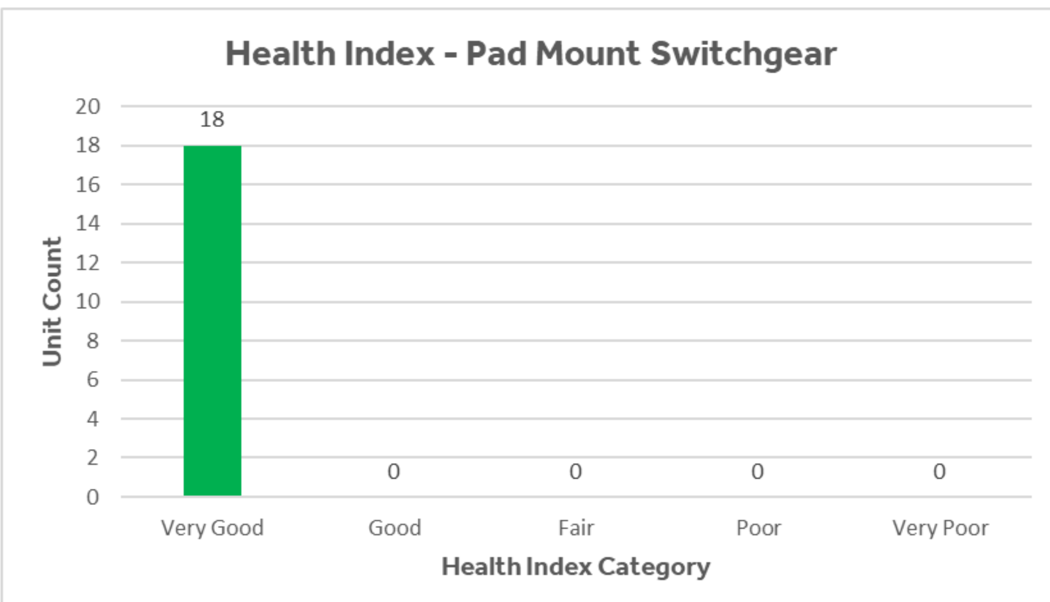
LUI owns 18 switchgear units within its service territory. Age was known for the entire population of LUI's in-service switchgear units. Figure 4-19 presents the age distribution for LUI's switchgear.

Figure 4-19: Switchgear Age Demographics



LUI's maintenance records and nameplate information were used to calculate the HI results based on the criteria provided in Table 4-7. The overall switchgear HI distribution is presented in Figure 4-20. All of the switchgear are in Very Good condition.

Figure 4-20: Switchgears HI Results



4.2 Station Assets

4.2.1 Power Transformers

Power transformers are key stations assets owned by LUI that are used to step down the voltage from the 44-kV subtransmission system to distribution levels. Computing the HI for a power transformer requires the combination of various end-of-life criteria for its components. Table 4-8 summarizes the HI formulation used for oil-type power transformers. The HI score for a transformer is composed of eleven condition parameters, each of which represents an aspect of a power transformer with a direct impact on the operational health of the asset.

Table 4-8: Power Transformer HI Formulation

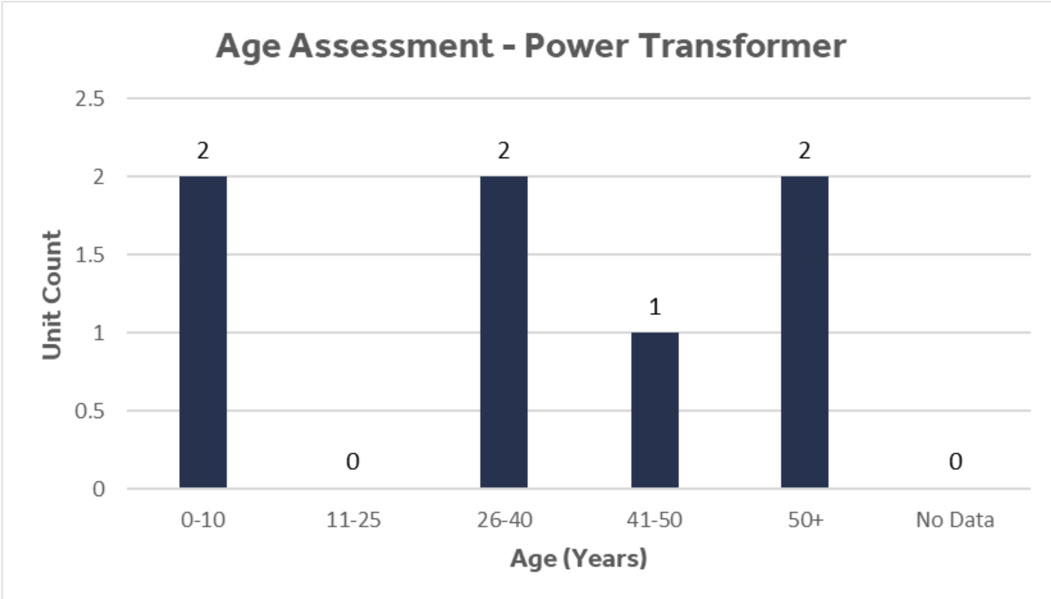
Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Dissolved Gas Analysis	10	A,B,C,D,E	4,3,2,1,0	40
Load History	10	A,B,C,D,E	4,3,2,1,0	40
Insultation Power Factor	10	A,B,C,D,E	4,3,2,1,0	40
IR Scan Results	2	A,C,E	4,2,0	8
Oil Quality	8	A,C,E	4,2,0	32
Degree of Polymerization	6	A,B,C,D,E	4,3,2,1,0	24
Insulation Resistance	4	A,B,C,D,E	4,3,2,1,0	16
Dissipation Factor	4	A,B,C,D,E	4,3,2,1,0	16
Turns Ratio Test	4	A,B,C,D,E	4,3,2,1,0	16
Winding Resistance	4	A,B,C,D,E	4,3,2,1,0	16
Visual Inspection	8	A,C,E	4,2,0	32
			Total Score	**280**

By performing DGA, it is possible to identify internal faults, PD, low-energy sparking, severe overloading, and overheating in the insulating medium. Insulation power factor measurements are an important source of data to monitor transformer and bushing conditions. Lower scores for one or a combination of these condition parameters strongly indicate progressed degradation of the asset, hence their larger weights.

Power transformer peak loading is a good indication of loss of insulation life. The rate of insulation degradation is directly related to the operating temperature which is directly related to transformer loading levels. The peak loading level of the transformers is expressed in a percentage of the nameplate rating. LUI collects the substation load history monthly, recording the monthly peak.

LUI owns seven oil-type power transformers. Figure 4-21 presents the age profile of power transformers in-service.

Figure 4-21: Power Transformer Age Demographics



LUI's power transformer inspections, test results, and loading history were used to calculate the HI based on the criteria provided in Table 4-8. The HI distribution for in-service power transformers is presented in Figure 4-22. All of the power transformers are in Very Good or Good condition.

Figure 4-22: Power Transformer HI Results

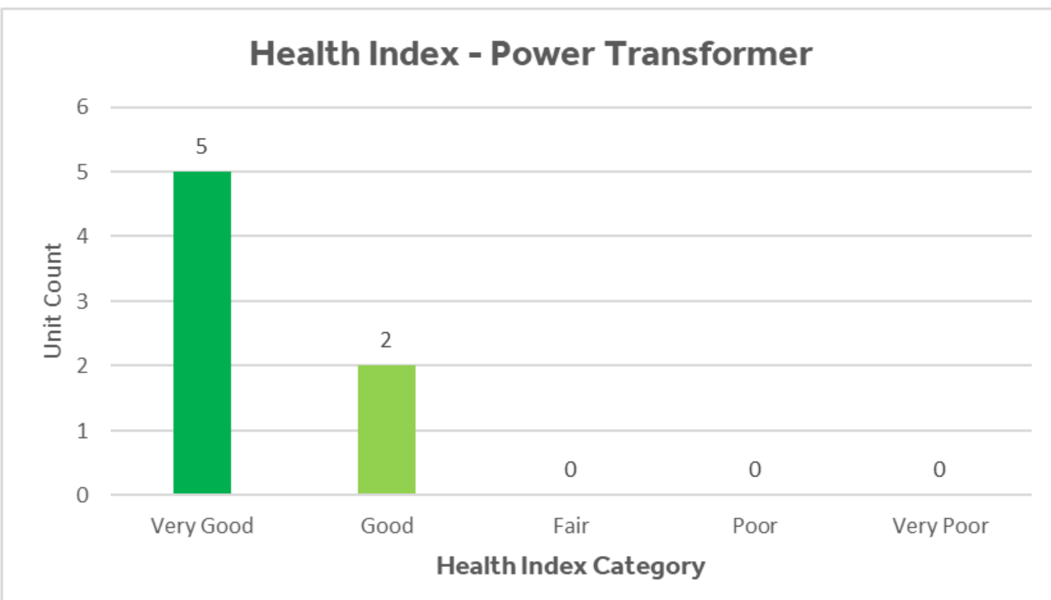
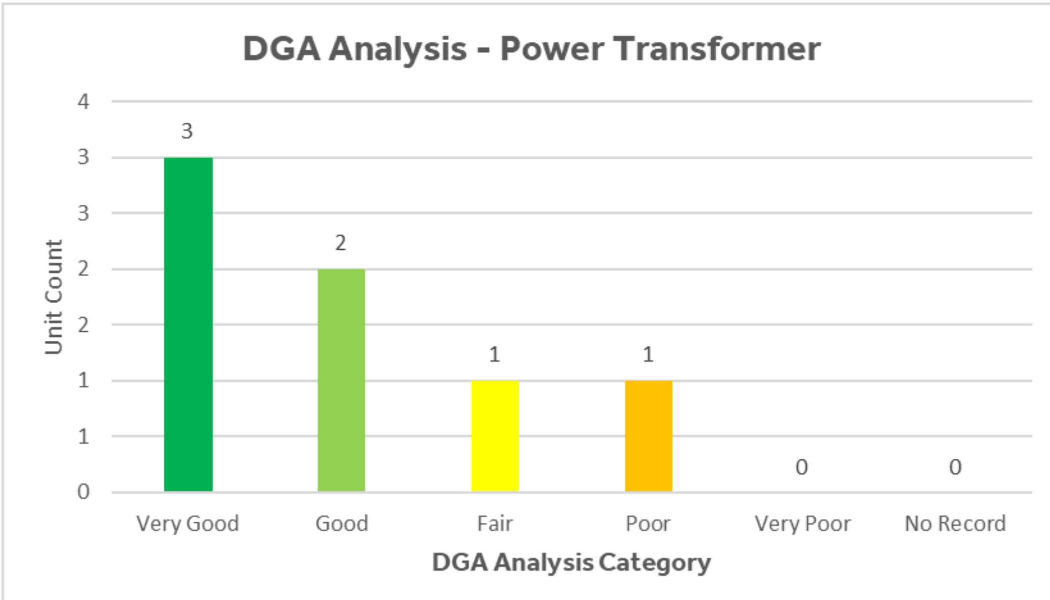


Figure 4-23 illustrates the DGA results for power transformers. DGA can be a leading indicator as to how the power transformer's internal condition is before experiencing unfavorable results. The figure is presented to show there are power transformers tested that may require follow-up investigation even though the other condition parameters do not indicate any issues

Figure 4-23: Power Transformers DGA Analysis Results



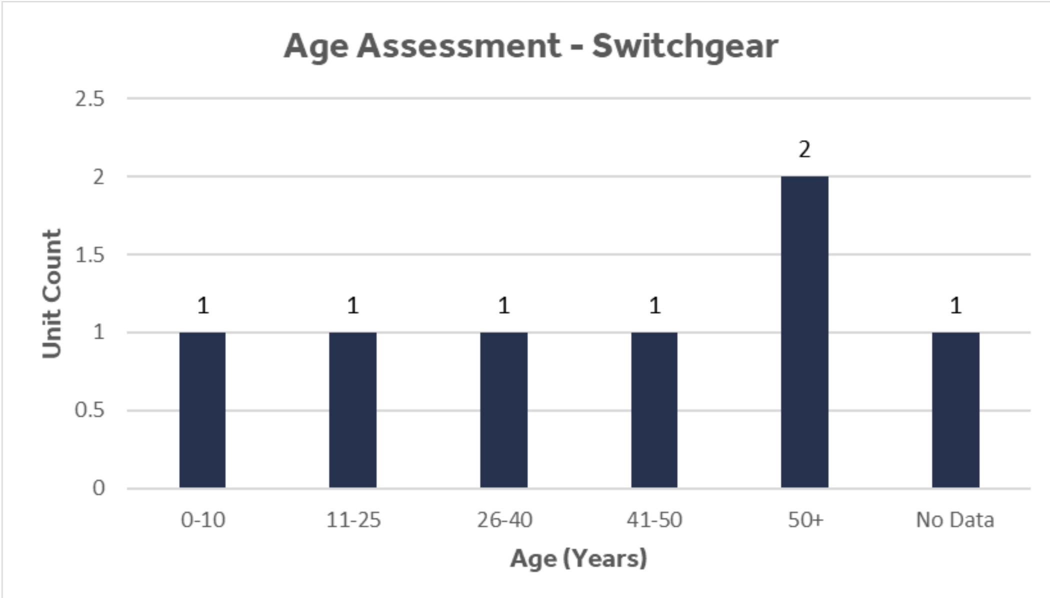
4.2.2 Station Switchgear

Station switchgear consists of breakers, fuses, and switches that control and regulate the current flowing through the distribution system. During a fault, the switchgear can isolate and clears the fault. It is also used to de-energize equipment during maintenance and testing. The HI for station switchgear is calculated by considering a combination of end-of-life criteria summarized in Table 4-9.

Table 4-9: Switchgears HI Formulation

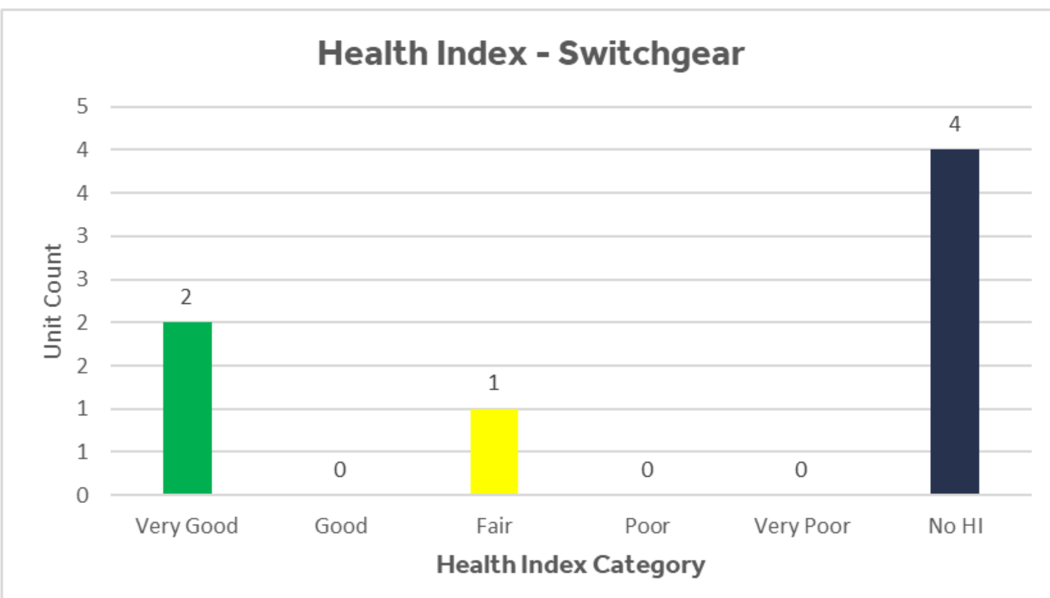
Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Enclosure & Components	3	A,C,E	4,2,0	12
Control & Operating Mechanism	3	A,C,E	4,2,0	12
Overall Condition	3	A,C,E	4,2,0	12
Insulation Resistance	4	A,B,C,D,E	4,3,2,1,0	16
			Total Score	**52**

Figure 4-24: Switchgears Age Demographics



LUI's inspection and maintenance records were used to calculate the HI based on the criteria listed in Table 4-9. The HI distribution of station switchgear is presented in Figure 4-25. Two out of the three switchgears with a valid HI were assessed to be in Good condition, while the remaining switchgear was assessed to be in Fair condition.

Figure 4-25: Switchgear HI Results



4.2.3 Circuit Breakers/Reclosers

Circuit breakers, located outdoors or in station switchgear, are electrical devices that operate automatically during a fault. It protects other electrical assets from damage due to short-circuit current. It operates when a fault is detected and can be programmed to automatically restore the connection once the fault is cleared or can be reset manually based on the severity of the fault. Reclosers function similar to circuit breakers, but often equipped with control unit for single- or multi-shot reclosing of the feeder.

Computing the HI of a circuit breaker considers end-of-life criteria for its various components. Each criterion represents a factor critical in determining the component's condition relative to potential failure. The HI for substation circuit breakers is calculated by considering a combination of test results, number of operations and visual inspections as summarized in Table 4-10.

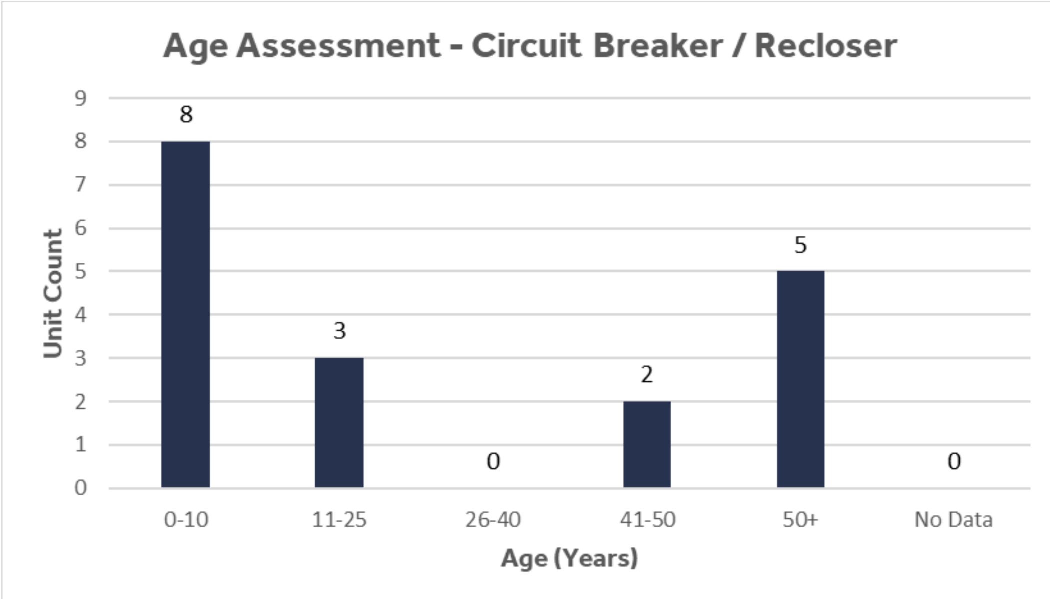
Table 4-10: Circuit Breaker/Recloser HI Formulation

Condition Parameter	Type	Weight	Ranking	Numerical Grade	Max Score
Control & Operating Mechanism	All	1	A,C,E	4,2,0	4
Contacts Condition	All	1	A,C,E	4,2,0	4
Foundation & Support	All	3	A,C,E	4,2,0	12
Overall Condition	All	3	A,C,E	4,2,0	12
Counter Reading	All	1	A,B,C,D,E	4,3,2,1,0	4
Vacuum Interrupter Condition	Vacuum	3	A,B,C,D,E	4,3,2,1,0	12
Contact Resistance	All	2	A,B,C,D,E	4,3,2,1,0	8
Insulation Resistance	All	4	A,B,C,D,E	4,3,2,1,0	16
				Total Score	**52**

Maintenance tests, such as the contact resistance test and insulation resistance test, are weighted the highest because they are the best indicator of the asset's condition and performance.

LUI owns fourteen circuit breakers and four reclosers within its stations. The age of the circuit breakers is known for the total population. Figure 4-26 presents the age distribution for circuit breakers.

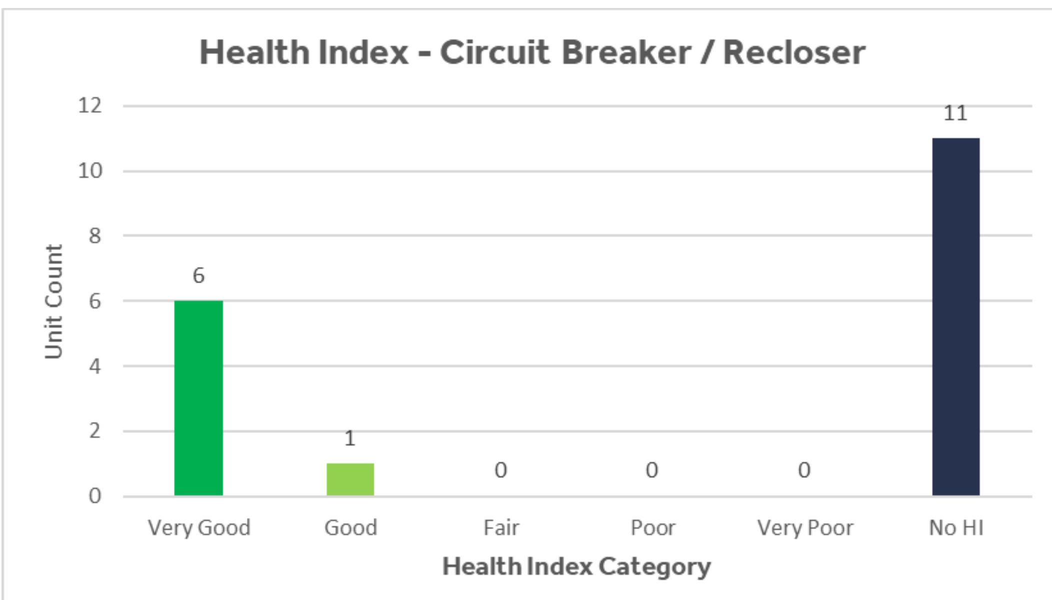
Figure 4-26: Circuit Breaker/Recloser Age Demographics



LUI's maintenance records, operation data, and nameplate information were used to calculate the Health Index based on the criteria provided in Table 4-10.

A valid HI was calculated for 39% of the total population, as shown in Figure 4-27.

Figure 4-27: Circuit Breaker HI Results



4.2.4 Station Switches

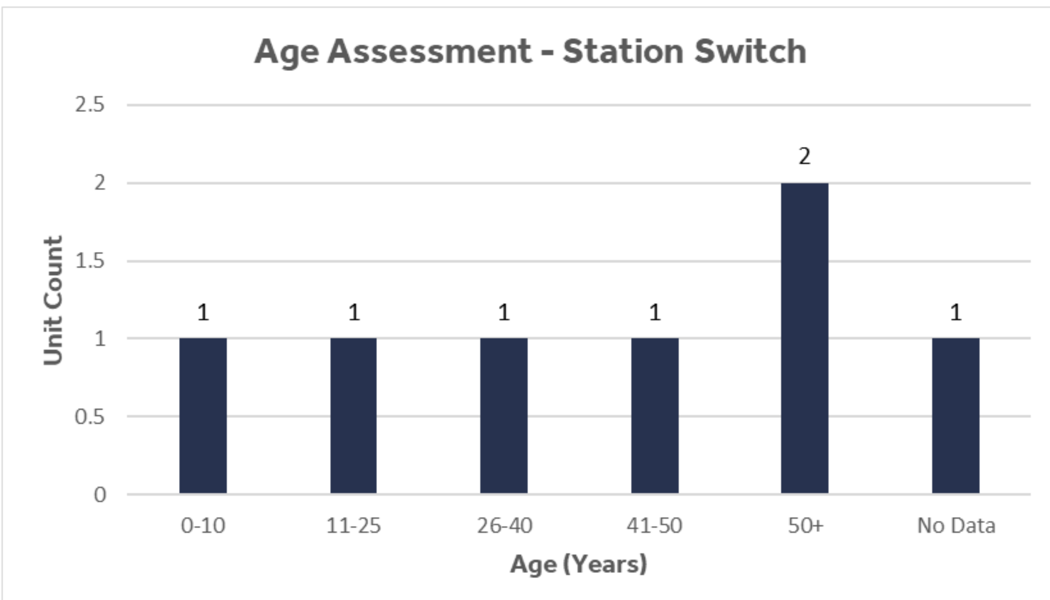
Station switches provide isolation and can make or break load. Table 4-11 summarizes the HI formulation for station switches.

Table 4-11: Overhead Station Switch HI Formulation

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Power Train Drive Assembly	4	A,C,E	4,2,0	16
Contacts	2	A,C,E	4,2,0	8
Connectors	4	A,C,E	4,2,0	16
IR Scan	2	A,C,E	4,2,0	8
Insulators/Porcelains	3	A,C,E	4,2,0	12
Foundation/Support Steel/Grounding	3	A,C,E	4,2,0	12
Contact Resistance	3	A,B,C,D,E	4,3,2,1,0	12
Insulation Resistance	4	A,B,C,D,E	4,3,2,1,0	16
			Total Score	**100**

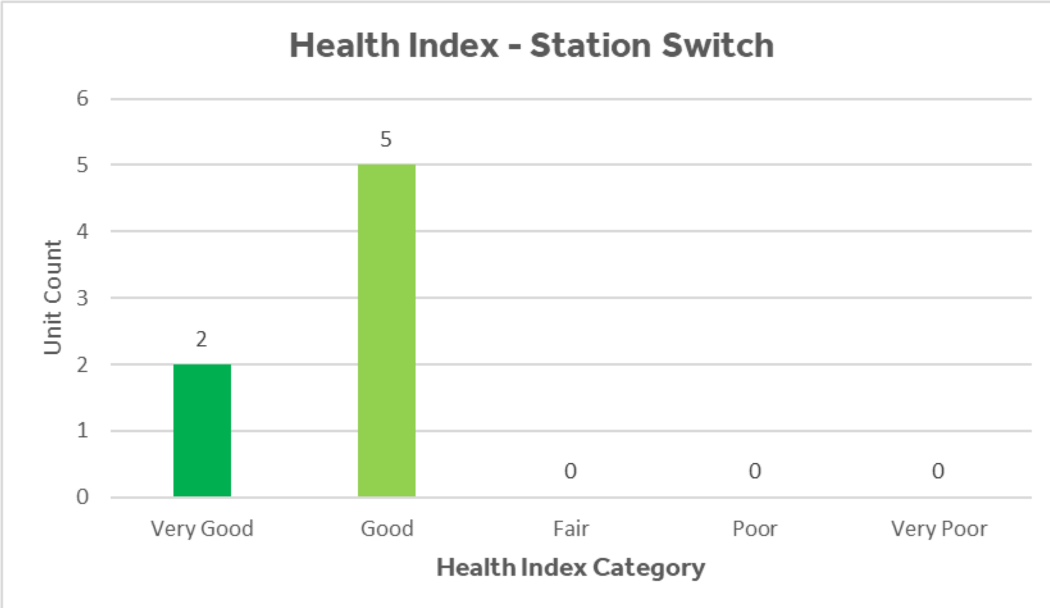
LUI owns seven station switches within its stations. The installation date is known for 86% of the total population. The age distribution for station switches is shown in Figure 4-28.

Figure 4-28: Station Switch Age Demographics



The HI distribution for in-service station switches is presented in Figure 4-29. The entire population is in Very Good or Good condition.

Figure 4-29: Station Switch HI Results



4.2.5 Station Service Transformers

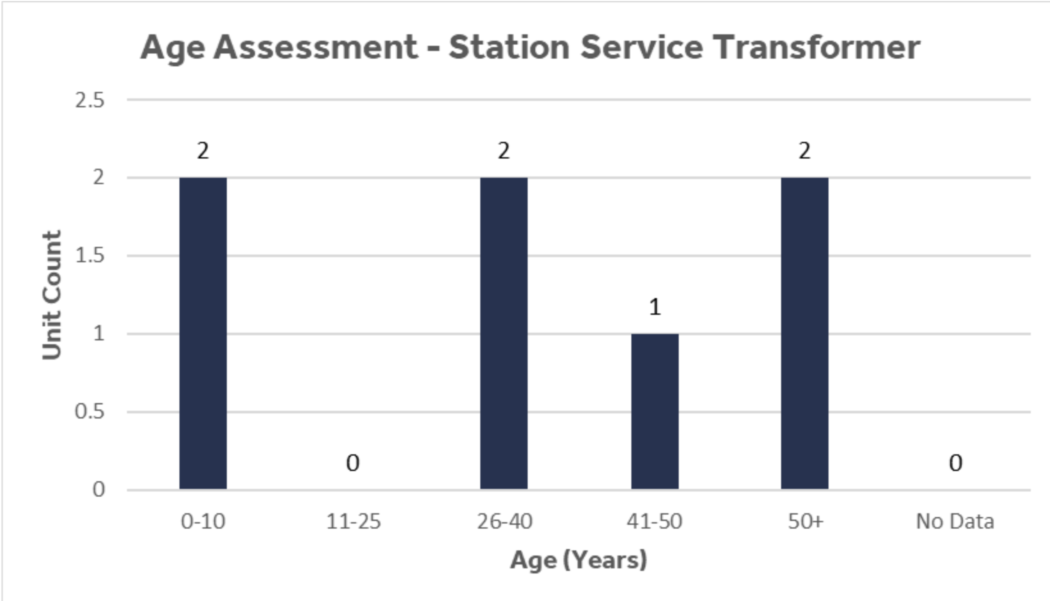
Station service transformers supply power to auxiliary equipment in the station including lights and security systems. Often, these assets can be encased in enclosures and are difficult to assess or read the nameplate without taking an outage. Table 4-11 summarizes the HI formulation used by METSCO to assess LUI's station service transformers.

Table 4-12: Station Service Transformer HI Formulation

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Infrared Scanning	2	A,C,E	4,2,0	8
Insulation Resistance	4	A,B,C,D,E	4,3,2,1,0	16
Turns Ratio Test	4	A,B,C,D,E	4,3,2,1,0	16
Connection	2	A,C,E	4,2,0	8
Grounding	2	A,C,E	4,2,0	8
Enclosure	2	A,C,E	4,2,0	8
			Total Score	**64**

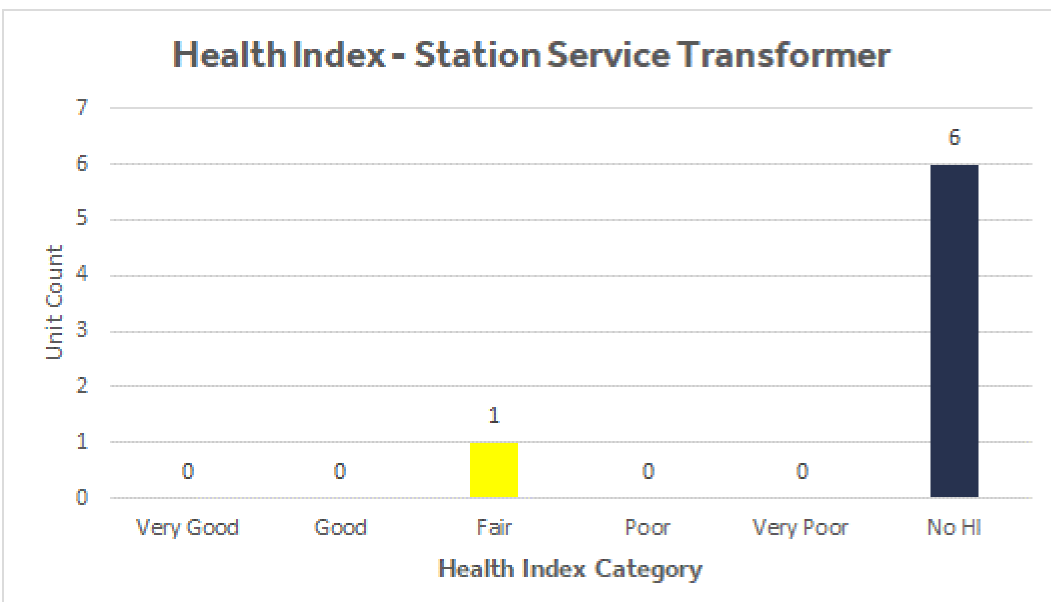
LUI owns seven station service transformers. Installation date is unknown for the population; the age of the station which house the service transformer has been used as a proxy. The age distribution of station service transformer is illustrated in Figure 4-30.

Figure 4-30: Station Service Transformer Age Demographic



The HI distribution for in-service station service transformer is presented in Figure 4-31. Only one station service transformer could be assessed and is presently in Fair condition. This transformer underwent a thorough inspection during a planned outage to perform maintenance at the station. In particular, the insulation resistance test results for this transformer are suspect and warrant additional investigation.

Figure 4-31: Station Service Transformer HI Results



4.2.6 Battery Banks and Chargers

The battery system provides backup power to essential station functionalities such as lighting, communication, and protection/control equipment in the event of a loss of supply to the station. The main components of the battery system are the charger and the battery bank which is comprised of several battery cells in series.

The HI formulations for battery banks and chargers are both based on age, test results, and visual inspection results. The first condition parameter is age, which provides insight into the remaining useful life of the asset based on the typical useful lives of DC systems seen across the industry. Batteries also operate based on a determinate chemical process, which has a known lifetime and useful duration. Discharge testing provides detail on individual cell charges, total voltage, and discharge rates as the battery supplies energy over time. Any atypical degradation of a battery bank's performance will be seen with this testing procedure. The output voltage and float voltage of the battery charger are also tested. Table 4-13 summarizes the methodology to generate the Health Index for station battery banks.

Table 4-13: Station Battery Bank and Charger HI Formulations

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Service Age	3	A,B,C,D,E	4,3,2,1,0	12
Testing	4	A,C,E	4,2,0	16
Visual Inspection	4	A,C,E	4,2,0	16
			Total Score	**44**

LUI owns seven batteries and chargers within its stations. Respectively, 29% and 41% of the asset installation years are known for battery banks and chargers. Figure 4-32 and Figure 4-33 present the age distributions for station battery banks and chargers.

Figure 4-32: Station Battery Banks Age Demographic

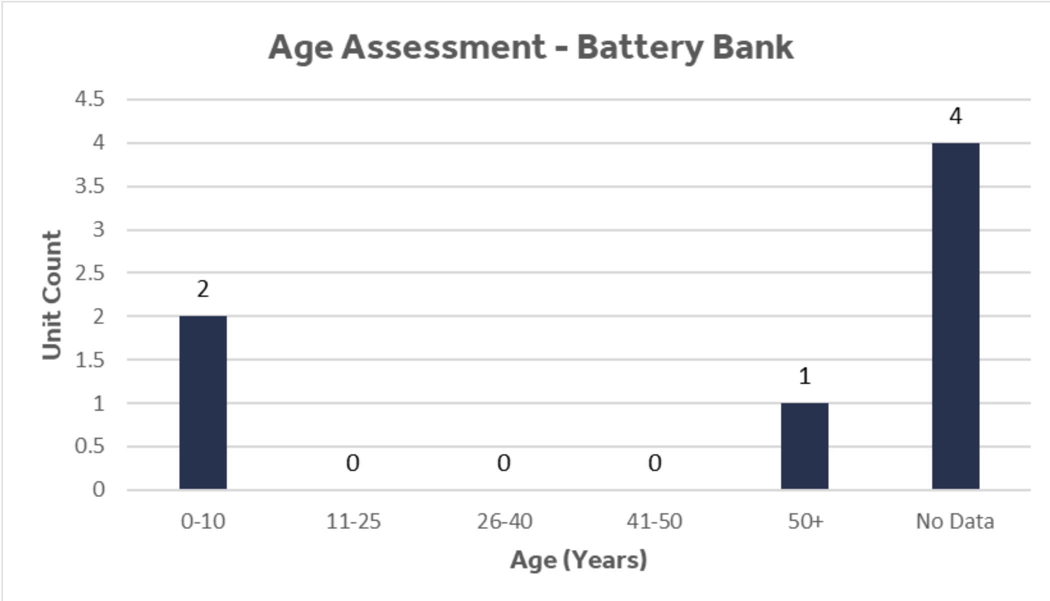
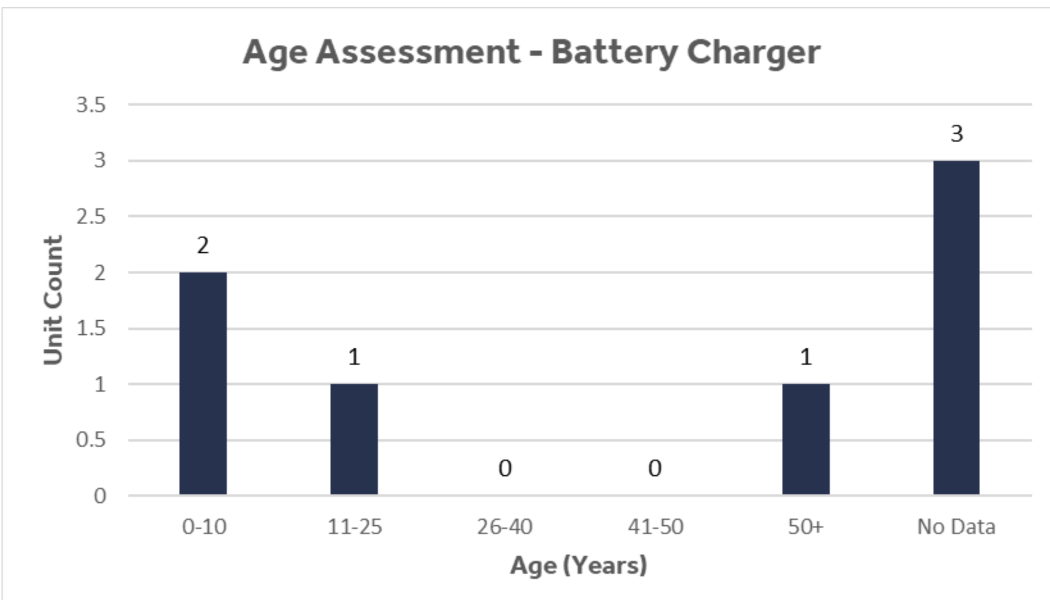
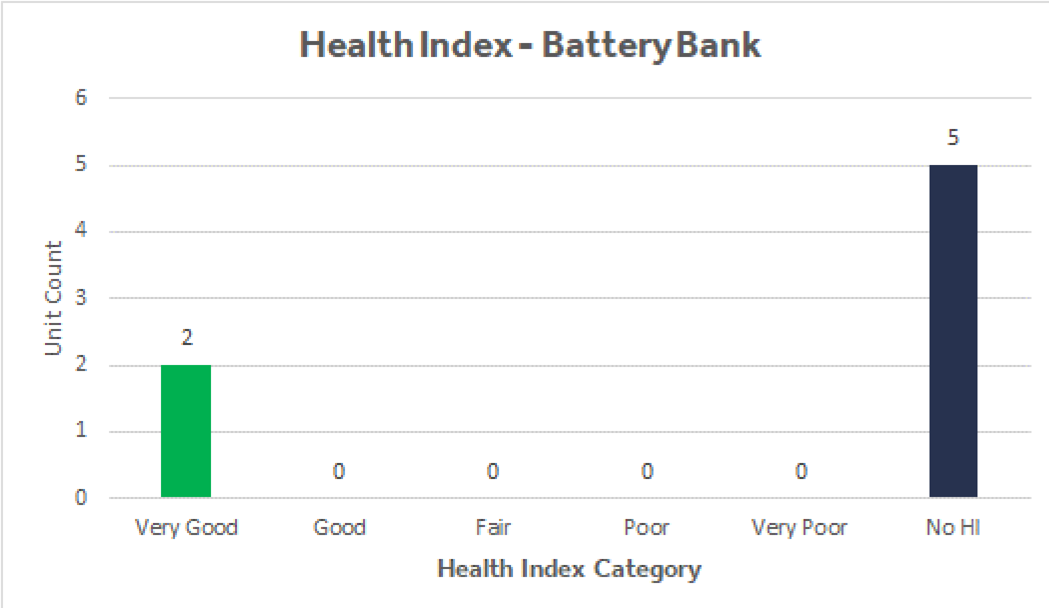


Figure 4-33: Station Chargers Age Demographic



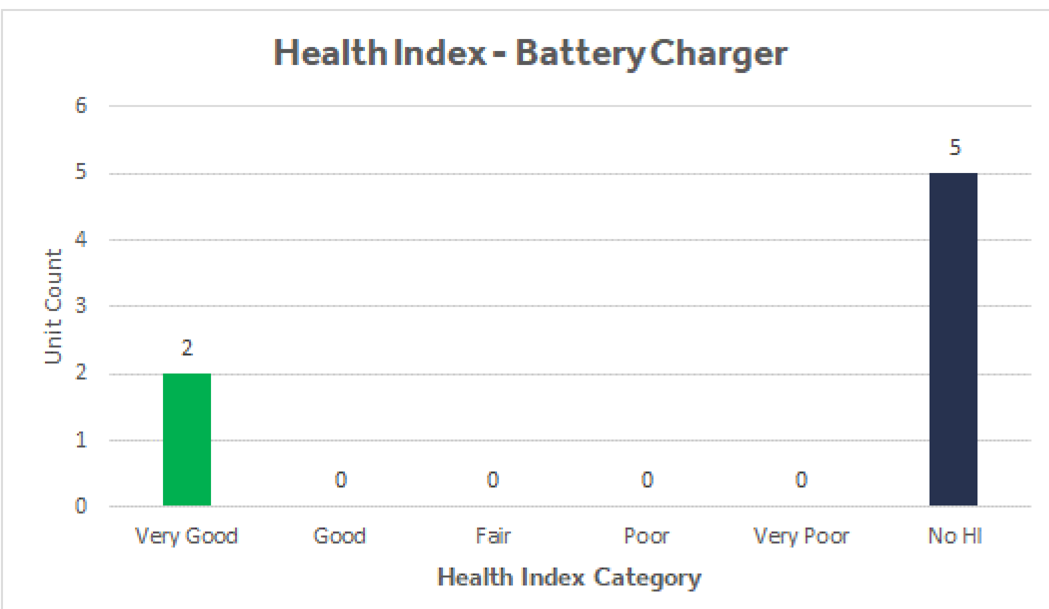
The maintenance test results and nameplate information for LUI's battery banks were used to calculate the HI based on the criteria listed in Table 4-13. The HI distribution for station batteries is presented in Figure 4-34. The two batteries with sufficient condition information were assessed to be in Very Good condition, while the remaining five do not have enough data to calculate a valid HI.

Figure 4-34: Station Battery Bank HI Results



The maintenance test results and nameplate information for LUI's battery banks were used to calculate the HI based on the criteria listed in Table 4-13. The HI distribution for station battery chargers is presented in Figure 4-35. The two chargers with sufficient condition information were assessed to be in Very Good condition, while the remaining five do not have enough data to calculate a valid HI.

Figure 4-35: Station Battery Charger HI Results



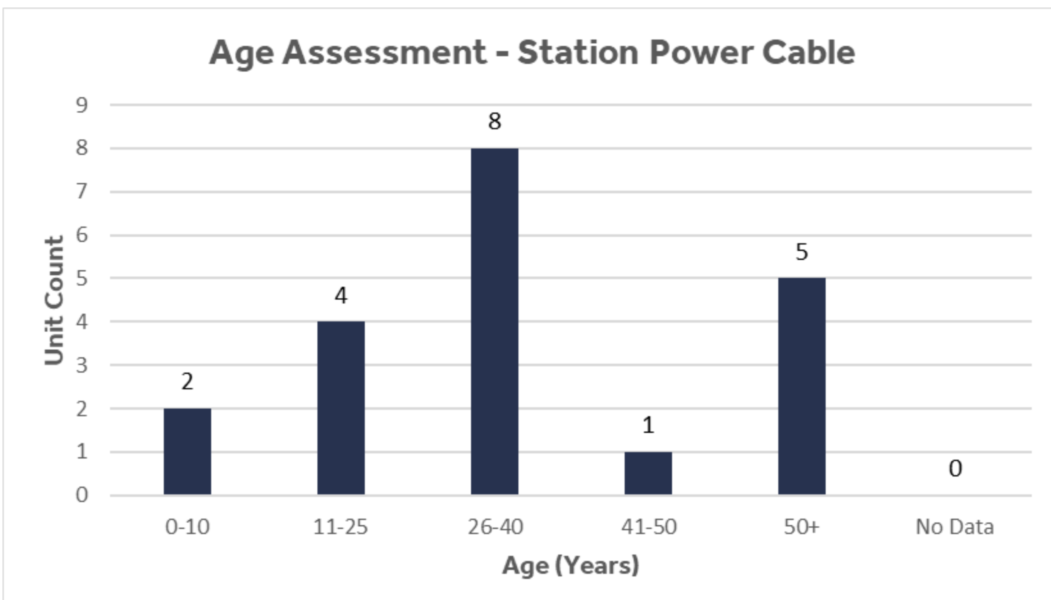
4.2.7 Station Power Cables

Station power cables are a key part of the medium-voltage system. Some station power cables carry the entire phase load for the feeder. Degradation modes of power cables include thermal and electrical degradation of the insulation. The insulation resistance test that helps find crushed insulation, terminal spacing problems, stray wire strands or braided shielding, and conductive or corrosive contaminants around the cables. Table 4-14 summarizes the HI formulation used to assess LUI's station power cables.

Table 4-14: Station Feeder Egress Cable HI Formulation

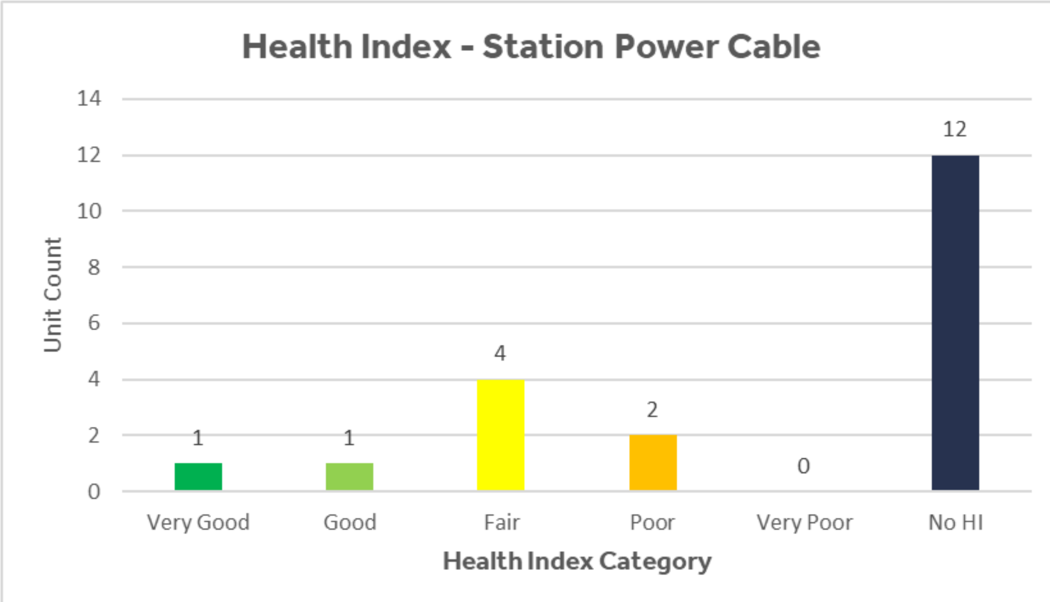
Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Insulation Resistance	10	A,B,C,D,E	4,3,2,1,0	40
Service Age	10	A,B,C,D,E	4,3,2,1,0	40
Loading History	5	A,B,C,D,E	4,3,2,1,0	20
			Total Score	**100**

Figure 4-36: Station Power Cable Age Demographics



The HI for station power cables is presented in Figure 4-37. Of the seven station power cables with a valid HI, two are in Poor condition based on the insulation resistance test results (among the age and loading factors). Additional investigation is required to validate these test results and determine whether there is an issue with these cables.

Figure 4-37: Station Power Cable HI Results



4.2.8 Station Facilities

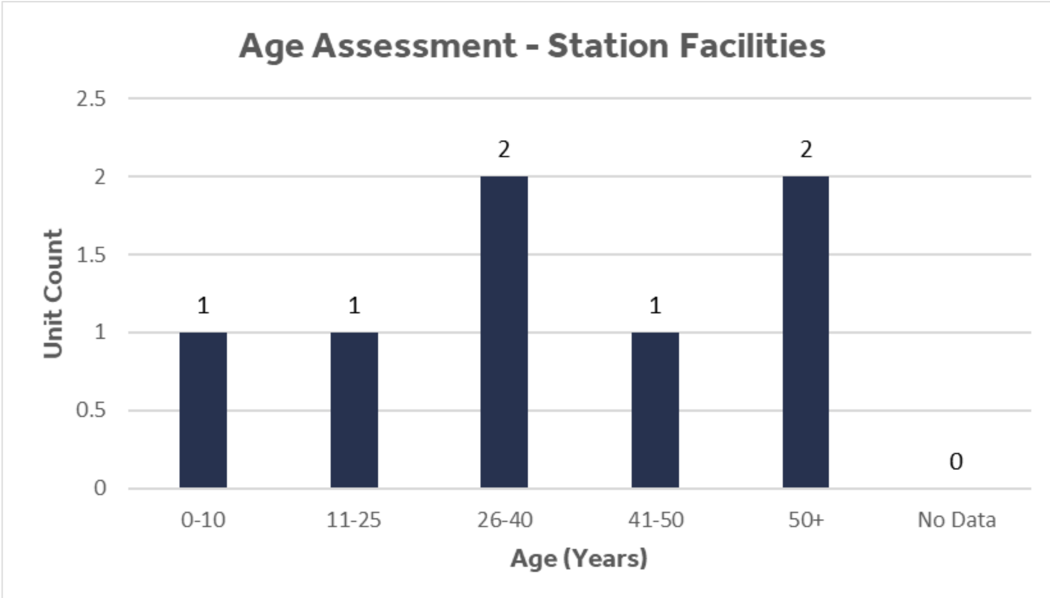
The integrity of station building, fence, gate, and yard contribute the safety of the station and the performance of the assets therein. The HI for station facilities is calculated by using the visual inspection results from monthly station inspections. Table 4-15 summarizes the HI formulation for station facilities.

Table 4-15: Station Building HI Formulation

Condition Parameter	Weight	Ranking	Numerical Grade	Max Score
Building - Signage	1	A,E	4,0	4
Building - HVAC	2	A,E	4,0	8
Fence - Condition	3	A,E	4,0	12
Fence - Tampering	3	A,E	4,0	12
Fence - Coverage	3	A,E	4,0	12
Fence - Signage	1	A,E	4,0	4
Fence - Grounding	2	A,E	4,0	8
Gate Operational	3	A,E	4,0	12
Yard - Condition	1	A,E	4,0	4
Yard - Vegetation	1	A,E	4,0	4
Yard - Debris	1	A,E	4,0	4
			Total Score	**84**

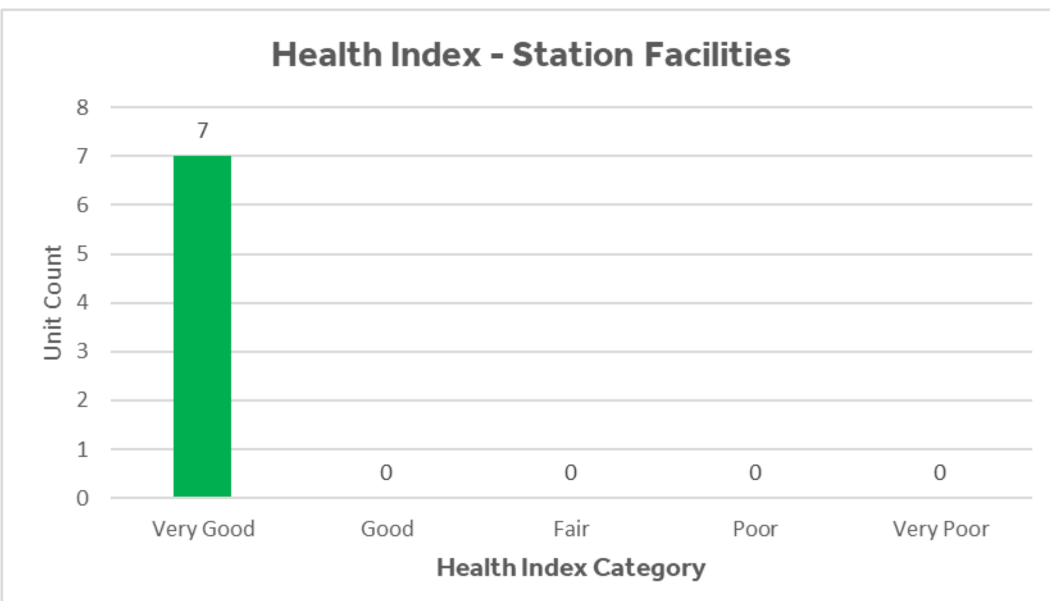
LUI owns seven station within its service territory. Figure 4-38 presents the age distribution of these stations.

Figure 4-38: Station Age Demographics



LUI's maintenance records were used to calculate the HI based on the criteria listed in Table 4-15. The HI distribution for station facilities is presented in Figure 4-39. All of the population are in Very Good condition.

Figure 4-39: Station Facility HI Results



5 Conclusions

As Figure 5-1 and Figure 5-2 indicate, most assets across LUI's asset classes analyzed are in Fair condition or better, with a significant portion of asset populations in Good or Very Good condition. This can indicate LUI has taken steps in the past to manage their asset health and performance for the benefit of its customers. As with every system, however, there are areas that require LUI's attention in the coming years where asset populations contain material portions of equipment in or approaching Poor condition or worse.

Figure 5-1: Distribution Asset Health Index Results

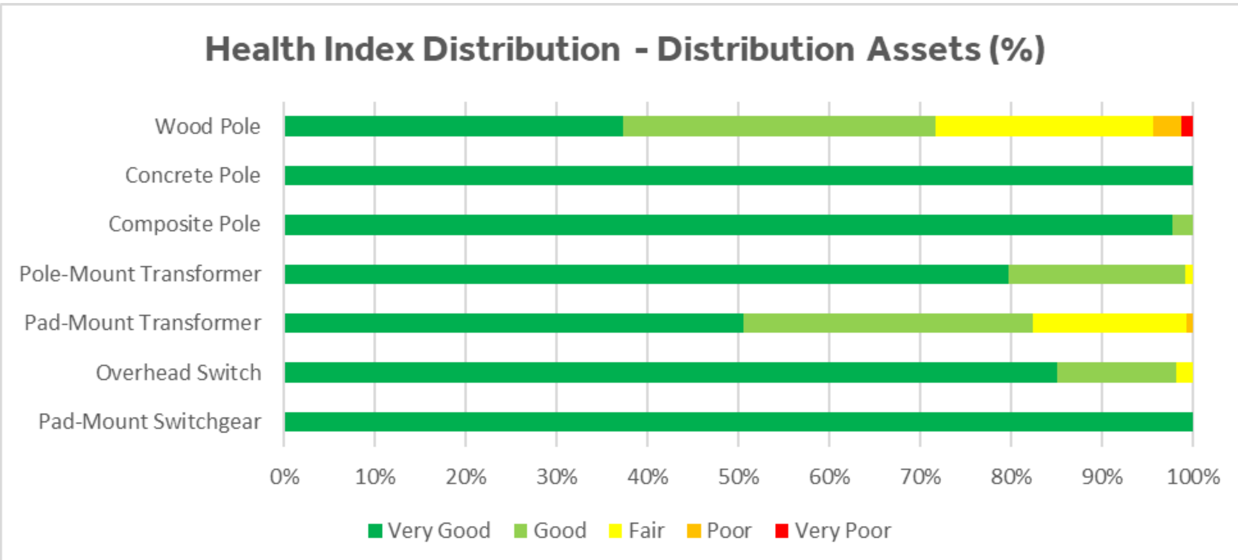
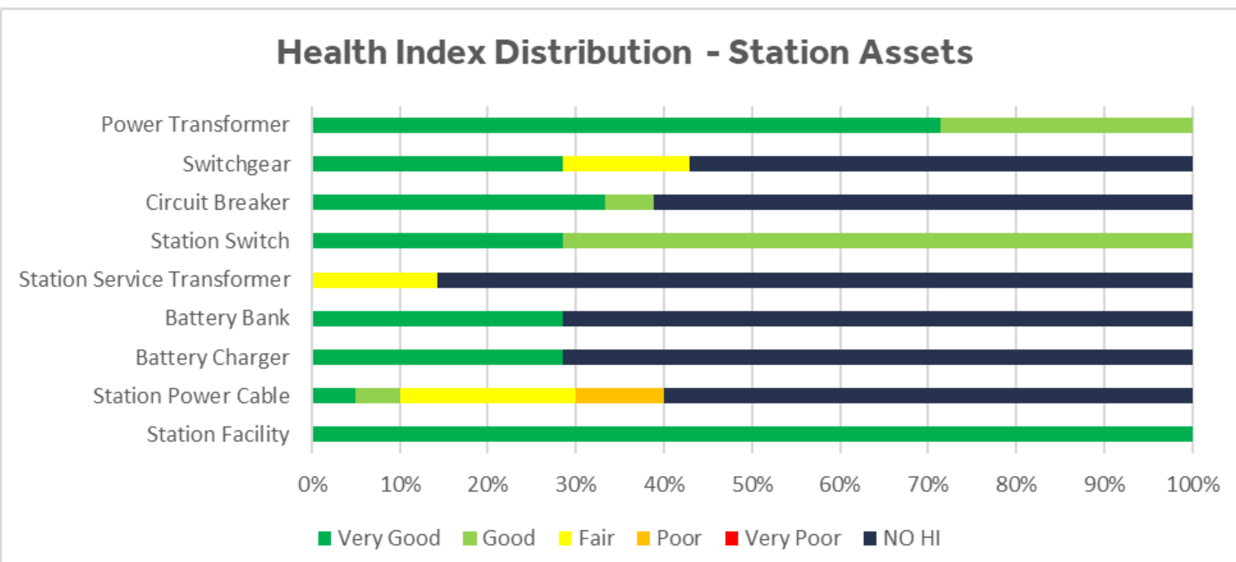


Figure 5-2: Station Asset Health Index Results



6 Recommendations

A complete ACA framework for LUI represents an integral component of its broader AM framework, enabling it to proactively manage its distribution assets and ensure that the right actions are taken for the right assets at the right time. This framework leveraged the information captured from maintenance programs and other utility records, creating an essential linkage between the ongoing maintenance activities and the capital investment decision-making process. Leveraging the HI insights allows for LUI's investment decision-making to be further enhanced with the current information regarding the state of the assets. There are also further opportunities to introduce new data collected, improve on data availability, and continuously improve the ACA framework.

This section breaks down METSCO's recommendations into the following categories:

1. Asset intervention strategies;
2. HI improvements; and
3. Data availability improvements.

6.1 Asset Intervention Strategies

Appendix B lists the detailed Asset Replacement Plan based on the ACA results. The Asset Replacement is based on condition results only. Asset candidates for replacement should be evaluated based on risk before they are added to investment scopes which are then paced and prioritized.

In addition, we note that the maintenance results for power cables and station service transformers indicate that a more detailed follow-up investigations are required to confirm whether these assets have deficiencies.

6.2 Health Index Improvements

For select asset classes, a recommended HI formulation was used for LUI's ACA framework. The following set of recommendations target additional condition parameters that can be incorporated for specific asset classes to improve the HI formulation and provide LUI with additional data to refine its asset condition calculations. The recommendations are based on improving the ACA framework over time and should not be interpreted as suggesting that immediate action is warranted. The following tables highlight the condition parameter name, a short description of the reasoning to include the condition parameter, and a priority of importance to include it into the specific asset's class HI framework. The priority is dependent on the condition parameter's weighting in comparison to the current HI framework condition parameter's weights.

1. Underground Primary Cables

LUI has not experienced many cable failures on its system to date; however, should their rate of occurrence increase, then it would be prudent to track these. The condition of the concentric neutral and cable loading can also be assessed.

Table 6-1: Data Collection Recommendation for Underground Primary Cable

Criteria	Reasoning	Priority
Cable Failure	Identifying water tree samples throughout the service territory and varying age, the utility would be able to have an improved view on cable conditions within the system.	**High**
Condition of Concentric Neutral	Corrosion of concentric neutrals is another mode of degradation. Insulation degradation and cable failures can be accelerated if the cable jacket is damaged allowing moisture to enter into the insulation system. Concentric neutral corrosion is a major problem particularly on unjacketed cables or when the neutrals of the cable are exposed to excessive moisture over time. The corrosion can lead to premature cable failures and/or cause touch potential risks. Time Domain Reflectometry (TDR) tests are performed to determine the degree of corrosion on concentric neutral cables.	**Medium**
Loading History	Cable degradation can also occur due to overheating under overloading or short circuit conditions. Over stressing of insulation during voltage surges can also lead to cable failures.	**Low**

2. Overhead Distribution Transformers

While LUI visually inspects its overhead distribution transformers, the results of the inspections are not recorded.

Table 6-2: Data Collection Recommendation for Overhead Distribution Transformer

Criteria	Reasoning	Priority
Visual Inspection	To identify if the transformer is subject to any physical damage, oil leak, or corrosion.	**High**

3. Overhead Switches

While LUI visually inspects its overhead distribution transformers, the results of the inspections are not recorded.

Table 6-3: Data Collection Recommendation for Overhead Switch

Criteria	Reasoning	Priority
Visual Inspection	To identify the condition of insulators, blades and operating mechanism. The conditions help assess the life expectancy of the switch which	**Medium**

	affects the operability of the switch. Identification of this condition parameter over time provides degradation information of an asset.	

4. Circuit Breakers

Circuit breaker timing/travel tests provide a means to exercise the breaker and ensure it operates within specifications. Other condition parameters may apply depending on the type of breaker.

Table 6-4: Data Collection Recommendation for Circuit Breaker

Criteria	Reasoning	Priority
Visual Inspection - Condition Bushing Insulators	The condition of the bushing helps assess the life expectancy of the circuit breaker since it affects the operability of the breaker. Identification of this condition parameter over time provides degradation information of an asset.	**Medium**
Timing/Travel tests	Timing/ Travel test provides information as to whether the breaker's operating mechanism is operating properly. Identification of operation use over time provides degradation information of an asset.	**Medium**
Visual Inspection – SF6 Leaks	SF6 leakage is an environmental hazard since SF6 has been designated a greenhouse gas by the EPA and can affect the organization financially. Identification of leaks over time provides degradation information of an asset.	**Medium**
Visual Inspection – Enclosure	Damage to the enclosure may affect the insulating medium, which eventual affects the operability of the device. Identification of leaks over time provides degradation information of an asset.	**Medium**

5. Station Facilities

As the ground grid degrades over time and can be at risk of theft, ground grid testing is critical to verify the effectiveness of the grounding relative to its design parameters.

Table 6-5: Data Collection Recommendations for Station Facilities

Criteria	Reasoning	Priority
Ground Grid Test Results	Fall-of-potential and point-to-point integrity tests are essential for ensuring the safe operation of the ground grid as designed.	**High**

6.3 Data Availability Improvements

Data availability is critical to produce prudent, accurate, and justified decision-making outputs. It represents the single most important element that can influence the degree to which the AM decision-making relies on objective factors. Companies understand that it is critical to execute continuous improvement procedures through an AM data lifecycle, such that data gaps and inaccuracies can be addressed and mitigated. In the case of this ACA, the quality of the HI is dependent on the available data. For condition parameters with low data availability METSCO recommends that LUI continue collecting the information related to these data points.

Additionally, for an asset to have a valid HI, it must meet a minimum 70% of available data across the condition parameters used in the HI formulation for distribution assets and 65% for station. As part of future improvement opportunities, it is recommended that LUI continue capturing asset data for condition parameters that are currently available for a small proportion of the asset population, such that valid Health Indices can be produced across the population. It is expected that with every passing year, the inspection record database will continue to grow, allowing for Health Indices to be calculated for the remaining population.

Lastly, METSCO noticed that some condition parameters recorded by LUI vary in the detail with respect to the grading scheme. Some parameters will have a three-tier grade (e.g., Good, Fair, and Poor) and others may have five levels (e.g., from Very Good to Very Poor). METSCO recommends for LUI to evaluate options of changing some condition parameters recorded to a five-level grade, as doing so can provide more defined segregation between assets that need immediate attention and those that can still be in-service without intervention in the short term.

METSCO recommends that LUI continue to work on mitigating the existing data gaps, such that more degradation parameters can be assigned actual grades, thus expanding the sample size of valid HI and capturing all possible degradation of the evaluated assets. LUI's testing, inspection, and maintenance programs are well-positioned to continue to capture this information using processes and technologies in place within the organization.

Appendix A – METSCO Company Profile

METSCO Energy Solutions Inc. is a Canadian corporation which started its operations on the market in 2006. METSCO is engaged in the business of providing consulting and project management services to electricity generating, transmission, and distribution companies, major industrial and commercial users of electricity, as well as municipalities and constructors on lighting services, asset management, and construction audits. Our head office is located in Toronto, ON and our western office is located in Calgary, AB. Through our network of associates, we provide consulting services to power sector clients around the world. A small subset of our major clients is shown in the figure below.

Figure A-1: METSCO Clients

METSCO has been leading the industry in Asset Condition Assessment and Asset Management practices for over ten years. Our founders are the pioneers of the first Health Index methodology for power equipment in North America as well as the most robust risk-based analytics on the market today for high-voltage assets. METSCO has since completed hundreds of asset condition assessments, asset management plans, and asset management framework implementations. Our collective record of experience in these areas is the largest in the world, with ours being the only practice with widespread acceptance across regulatory jurisdictions. METSCO has worked with over 100 different utilities through its tenure, and as such, has been exposed and introduced to practices and unique challenges from a variety of entities, environments, and geographies. When a client chooses METSCO to work on improving Asset Management practices, it is choosing the industry-leading standard, rigorously tested and refined on a continued basis. Our experts have developed, supported, managed, led and sat on stand defending their own DSPs as utility staff giving METSCO the qualified expertise to provide its service to LUI.

In addition to our work in the area of asset health assessments and lifecycle enhancement, our services span a broad common utility issue area, including planning and asset management, design, construction supervision, project management, commissioning, troubleshooting operating problems, investigating asset failures and providing training and technology transfer.

Our founders and leaders are pioneers in their respective fields. The fundamental electrical utility-grade engineering services we provide include:

- Power sector process engineering and improvement
- Fixed Asset Investment Planning – development of economic investment plans
- Regulatory Proceeding Support
- Power System Planning and Studies – identifying system constraints
- Smart Grid Development – from planning to implementation of leading technologies
- Asset Performance and Asset Management
- Distribution and Transmission System Design
- Mentoring, Training, and Technical Resource Development
- Health Index Validation and Development
- Business Case Development
- Owners Engineering Services
- Risk Modeling – Asset Lifecycle and Risk Assessment

Appendix B – Asset Replacement Plan

Asset Replacement Plan

Disclaimer

This report was prepared by METSCO Energy Solutions Inc. ("METSCO") for the sole benefit of Lakefront Utilities Inc. ("LUI" or the Client), in accordance with the terms of the METSCO proposal and the Client Agreement.

Some of the information and statements contained in the Asset Replacement Plan ("ARP") are comprised of or are based on, assumptions, estimates, forecasts and predictions and projections made by METSCO and LUI. In addition, some of the information and statements in the ARP are based on actions that LUI currently intends it will take in the future. As circumstances change, assumptions and estimates may prove to be obsolete, events may not occur as forecasted, predicted or projected, and LUI may at a later date decide to take different actions to those it currently intends to take.

Except for any statutory liability which cannot be excluded, METSCO and LUI will not be liable, whether in contract, tort (including negligence), equity or otherwise, to compensate or indemnify any person for any loss, injury or damage arising directly or indirectly from any person using, or relying on any content of the ARP.

When considering any content of the ARP, persons should take appropriate expert advice in relation to their own circumstances and must rely solely on their own judgement and expert advice obtained.

Purpose

This plan provides the projected quantities of assets that would likely require replacement for the upcoming short-term planning period based on the condition assessment completed for the assets.

Approach

The ACA report documents the Health Index distribution for each asset, estimating the number of assets within each condition category. For each condition of an asset, the condition-based intervention approach can be applied to assess when assets should be replaced to manage the number of expected failures. This is a general approach to assess a preliminary investment plan but can vary between asset classes. However, the Health Index values are based on samples of the asset population that have testing and field inspection records. Continuous monitoring of the asset by inspectors will provide the current state condition of the asset population.

In the case where asset condition is not available, a probabilistic model has been utilized to assess the expected asset failure within a given timeframe. The Weibull distribution function was used to derive the age-based failure probability curves, as it is adaptable to a large range of requirements and can be parametrically controlled to simulate time-variable increasing or decreasing, as well as time-invariant, failure rates. The Weibull distribution is by far the most widely utilized distribution for life data analysis due to its flexibility. The model considers the typical useful life of each asset class based on the OEB's *Asset Depreciation Study*. In these cases, actual asset candidates or replacement should be verified by an in-field assessment of condition and risk.

The identified replacement units can assist with managing the health of the asset population at acceptable levels (i.e. mitigating further deterioration of the population than the current state). The replacement plan leverages the condition of the assets that were calculated with the current Health Index framework and the recent maintenance records. The recommended plan prioritizes those assets that are rated as Poor and Very Poor. Furthermore, it is expected that Fair condition assets will continue to deteriorate and will eventually require replacement.

Healthy Asset Classes

A few asset classes are healthy, meaning no unit in the asset class was evaluated to be in Poor or Very Poor condition. This applies to the following asset classes:

- Concrete Poles;
- Composite Poles;
- Pole-Mount Transformers
- Overhead Switches;
- Pad-Mount Switchgear;
- Station Switches; and
- Station Facilities.

However, these assets require continuous inspections to monitor and note any health degradation observed. Though not commonly observed, asset materials are prone to experiencing degrading conditions and can quickly change from a Good condition grade to a Poor condition within a year. Hence, although this plan does not identify an immediate need to replace any units of the asset classes, it is advised to LUI to be diligent in observing changing trends and planning accordingly.

Furthermore, some asset classes such as station buildings would not require a complete renewal though may require minor improvements to maintain the integrity of the building.

Wood Poles

The ACA determined that 702 wood poles are in Fair condition, 90 poles are in Poor condition, and 37 poles in Very Poor condition. Furthermore, LUI has wood poles that are beyond their typical useful life and may require intervention if the condition of wood poles begins to deteriorate. Specifically, there is approximately 406 poles at or past 40 years of age, based on the OEB's *Asset Depreciation Study*.

Table B-1 presents the recommended number of wood pole replacements each year for 2020 to 2025 based on the ACA results and expected deterioration rate. As a percentage of the total poles in service, this represents 1.9% annually.

Table B-1: Estimated replacement units for wood poles

Quantity of Assets Recommended for Replacement						
Year	2020	2021	2022	2023	2024	2025
Units (#)	55	55	55	55	55	55

Overhead Primary Conductors

Table B-2 presents the recommended quantity of overhead primary conductor replacements each year for 2020 to 2025 based on the expected deterioration rate. As a percentage of the total overhead primary conductor in service, this represents 0.9% annually.

Table B-2: Estimated replacement units for overhead primary conductor

Quantity of Assets Recommended for Replacement						
Year	2020	2021	2022	2023	2024	2025
Units (km)	1.35	1.35	1.35	1.35	1.35	1.35

Underground Primary Cables

Table B-3 presents the recommended quantity of underground primary cable replacements each year for 2020 to 2025 based on the expected deterioration rate. As a percentage of the total underground primary cable in service, this represents an average of about 1.3% annually.

Table B-3: Estimated replacement units for underground primary cable

Quantity of Assets Recommended for Replacement						
Year	2020	2021	2022	2023	2024	2025
Units (km)	0.75	0.75	0.75	0.75	0.75	0.75

Underground Distribution Transformers

The ACA determined that 90 pad-mount transformers are in Fair condition and 3 are in Poor condition. Table B-4 presents the recommended number of pad-mount transformers for replacement each year for 2020 to 2025 based on the ACA results and expected degradation rate. As a percentage of the total underground distribution transformers in service, this represents an average of about 1.1% to 1.3% annually.

Table B-4: Estimated replacement units for pad-mount transformers

Quantity of Assets Recommended for Replacement						
Year	2020	2021	2022	2023	2024	2025
Units (#)	6	6	6	6	7	6

Station Switchgear

While a valid HI was determined for three station switchgear, the other four were run through an end-of-life model to forecast replacements based on expected degradation. It is expected that two station switchgear units will require replacement between the years 2020 and 2025.

Table B-5: Estimated replacement units for station switchgears

Quantity of Assets Recommended for Replacement						
Year	2020	2021	2022	2023	2024	2025
Units (#)	0	0	0	1	0	1

Circuit Breakers/Reclosers

Similar to station switchgear, Table B-6 presents the recommended number of circuit breakers replacements each year for 2020 to 2025 based on the expected degradation rates of the assets without condition data. No replacements are recommended for station reclosers.

Table B-6: Estimated replacement units for circuit breakers

Quantity of Assets Recommended for Replacement						
Year	2020	2021	2022	2023	2024	2025
Units (#)	0	0	1	0	0	1

APPENDIX B – DISTRIBUTION SYSTEM PLAN

Lakefront Utilities Inc.

Distribution System Plan

Developed in accordance with:

"Ontario Energy Board – Filing Requirements for Electricity Transmission and Distribution Applications"

Chapter 5

Consolidated System Plan Filing Requirements

Historical Period:

2017 - 2021

Forecast Period:

2022-2026

April 30, 2021

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

GLOSSARY

ACA – Asset Condition Assessment

AM – Asset Management

AMP – Asset Management Process

CAIDI – Customer Average Interruption Duration Index

CI – Customers Interrupted

CHI – Customer Hours Interrupted

CSA – Canadian Standard Association

DRT – Development Review Team

DSC – Distribution System Code

DSP – Distribution System Plan

EOL – End of Life

ESA – Electrical Safety Authority

GIS – Geographic Information System

GS – General Service

GTA – Greater Toronto Area

GUP – Good Utility Practice

IESO – Independent Electricity System Operator

IST – Information Systems and Technology

IT – Information Technology

KPI – Key Performance Indicator

LDC – Local Distribution Company

LOS – Loss of Supply

LUI – Lakefront Utilities Inc.

LUSI – Lakefront Utility Services Inc.

MAIFI – Momentary Average Interruption Frequency Index

MED – Major Event Day

MWO – Maintenance Work Order

O/H or OH - Overhead

O&M – Operation & Maintenance

O&M – Operation, Maintenance & Administration

OEB – Ontario Energy Board

OMS – Outage Management System

REG – Renewable Energy Generation

RRFE - Renewed Regulatory Framework for Electricity

RTU – Remote Terminal Units

SAIDI – System Average Interruption Duration Index

SAIFI – System Average Interruption Frequency Index

SCADA – Supervisory Control and Data Acquisition

the Board – Ontario Energy Board

TUL – Typical Useful Life

TS – Transmission Station or Transformer Station

U/G or UG – Underground

ULTC – Under-Load Tap Changing

URD – Underground Residential Distribution

USF – Utilities Standards Forum

XFMR – Transformer

1 INTRODUCTION

This consolidated Distribution System Plan ("DSP") has been prepared by Lakefront Utilities Inc. ("LUI") in accordance with the Ontario Energy Board's ("OEB's") *Chapter 5 Consolidated Distribution System Plan Filing Requirements* dated 14 May 2020 ("the Filing Requirements") as part of its 2022 Cost of Service Application ("the Application"). LUI retained METSCO Energy Solutions Inc. ("METSCO") to advise on and assist with the preparation of this DSP.

1.1 OBJECTIVES & SCOPE OF WORK

LUI's DSP is a stand-alone document and is filed in support of LUI's Application. The DSP is designed to present LUI's fully integrated approach to capital expenditure planning. This includes comprehensive documentation of its Asset Management ("AM") process that supports its future five-year capital expenditure plan while assessing the performance of its historical five-year period. It recognizes LUI's responsibilities and commitments to provide customers with reliable service by ensuring that its asset management activities focus on customer preferences, operational effectiveness, public policy responsiveness and financial performance.

1. ***Customer Focus:*** *services are provided in a manner that responds to identified customer preferences.*
2. ***Operational Effectiveness:*** *continuous improvement in productivity and cost performance is achieved, and utilities deliver on system reliability and quality objectives.*
3. ***Public Policy Responsiveness:*** *utilities deliver on obligations mandated by the government (e.g. in legislation and regulatory requirements imposed further to Ministerial directives to the Board).*
4. ***Financial Performance:*** *financial viability is maintained, and savings from operational effectiveness are sustainable.*

1.2 OUTLINE OF REPORT

The DSP is prepared in accordance with OEB's Filing Requirements. The electric distribution system is capital intensive in nature and prudent capital investments and maintenance plans are essential to ensure the sustainability of the distribution network. LUI's DSP documents the practices, policies and processes that are in place to ensure decisions on capital investments and maintenance plans support LUI's desired outcomes cost-effectively and provides value to customers.

The report contains four major sections, including this introductory Section 1. Section 2 provides a high-level overview of the DSP, including coordinated planning with third parties and performance measurement for continuous improvement. Section 3 provides an overview of LUI's asset management practices. Section 4 provides a summary of LUI's capital expenditure plan, including an overview of the capital planning process, an assessment of the system capability for Renewable Energy Generation (REG), and justification of material projects above the materiality threshold.

In accordance with the instructions given in the revised Chapter 5 filing requirements, this report follows the chapter and section headings. Although the numbering does not match, the reference numbers are included in the heading titles in brackets.

1.3 DESCRIPTION OF THE UTILITY COMPANY

LUI is an electricity distributor licensed by the Ontario Energy Board. In accordance with its Distribution License ED-2002-0545, the Applicant provides electricity distribution services in the Town of Cobourg and the former Village of Colborne (referred to as the Village of Cramahe moving forward). LUI is responsible for maintaining distribution and infrastructure assets deployed over 28 square kilometres within the Cobourg and Cramahe service areas shown in Figure 1-1. LUI currently serves approximately 10,500 electricity distribution customers across its two service areas.

LUI is supplied power from one transformer station and three 44 kV breakers, all owned and operated by Hydro One Networks Inc. LUI distributes electricity to the Town of Cobourg and Village of Cramahe at primary distribution voltages of 27.6 kV and 4.16 kV (through five 4.16 kV and two 27.6 kV substations). Revenue is earned by LUI by delivering electric power to the homes and businesses in the service territory. The rates charged for this and the performance standards that the energy delivery system must meet are regulated by the Ontario Energy Board.

LUI is incorporated under the Ontario Business Corporations Act and is a subsidiary of the Town of Cobourg Holdings Inc. which is owned jointly by the Town of Cobourg and the Village of Cramahe. The Town of Cobourg is the majority shareholder at 99.99% and the Village of Cramahe is the minority shareholder at 0.0001%.

Figure 1-1: Map of Distribution Service Territory – Town of Cobourg

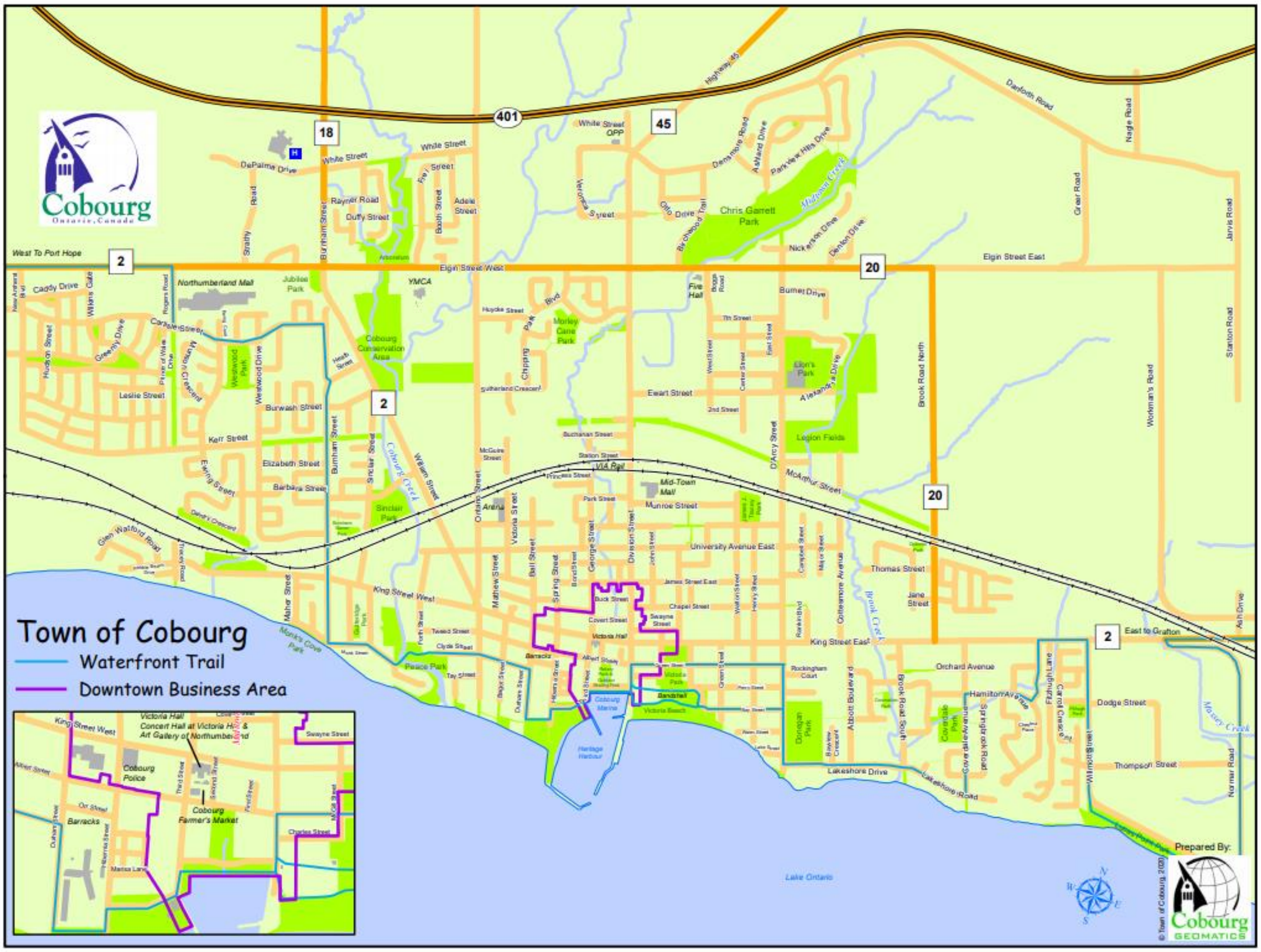
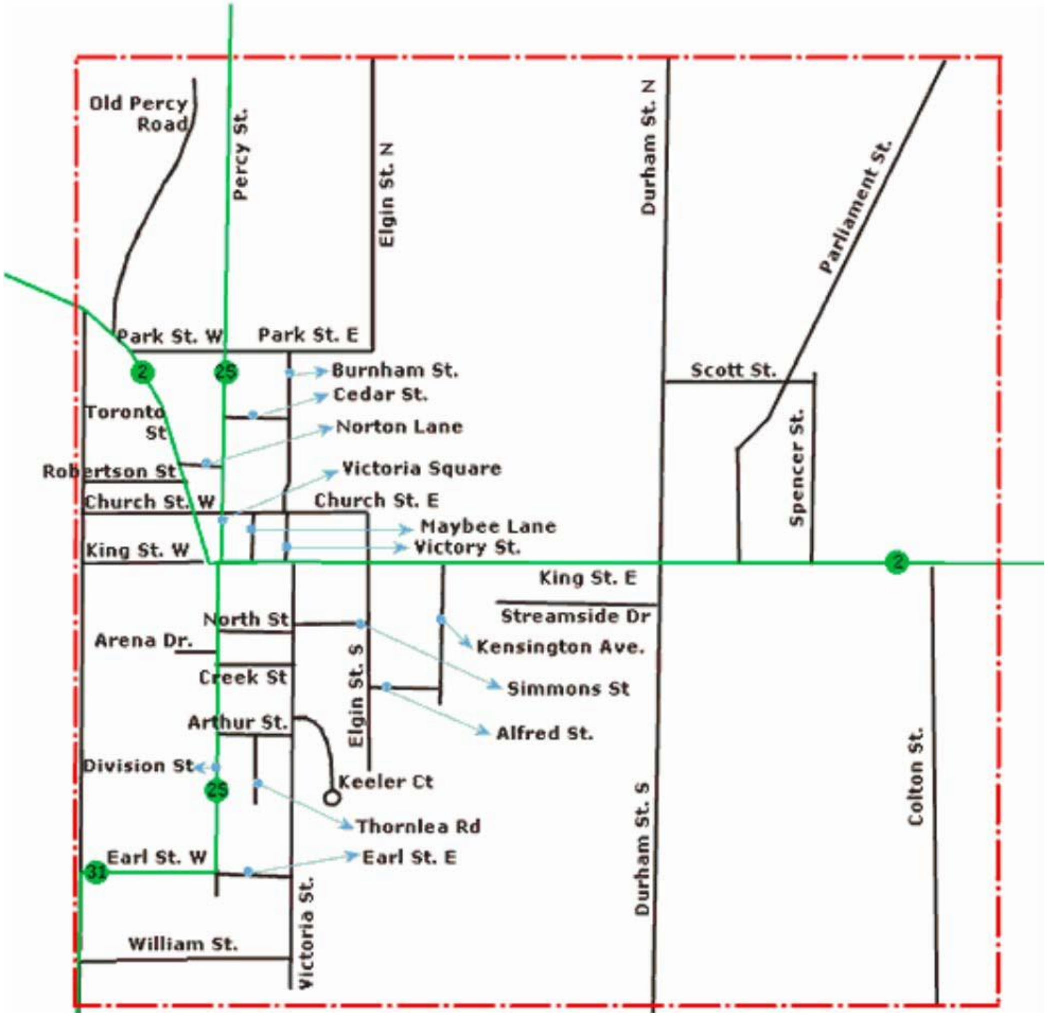


Figure 1-2: Map of Distribution Service Territory – Village of Crahame



1.3.1 Mission, Vision, and Core Values Statement

Our Mission

To provide safe, reliable, and efficient delivery of electrical energy within the Town of Cobourg and Village of Crahame while being accountable to our shareholders and the citizens.

Our Vision

To be acknowledged as a leader among electric utilities in the areas of customer service, safety, reliability, financials, and performance.

1.3.2 Corporate Strategic Goals

The following are LUI's strategic priorities as defined in its Corporate Goals:

- To understand the needs of our customers and to provide them with service and information in a manner that makes sense to them.
- To form partnerships and alliances with other local distribution companies for economies of scale and cost-sharing opportunities. This is accomplished through participating in the Cornerstone Hydro Electric Concept ("CHEC") and Utilities Standards Forum ("USF") groups.

- To invest in the development of our staff to provide an employee-oriented, high-performance culture of organizational effectiveness that emphasizes empowerment, quality, productivity and standards, goal attainment, and ongoing development of a superior workforce.
- To stay current with industry, sector, and regulatory changes.
- To pursue new business opportunities, partnerships, and best management practices in our quest to meet or exceed financial expectations of our community by cost-sharing, efficiency gains, cost savings, improve reliability, superior customer service and protecting the environment.
- To investigate roles and opportunities that LUI can pursue in the generation and promoting conservation and demand management initiatives.

These priorities are in line with the Corporate Vision and Mission statements.

1.3.3 Customers Served

In 2019, LUI served 10,546 electricity distribution customers across its service area. The Town of Cobourg and the Village of Cramahe are situated on Lake Ontario of which both have only urban settings.

The table below illustrates a slight increasing trend in LUI's customer base over the historical period, divided into residential, general service less than 50 kW, general service greater or equal to 50 kW, and large users. Distribution system investments to date have focused on upgrading the system in certain areas as well as maintaining the infrastructure with a minimal cost impact to customers and meeting customer needs.

Table 1-1: Changing trends in LUI's customer base

Annual Year	Residential	General Service <50 kW	General Service ≥50kW	Large User > 5MW	Total
2019	9,300	1,136	110	-	10,546
2018	9,213	1,123	114	-	10,450
2017	9,117	1,116	116	-	10,349
2016	9,001	1,085	128	-	10,214

1.3.4 System Demand and Efficiency

Table 1-2 shows the annual season and average peak demand (kW) for LUI's distribution system.

Table 1-2: Peak system demand statistics

Annual Year	*Winter Peak (kW)*	*Summer Peak (kW)*	*Average Peak (kW)*
2019	43,622	43,236	38,770
2018	43,382	45,324	39,768
2017	40,045	40,516	37,136
2016	41,183	43,462	38,733

LUI experiences a marginal system peak during the summer months in comparison to the winter months. Peak data shown includes the net effect of embedded loads and generators. Variances in the seasonal peaks are attributable to weather temperature in both winter and summer and loading impacts associated with the number of degree days. Table 1-3 indicates the efficiency of the kilowatt-hour purchased by LUI and delivered.

Table 1-3: Efficiency of kWh purchased by LUI

Annual kWh Purchased	Total kWh Delivered (excluding losses)	Total kWh Purchased	Losses as % of Purchased
2020	236,186,591	240,536,452	5.39 %
2019	243,752,568	245,725,460	1.24 %
2018	243,920,467	248,498,888	4.84 %
2017	221,562,616	235,096,884	4.46 %
2016	222,051,158	239,469,596	4.13 %

1.4 BACKGROUND & DRIVERS

The Filing Requirements outline four categories of investments into which projects and programs must be grouped. The drivers for each investment category align with those listed in the Filing Requirements. For reporting purposes, a project or program involving two or more drivers associated with different categories is included in the category corresponding to the trigger driver. To note, all drivers of a given project or program were considered in the analysis of capital investment options and are further described in Section 4 of the DSP.

System Access

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

System Renewal

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

System Service

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

General Plant

These investments are modifications, replacements, or additions to LUI'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.

2 DISTRIBUTION SYSTEM PLAN (5.2)

Section 2.1 provides an overview of the Distribution System Plan ("DSP"). Section 2.2 summarizes coordinated planning activities with third parties. Section 2.3 covers the performance measurement approach to continuously improve asset management and capital expenditure planning processes. Finally, Section 2.4 summarizes the realized efficiencies from smart meters.

2.1 DISTRIBUTION SYSTEM PLAN OVERVIEW (5.2.1)

This section provides the OEB and stakeholders with a high-level overview of the information filed in the DSP, including key elements of the DSP, sources of expected cost efficiencies, the period covered by the DSP, the vintage of the information, an indication of important changes to LUI's asset management processes, and aspects of the DSP that are contingent on the outcome of ongoing activities or future events.

2.1.1 Key Elements of the DSP (5.2.1a)

LUI's Distribution System Plan is designed to support the achievement of the four key OEB established performance outcomes:

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

To achieve a fully complete and compliant DSP, LUI was required to accomplish the following:

- Understand customer preferences – how do customers wish to receive service and how do they wish to interact with the utility to obtain the information they require and understand the goals, objectives, and priorities of the utility.
- Develop a plan for continuous improvement which includes concepts from reliability maintenance, asset monitoring and project prioritization.
- Understand the age, condition, and performance of its assets.
- Ensure its inspection practices are conducted following the Distribution System Code ("DSC").
- Describe its maintenance activities following good utility practice.
- Ensure that all aspects of employee and public safety are addressed in compliance with all regulatory and legal obligations.
- Forecast and plan for the growth of load customers and renewable generation facilities.
- Recognize and address constraints in the current distribution system and anticipate future capacity requirements.
- Review the historical years with the current year of capital expenditures and report on variances from the previous DSP.
- Demonstrate that the asset management process recognizes the above items and prioritizes projects to accommodate customers and system requirements.
- Develop a five-year forward-looking capital expenditure plan that anticipates the future growth, capacity and performance of the distribution system while remaining flexible to accommodate the unknown requirements of its customer base.

LUI's DSP documents LUI's asset management processes and capital expenditure plan for the 2022-2026 period, which integrates qualitative and quantitative information resulting in an optimal investment plan that covers:

- Customer value considerations
- System expansion considerations
- System renewal considerations

- Regional planning considerations
- Renewable generation considerations
- Smart grid considerations
- Alignment with public policy objectives

LUI incorporates good utility practices of the electricity distribution industry into its operations. This includes adhering to the OEB's Distribution System Code ("DSC") that sets out both good utility practices, minimum performance standards for electricity distribution systems in Ontario, and minimum inspection requirements for distribution equipment. Consistent with good practices, LUI continues to maintain its equipment in safe and reliable working order and, only when economically justified, upgrades, or renews its equipment. However, to maintain a moderate increase in the customers' bill, LUI is prudent when incurring costs over the historical period. This is in direct response to customer satisfaction survey results which indicate that the low price of electricity is an important factor to customers.

By prudently controlling all expenditures and therefore moderating any increases in its customers' bills, the distribution system evolved into an array of equipment of different vintages spanning several technological eras. The oldest equipment dates from the 1950s and is part of the 4.16 kV system. LUI did not propose investments in replacing functioning equipment to simply have more modern technologies in place. In developing the long-term DSP, LUI'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 lifetime cost by balancing preventative maintenance, life-extending refurbishment, and end-of-life replacement. In short, the system is expected to meet the customers' needs for quality and reliability of power at a reasonable and affordable cost to customers.

LUI considers performance-related asset information including, but not limited to, data on reliability, asset age and condition, loading, customer connection requirements, and system configuration, to determine investment needs of the distribution system. LUI's DSP demonstrates prudence and rate mitigation consideration in the pacing and prioritizing of non-discretionary investments, specifically those related to replacement or renewable of end-of-life plant.

It can be expected that the operational and service requirements driving LUI's capital expenditures, and found within its DSP, should generally remain consistent through the 2022 to 2026 forecast period. The projected expenditures for 2022 and going forward reflect:

- the typical spending needs of a distribution electric utility serving a stable customer base with a geographically distributed (over two separate service areas), and a diverse collection of physical assets.
- focused planned capital sustainment investments required to replace the ageing assets found in LUI's distribution system.

The table below presents LUI's historical actuals and forecast expenditures for both capital and O&M categories. LUI's 2021 expenditures are projected actuals for projects on track for completion in 2021, however, values are not final and may still change upon year completion.

Table 2-1: Historical actuals and forecast capital expenditures and system O&M (rounded thousands)

Category	Historical ($ '000)					Forecast ($ '000)				
	2017	2018	2019	2020	2021*	2022	2023	2024	2025	2026
System Access (Gross)	423	572	361	177	100	75	318	244	330	336
System Renewal (Gross)	1,800	482	826	733	845	1,300	1,131	869	1,173	1,195
System Service (Gross)	33	40	0	1,109	550	525	315	242	327	333
General Plant (Gross)	105	96	71	89	168	60	131	574	135	138
Gross Capital Expenses	**2,360**	**1,190**	**1,258**	**2,109**	**1,663**	**1,960**	**1,894**	**1,929**	**1,965**	**2,002**
Contributed Capital	202	359	137	268	100	100	0	0	0	0
Net Capital Expenses after Contributions	2,158	831	1,121	1,841	1,563	1,860	1,894	1,929	1,965	2,002
System O&M	835	991	986	1,057	975	1,020	1,39	1,058	1,078	1,098

Estimated actuals based on current projections and pipeline projects.

2.1.1.1 Key Challenge: Aging Infrastructure

LUI's efforts to prolong the useful life of their installed assets have led to an ageing infrastructure resulting in maintenance budget increases to continue delivering the expected services. In addition, older vintages of physical assets are more difficult to maintain as it is difficult to source spare parts for them. Recognizing the challenges that lie ahead, LUI continues to work upon a formal asset management program based on reliability, condition assessment and preventative and predictive maintenance practices. Understanding that replacement of large portions of the distribution system would be financially challenging, LUI has initiated several piece-wise renewal projects that can help to level the expenditures over the forecast period thereby minimizing rate impacts.

The implementation of these programs is anticipated to result in future removal of 4.16 kV substations, reduced future operating costs, reduced outages and maintenance costs, the ability to achieve customer mandated reliability levels in addition to maintaining public and staff safety and increased capacity for renewables integration.

2.1.1.2 Key Challenge: Utility Size & Growth Rate

LUI is a small utility that serves a few large industrial customers. These customers have high electricity delivery expectations, particularly for exceptional reliability performance. Furthermore, LUI needs to manage the threat of large customer(s) leaving for other jurisdictions or converting to self-generation technology. To address this, LUI is constantly engaging with large customers to understand issues that are faced and develop plans to improve the service they are receiving.

Furthermore, LUI experiences a very marginal customer growth rate as compared to the Greater Toronto Area ("GTA"), resulting in fewer investment dollars to be secured for addressing all residential concerns while balancing with the identified system needs. LUI's customer demographics are shifting more heavily towards fixed-income seniors as retired people from the GTA move to Cobourg and Cramahe. In response to this LUI attempts to manage significant rate spikes.

2.1.1.3 Key Challenge: Voltage Conversion

Feeder conversion work remains a key focus of LUI's investment program throughout the forecast period. LUI is in the process of converting its 4.16 kV system to a 27.6 kV system. The conversion process is scheduled over a relatively long period and approximately 80% is completed with the remaining targeted to be completed within the current DSP period. Throughout the conversion process, LUI will have to support the carrying cost of the three 4.16 kV substations and the associated cost of ageing infrastructure, particularly in the 4.16 kV areas.

Furthermore, LUI engaged with a consultant to review the capacity of the existing 44/27.6 kV substations in the Town of Cobourg and to determine the timing of additional capacity requirements to meet forecast load growth, new developments, and the impact of 4.16 kV voltage conversions. Based on the projected load growth and planned voltage conversion program, additional capacity will be required in the forecast period. As a result, LUI is planning to build and install a new 27.6 kV substation within the DSP forecast period. The station capacity study is provided in Appendix A.

2.1.1.4 Key Challenge: Operational Regional Constraints

LUI services two territories, Cobourg, and Cramahe. The two are approximately 23 km apart, a distance that takes approximately 30 minutes to drive in ideal conditions. Due to political requirements, LUI needs to be highly visible in both communities. However, LUI's main operation locations are found in Cobourg. This includes LUI's main office, fleet garage and pole yard. This presents a key challenge for LUI to managing its operations (i.e. the people, fleet, and material) as well as meeting political requirements for both service territories. Furthermore, LUI's workforce is progressively ageing with key individuals retiring from the utility service. LUI is faced with the challenge of attracting new staff to an area outside of the GTA and must compete with the GTA utilities for talent. Additionally, LUI is faced with the challenge of paying competitively as a small utility to attract the desired talent.

2.1.1.5 Key Challenge: COVID-19 Pandemic

The COVID-19 pandemic has challenged Ontario's, Canada's, and the global economy in an unprecedented manner, leading to extreme volatility in the global equity markets, curtailment of personal consumption levels, and widespread layoffs across multiple sectors of the economy. Southeastern Ontario was not an exception, with accommodation, food services, culture, and retail industries being among the most affected.

In 2020, the large concentration of LUI's customers in the downtown areas of Cobourg and Cramahe have been negatively affected by the COVID-19 pandemic. This increases the possibility of these customers going out of business.

The uncertain pace of the economy's recovery within LUI's service territory represents a planning challenge for most System Access and System Service investments driven by current or anticipated customer demand. Since the development of this DSP coincided with the peak of the COVID-19 pandemic, LUI planners considered the potential for greater deviations from the historical connection work demand and will actively engage the region's commercial developers and the broader business community to ensure that the plan remains sufficiently flexible.

2.1.2 Overview Customer Preferences and Expectations (5.2.1b)

Lakefront's customer engagement activities related to this DSP took place from October 2020 to March 2021, through a series of customer engagement opportunities. Many of the customer engagement process findings corroborated what LUI had been hearing recently from customers, via the ongoing dialogue through the day-to-day engagement. Key learnings that emerged through the engagement included:

- In the customer survey issued on the Municipality's website "Engage Cobourg", Lakefront asked customers how familiar they are with Lakefront Utilities which operates the electricity distribution system. Overall, only 25.8% indicated that they are very familiar with Lakefront.
    - To improve overall image, Lakefront should increase its public education efforts to delineate LDCs from the problems of the broader electricity sector in Ontario and promote that LDCs, and specifically Lakefront, are a cost-effective, efficient, and important distributor of electricity and is valuable to the community.
- Similarly, Lakefront asked customers how familiar they are with how electricity distribution rates are set in Ontario – 82.20% indicated that they are either somewhat familiar or not familiar.
- Lakefront has positive reliability stats, but there is room for improvement. There is a positive perception that the utility provides a reliable power supply; however, the number of outage complaints was higher than observed from other years and as indicated in the feedback, customers would like more communication surrounding an estimated time of restoration.
    - Lakefront believes that the current DSP centred around a risk-based optimization program can allow for maintenance, or improvement, of reliability and power quality while maintaining prudent and consistent capital spending levels per recent historical years.

- One of the top feedbacks received from customers was to keep rates low. LUI recognizes the need to keep distribution rates reasonable and affordable for its customers and believes it has addressed this by budgeting efficiently and carefully for the future in this application.
- LUI's outreach initiatives showed some customers expressed a need for extra consultation and assistance with various programs. In response to this, utility staff have made direct contact with customers to assist them with their concerns. These outreach efforts provide a communication channel to energy-conscious customers so that the needs and desires of customers are better understood and addressed.

In addition to receiving customer feedback on the utility, Lakefront had various engagement activities related to its proposed capital projects. Lakefront was proactive in using the customer engagement sessions to communicate directly with their customers about the capital projects that would be affecting them. The customer engagement activities invited customers to learn about Lakefront and the industry, tell LUI about things that are important to them, and prioritize or assess various capital projects and programs, operational plans, and other initiatives for considering in LUI's development of its DSP and this application. In addition, Lakefront used the meetings as an opportunity to provide more education to customers on the distribution system and Lakefront's role in the system. In some cases, Lakefront strived to show a direct link between funding and the deterioration of reliability or conversely, the improvement in reliability in response to an increased spend.

During this phase, Lakefront focused on determining whether, and to what scale the DSP needs to be adjusted to closely reflect the views of customers. Lakefront worked along with the customers to ensure they understood the utility's plans and where there is optionality within the plan (i.e. discretionary vs non-discretionary spending). In the context of the overall spending envelope of the DSP, Lakefront wanted to determine if we have set the right priorities and found the right balance between what customers want and expect from the utility and the responsibility of a safe, reliable local distribution system.

Although the events were not well attended, Lakefront conducted in-depth discussions with those in attendance and followed up with phone calls and emails with other customers that could not attend the sessions. Further, the pattern of responses from this sample of participating customers indicates that this engagement process garnered sufficient qualitative feedback to indicate customer preferences.

2.1.3 Anticipated Sources of Cost Savings (5.2.1c)

Lakefront commits to producing evidence of sustainable savings arising from its operational effectiveness initiatives. Productivity and cost reductions are never static and LUI is constantly searching for ways to improve efficiency and productivity performance to provide better value service for its customers. Some efficiency improvements may lead to direct cost savings, other efficiency improvements may lead to the more effective utilization of resources, allowing LUI to do more with less.

LUI's processes supporting the DSP leverages and follows Good Utility Practices ("GUP"). GUP has inherent cost savings through sound decision-making, thoughtful compromises, right timing, and optimum expenditure levels. This includes adhering to the OEB's Distribution System Code that sets out both GUP, minimum performance standards for electricity distribution systems in Ontario, and minimum inspection requirements for distribution equipment. Consistent maintenance of its equipment has permitted LUI to, in some circumstances, extract an extended useful working life from their assets. Additionally, LUI is a member of both the CHEC and Utilities Standards Forum ("USF"). As a member, LUI continues to realize savings in the form of staff training, shared policies, processes and product delivery, and access to the expertise of other utilities for consultation and problem-solving.

Cost savings expected to be achieved through LUI's Distribution System Plan and existing utility practices are the following:

- Technology improvements can lead to cost savings.
    - Improved use of the GIS to capture/access plant attribute data (i.e. nameplate data, condition, inspection/maintenance histories, location coordinates, etc.) can aid in cost control through optimization of the asset's lifecycle. Cost efficiencies are built into the forecast amounts.

  - Supervisory control and data acquisition (“SCADA”) brought online in 2020 gathers and analyses plant/equipment data. SCADA can aid in troubleshooting, holdoffs, grid status etc. reducing the time and cost in addressing service issues. Cost efficiencies are built into the forecast amounts.
  - Installation of more automated switches and reclosures. These reduce outage times for customers and allow Lakefront to make ongoing changes to its system in a prompter and cost-effective manner. These investments also improve situational awareness for operating staff during power outage events leading to more informed, effective, and efficient restoration of power to customers. Cost efficiencies are built into the forecast amounts.
  - Smart Maps, for improvements including outage management, and planned installation of fault indicators can aid in cost control through faster and more efficient power restoration. Cost efficiencies are built into the forecast amounts.
  - Mobile equipment is being put into use that provides paperless access to GIS information, maps, schematics, drawings and standards for inspection crews and Operations supervisors. Immediate access to data helps streamline utility operations and ensure crew safety in executing capital projects or day-to-day operations. Cost efficiencies are built into the forecast amounts.

- Continuous operational enhancements within LUI introduce additional cost savings.
  - Asset condition inspections and comprehensive data collection will provide a better understanding of each asset’s stage in their lifecycle which can lead to more cost-effective decisions concerning maintenance, refurbishment, and replacement decisions. This includes utilizing pole test data to replace specific poles as required versus rebuilding the whole line if not necessary. Cost efficiencies are built into the forecast amounts.
  - Outsourcing is used for many services to save on costs. In-house versus outsourcing is carefully reviewed and managed to ensure overall best value and ongoing value benefit. Cost efficiencies are built into the forecast amounts.
  - LUI staff reside in an unregulated company Lakefront Utility Services Inc. (“LUSI”). LUSI operates the water system within Cobourg and other small communities with the geographic area. Opportunity to collaborate with LUSI water systems management for on-going cost savings through shared services. Cost efficiencies are built into the forecast amounts.
  - Lakefront’s previous OM&A included a staff level of 18.5. This application includes a staff level of 16.75. Lakefront has been able to do more (increased workload) with less by maintaining consistent staffing levels while still maintaining the service to customers that they expect and ask for. Cost efficiencies are built into the forecast amounts.

- Execution of planned capital and maintenance projects continues to contribute to cost savings.
  - Meter sampling for seal extension is done to avoid replacing the meter extending usable life. Meters are sampled in batches to avoid new meter purchases for the entire sample. Cost efficiencies are built into the forecast amounts.
  - Proactive maintenance and replacement of plants can reduce reactive maintenance costs and improve service to the customer that can result in fewer and shorter duration outages that can have a beneficial impact on the cost of outages to customers. A structured program can also smooth out financial rate impacts to avoid disruptive rate spikes to address the volume of the plant reaching the end of life. Cost efficiencies are built into the forecast amounts.
  - Introducing a managed and targeted reliability improvement program that identifies the worst performing feeders through the analysis of historical outage causes. Reliability improvement measures can be considered to address leading outage causes such as installing animal guards/insulated leads, increase in tree trimming, installing lightning arrestors, etc. Cost efficiencies are built into the forecast amounts.
  - Performing a mid-term review of projects completed and proposed and selecting projects that are relevant and have the greatest customer benefit. Projects that are not aligned either get revised or deferred to another planning year to appropriately achieve the intended objectives and benefits. Cost efficiencies are built into the forecast amounts.

  - Addressing rear-lot underground renewal to front-yard underground can contribute to lower maintenance costs. Cost efficiencies are built into the forecast amounts.
  - Plant relocation related to road authority work will be coordinated with Cobourg and Cramahe and other utility work schedules to ensure that plant is not replaced prematurely and then replaced again shortly afterwards. Cost efficiencies are built into the forecast amounts.
  - Voltage conversions will ensure long-term reliability is maintained at current levels. Conversions will reduce station maintenance needs and lower line losses, provide additional capacity for distributed generation connections and in some cases, improve power quality. The eventual elimination of the legacy voltage plant will reduce the need to stock parts/equipment specific to that voltage class, leading to supply chain and inventory efficiencies. Cost efficiencies are built into the forecast amounts.

2.1.4 Period Covered by DSP (5.2.1d)

The DSP covers the historical period of 2017 to 2021, with 2021 being the bridge year, and a forecast period of 2022 to 2026, with 2022 being the Test Year.

2.1.5 Vintage of the Information (5.2.1e)

Unless otherwise noted, all information contained in the DSP is current as of March 31, 2021.

2.1.6 Important Changes to Asset Management Processes (5.2.1e)

LUI has made several important changes recently to its asset management process which outlines the company's good utility practices and its replacement/refurbishment program in addition to its inspection and maintenance program. These advances include:

- Update of the LUI's strategy and asset management objectives which provides specific information to establish the capital and maintenance requirements for the five-year capital investment program.
- Formalization of the project prioritization process for the capital investment program.

In addition, LUI's planning, and investment processes follow GUP. LUI continues to improve the following activities that contribute to its asset management processes:

- Updating maintenance and GIS records of assets.
- Improving the accuracy of documentation of the assessed condition of assets.
- Improving the accuracy of cost estimating tools.
- Understanding of the effect on the reliability of deteriorating assets.
- Increasing the efficiency of the system through the elimination of substations and a conversion to a higher operating voltage.

2.1.7 DSP Contingencies (5.2.1f)

There are few ongoing and future activities in the LUI service areas that may impact the capital project prioritization and spending as outlined in the DSP.

Customer Connections

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

Municipal Road Projects

Cobourg and Cramahe carry out road resurfacing and other types of roadway improvements on an annual basis. Timing and location for these works are subject to short-term planning considerations, and as such, are frequently rescheduled. LUI will be required to accommodate and react to these road projects as they occur during the period of the DSP.

2.1.8 Grid Modernization, Energy Resources & Climate Change Adaptation (5.2.1h)

There are several ongoing and proposed projects that LUI is undertaking to address grid modernization, DERs integration and climate change adaptation. LUI's approach to these activities includes proactive measures such as rebuild opportunities. The following activities are being undertaken at LUI:

Storm Hardening – Employing proven storm hardening techniques such as installing stainless steel equipment for below-grade applications, moving below grade equipment to above grade (if possible) where flooding is a possibility, design to Canadian Standard Association ("CSA") Heavy Loading conditions standards, and utilize stronger poles in construction. New subdivisions designed with the underground distribution.

Voltage Conversion – Upgrading the 4.16 kV system to 27.6 kV to increase load transfer capability, reduce losses and allow higher penetration of DERs.

Replacement of obsolete assets – Grid modernization effort to remove assets that no longer meet LUI's design standards. Removing these assets will support reliability performance, resiliency, and operational efficiency while reducing LUI's procurement and spare inventory costs through standardization of equipment.

SmartMap Investment – Investment in a Utilismart SmartMap system for outage management system ("OMS") functionality and near a real-time operating map of distribution system with a link to customer information system. This will allow improved customer service, situational awareness, and outage response.

SCADA Expansion – Re-introduction of Survalent SCADA system to LUI. Adding this asset will improve the operability of the system, monitoring of the system, and logging of historical loading for short- and long-term system planning. Additional functionality includes the remote operation of the system and block/unblock auto-reclose. The communication system will be reviewed and upgraded, as necessary.

Switch Automation Expansion – There is currently one overhead automated line switch on the 27.6 kV system. LUI plans to expand overhead and underground switch automation to key switch points on the 44 / 27.6 kV system in Cobourg and the 4.16 kV system in Cramahe.

Smart Fault Indicator Installation – Currently, the technology is partially deployed on the 44 kV system in Cobourg. LUI plans to continue the deployment and installation on the remaining 44 / 27.6 kV system in Cobourg and 44 / 4.16 kV system in Cramahe. The deployment of these assets will improve restoration time for customers. LUI plans to expand to fault indicators capable of communicating with SCADA.

Electric Vehicle (EV) Charging Stations – LUI conducted EV charging pilots to understand the impact of EVs on the distribution system. LUI designs for 200 A service for residential customers and EV charging is considered in the connection design for commercial/industrial customers. EV charging will be considered in new distribution system renewal and access projects. The use of SmartMap allows individual transformer monitoring to identify overloaded assets due in part to EV charging and to appropriately act.

2.2 Coordinated Planning with Third Parties (5.2.2)

2.2.1 Summary of Consultations (5.2.2a)

In preparing this DSP, LUI has considered the needs of its customers, the municipal governments of Cobourg and Cramahe, HONI and the IESO. This DSP considers the outcomes of completed consultations, reports, and plans as well as a continued effort in coordinating with any future ongoing developments with third parties. The following sections describe each consultation LUI participated in that was considered for this DSP.

2.2.1.1 Transmitter Consultation - Hydro One Networks Inc. (HONI)

LUI is connected to the main Ontario power grid via a single Transmission Station ("TS") – Port Hope TS, owned and operated by Hydro One. LUI serves two communities in South Eastern Ontario. The express feeders from Port Hope TS to Cobourg (M2 and M4) are directly connected to Hydro One, whereas the non-express feeder to Cramahe (M16) is embedded in Hydro One. As a result, Lakefront and Hydro One are in constant conversation regarding changes on their respective systems that would materially affect each utility.

Currently, no Regional Infrastructure Plan ("RIP") or Local Plan ("LP") is in place for Port Hope TS. However, the second cycle of the IRRP had begun in December 2019 with a completed Needs Assessment in February 2020. Port Hope TS, specifically T3/T4, was identified to be replaced due to the assets being end-of-life ("EOL") and need to be replaced to manage the risk of failure. LUI expects to be in communication with HONI in developing an LP and/or RIP for renewing the Port Hope TS. To date, no consultations on this topic were completed.

2.2.1.2 Municipal and Regional Consultations

LUI maintains a relationship with both Cobourg and Cramahe. LUI discusses with Cobourg and Cramahe regarding the implications of development to the distribution system in terms of potential system renewal, system access and system service projects. Whether through new developments, redefining existing space or with third-party relocation projects, LUI is working with Cobourg and Cramahe to achieve their goals. Respective projects are categorized in the appropriate investment categories as they are detailed or requested by Cobourg and Cramahe. LUI works closely with Cobourg and Cramahe in the execution of capital projects and in assisting them through the prioritization of projects.

Development Review Team (DRT)

LUI participates as a member of the Town of Cobourg's Development Review Team ("DRT"). DRT meetings are typically conducted weekly and are attended by various Town of Cobourg staff involved in planning and development within the municipality of Cobourg. Often, the meetings also include developers and potential developers of projects. Development plans are reviewed and each member of the DRT is offered an opportunity to comment on the impact of the development.

LUI utilizes the DRT meeting to create a relationship with the project developer, provide high-level comments on servicing and understand the impact of the development on others within the municipality of Cobourg. LUI can then further interact with the developer on the specific requirements of servicing the development with electricity. Typically, the interaction leads to an offer-to-connect or subdivision agreement between LUI and the developer.

Northumberland County Utility Coordinating Meeting

In January 2020, Northumberland County hosted the first utility coordinating meeting for all utilities performing work within the County. All utilities in attendance, including LUI and the Town of Cobourg, presented their annual capital works plans and discussed how the plans could potentially affect other utilities and customers in the vicinity of the work. The meeting was useful to understand these impacts and to make contacts with other utility members for coordination throughout the year and beyond. Northumberland County surveyed the participants at the end of the meeting to determine how frequently the meetings should occur. At the date of writing, the frequency of meetings has not been determined but could be as often as monthly and as infrequently as annual.

Northumberland County has a "Strategic Plan 2019 – 2023" however, there is no immediate economic development in the LUI service area for the forecast period. LUI is in constant communication with the county council on addressing any issues as well as identifying future work LUI can leverage for efficiency and cost-savings.

2.2.1.3 Customer Engagement

The purpose of LUI engaging in its customers is to incorporate customer's issues and needs within the utility's capital and maintenance plans while also communicating with customers of ongoing efforts to meet the expected level of service. LUI is both proactive and reactive in its customer engagement consultations and engages its customers through multiple ongoing streams which include:

- In-person engagements at LUI's offices.
- Social media platforms to bring attention to ongoing outages, restoration efforts, and other topics of interest.
- Phone calls through customer service can assist customers in addressing their needs and issues.
- Email sign-ups for receiving paperless bills and notices.

- Customer portal for looking up their power consumption habits and identifying ways to reduce costs.
- Website communication or important updates happening at LUI.
- One-on-one meetings with large business/industrial customers.
- Open-house sessions for DSP presentation and feedback.

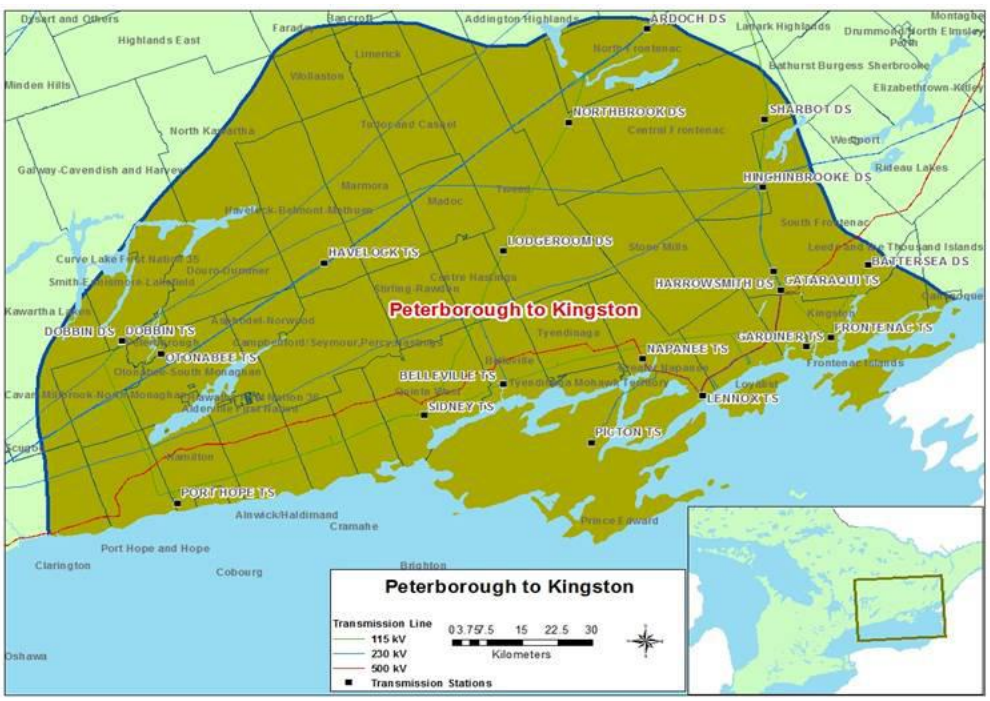
Discussions through the consultations provide helpful insight into the day-to-day operations at LUI. Consultations with industrial customers are conducted regularly primarily to engage and promote participation in utility offered programs, such as CDM initiatives in the past. In addition to this, LUI capitalizes on the opportunity to also discuss power quality, other reliability issues and future system planning.

In 2020 and into 2021, LUI proceeded to complete its DSP customer engagement for both residential and business customers. The purpose of this engagement was to consolidate and consider the feedback received on LUI's upcoming DSP filing and its proposed investment plan. LUI sought direct input from customers to determine if LUI's operational and capital plans aligned with customer preferences and whether customers would ultimately support LUI's decision-making in providing the best, optimized and effective plan for its customers. The results and effectiveness of the customer engagement are further detailed in Section 4.1.3. In summary, customer consultations support the DSP's focus on maintaining existing reliability and service levels through prioritized, efficient, and paced investments while managing the level of bill impacts.

2.2.2 Regional Planning Process (5.2.2b)

LUI is a member of the Peterborough-Kingston ("PtoK") Regional Planning Group which includes the counties of Frontenac County, Hastings County, Northumberland Country, Peterborough Country, Prince Edward County, and part of Lennox and Addington Country, and related municipalities. From a HONI and IESO perspective, the Peterborough-Kingston Region is within the Group 2 Region.

Figure 2-1: Map of PtoK Territory



The first regional planning cycle for the region was completed in July 2016 with a documented Regional Infrastructure Plan ("RIP") and a Needs Assessment done in 2015. There were only two needs identified in the region of which neither pertained nor involved LUI.

The second cycle of regional planning started in December 2019 which is in accordance with the Regional Planning process – that is the regional planning cycle should be revisited at least every five years. In February 2020, a Needs Assessment for PtoK was completed (attached in Appendix B). LUI was a part of the Needs Assessment team. The purpose of the Needs Assessment was to identify new needs for the region as well as recommend a path forward for each need by either developing a preferred plan or identifying which needs require further assessment and/or regional coordination. Inputs considered for the Needs Assessment included:

- Load forecast for all supply stations
- Known capacity and reliability needs, operating issues and/or major assets approaching the end of life ("EOL")
- Planned/foreseen transmission and distribution investments that are relevant to regional planning for the PtoK Region.

Two types of needs were identified and documented in the Needs Assessment: 1) line/station capacity upgrade, and 2) ageing infrastructure transformer replacements. LUI is not impacted by any line/station capacity upgrades identified. Within the ageing infrastructure of transformers, Port Hope TS, which supplies the LUI distribution system, is identified to be replaced in 2023. The implementation and execution plan for the replacement of the TS will be further coordinated by Hydro One and does not require further regional coordination. A short description pertaining to the scope of Port Hope TS replacement is extracted from the Needs Assessment report:

> *Port Hope Transformer Station supplies the City of Port Hope, City of Cobourg, and other surrounding areas via two DESN, T1/T2 & T3/T4. Each transformer is 50/83 MVA in size and steps down 115 kV to 44 kV voltages. The station's 2018 actual non-coincident summer peak load (adjusted for extreme weather) was about 114 MW and is forecasted to be 136 MW in the next 20 years. T3/T4 are 61 years old and have reached their end of life and need to be replaced with the addition of replacing the EOL 44 kV switchyard associated with the transformers. The preferred option is to replace the transformers with a similar size transformer as the current LTR rating of the transformers are adequate to serve the forecasted load for the next 20 years.*[1]

A Scoping Assessment Outcome Report for the PtoK Region Integrated Regional Resource Plan ("IRRP") was developed in April 2020, followed by a public webinar to seek input on the draft. A final Scoping Assessment was developed in May 2020 (attached in Appendix C). The main outcome of the Scoping Assessment is the identification of the best planning approach for each need identified in the Needs Assessment. Replacement of the Port Hope TS was identified to go through the IRRP process. Hence, the regional planning cycle continues with an IRRP anticipated to be posted in Q4 2021.

2.2.3 IESO Comment Letter (5.2.2c)

LUI has determined that the distribution system as currently constructed and configured can accommodate REG investments anticipated in the forecast period covered by this DSP. LUI's REG investment plan was forwarded to the IESO and the comment letter from the IESO is attached in Appendix D to this DSP.

2.3 Performance Measurement for Continuous Improvement (5.2.3)

LUI's corporate emphasis on continuous improvement is reflected in all areas of its operations. Like most utilities in Ontario, LUI must replace ageing, at risk of failure distribution infrastructure to ensure the safe and reliable supply of electricity. In addition to the strategic replacement of ageing assets, LUI continues to focus on core maintenance activities to reduce the disruption of electricity distribution to customers. LUI focuses on short- and long-term planning

[1] https://www.hydroone.com/abouthydroone/CorporateInformation/regionalplans/peterboroughtokingston/Documents/Peterboroug%20to%20Kingston_2nd%20cycle%20NA%20report.pdf

to ensure sufficient system capacity is available, and contingencies are in place should there be a loss of critical distribution infrastructure.

LUI monitors several performance measures, including those mandated by the OEB, that may assist in the utility's continuous improvement activities and satisfying customer requests. These measures can be divided into the following general groups:

1. Customer-oriented performance
2. Cost efficiency and effectiveness
3. Asset/system operations performance

Where applicable, the performance measures included on the scorecard have an established minimum level of performance to be achieved. The scorecard is used to continuously improve LUI's AM and capital planning process. LUI's current performance state is represented by LUI's official scorecard results for the recent historical year as published by OEB. The scorecard is designed to track and show LUI's performance results over time and helps to benchmark its performance and improvement against other utilities and best practices. The scorecard includes traditional metrics for assessing services, such as frequency of power outages and costs per customer.

The guidance provided by the OEB in the recently published *Report of the Board: Electricity Distribution System Reliability Measures and Expectations* (EB-2014- 0189), indicates that it would like to use the average or arithmetic mean of the previous five years (or historical period) of data to establish performance expectations for the forecast period. Specifically, the OEB referred to SAIDI and SAIFI as the two reliability indicators that would benefit from using targeted goals.

Each metric provided in the table and subsections below influences LUI's DSP to achieve the best performance for its customers. The following sections address performance metrics as published by the OEB in the performance scorecard and with additional performance metrics identified in OEB's Rate Filing Requirements. LUI's recent year scorecard is shown in Appendix E.

Table 2-2: DSP Performance Measures for LUI

Performance Outcome	Measure	Motivation	Metric	Target
Customer-oriented performance	Service Quality	Regulatory/Consumer	New Residential/Small Business Services Connected on Time	> 90%
			Scheduled Appointments Met on Time	> 90%
			Telephone Calls Answered on Time	> 65%
	Customer Satisfaction	Customer	First Contact Resolution	> 99%
			Billing Accuracy	> 98%
			Customer Satisfaction Survey	> 78%
	System Reliability	Regulatory/Customer	SAIDI	0.59
			SAIFI	0.46
			CAIDI	1.89
Cost efficiency and effectiveness	Cost Control	Regulatory/ Customer/ Corporate	Total Cost per Customer	Group 2 (between 10% and 25% below predicted costs)
			Total Cost per km of Line	
			O&M Cost per Customer	

Performance Outcome	Measure	Motivation	Metric	Target
			O&M Cost per km of Line	
			O&M Cost per MW of Average Peak Capacity	
	Asset Management	Corporate/ Regulatory	DSP Implementation Progress	Completion
Asset/system operations performance	Safety	Regulatory/ Corporate	Level of Public Awareness	80%
			Level of Compliance with Ontario Regulation 22/04	C
			Serious Electrical Incident Index	0
	Distribution Losses	Corporate	Line Losses	< 5%

Annual performance variances that are not within target ranges or meet minimal performance thresholds would result in senior management review of performance cause that may result in changes to immediate or future places to direct performance back to target levels. LUI has been and continues to be, focused on maintaining the adequacy, reliability, and quality of service to its distribution customers. Since 2021 is not yet a completed year, the historical performance measures include 2016 to 2020 to have a complete five-year historical performance assessment.

2.3.1 Customer-Oriented Performance

2.3.1.1 Service Quality

2.3.1.1.1 Methods and Measures (5.2.3a)

LUI measures and reports on an annual basis on each of the service quality requirements set out in the DSC. Failure to meet minimum service quality targets would result in measures being taken to realign performance with DSC service quality standards. Service Quality measures include the following major measures: New Residential/Small Business Services Connected on Time, Scheduled Appointments Met on Time, and Telephone Calls Answered on Time. Additional sub-measures are tracked as part of the DSC requirements. All these measures are self-explanatory, and all relate to LUI providing connection services as well as quality customer service. LUI is committed to meeting all targets found in the Service Quality performance measure group.

2.3.1.1.2 Historical Performance (5.2.3b)

Over the past years LUI has exceeded all of these measures including new services connected on time, scheduled appointments met, and telephone calls answered within 30 seconds. LUI attributes this success to its open-door policy to its customers. Employees answer the telephone themselves with no automated phone system and make personal arrangements for appointments. Customers are generally helped immediately with questions or issues at the first point of contact, whether by phone or in person. The overall answer rate is well above the industry targets and is indicative of LUI's dedication to being an organization focused on customer service. Table 2-3 presents the service quality metrics tracked by LUI along with LUI's historical performance records.

Table 2-3: Performance Measures - Service Quality

Measure	2016	2017	2018	2019	2020	LUI Target
New Residential /Small Business Services Connected on Time	98.50%	99.44%	98.99%	97.57%	91.17%	90%
Scheduled Appointments Met on Time	99.00%	100%	99.09%	100%	100%	90%
Telephone Calls Answered on Time	91.20%	91.95%	95.47%	94.10%	82.27%	65%

2.3.1.1.3 Performance Trend into the DSP (5.2.3c)

LUI exceeded the industry targets for each service quality measure. LUI's outstanding performance on these measures indicates no substantial additional material projects are required for investments in this area. LUI continues to strive to better serve the customer with the highest excellence. LUI's intended action for these measures is to maintain the performance.

2.3.1.2 Customer Satisfaction

2.3.1.2.1 Methods and Measures (5.2.3a)

LUI measures and reports on Customer Satisfaction measures which include: First Contact Resolution, Billing Accuracy and Customer Satisfaction Survey Results. LUI uses the OEB Targets for these measures and relies on its staff to meet these targets.

First Contact Resolution

LUI measures this performance by logging all calls, letters, and emails received and track them to determine if the inquiry was successfully answered at the first point of contact. A series of logged calls would be created to assist the customer service representative to accurately choose the logged call pertaining to the inquiry received. A specific service order has been created to track any call, letter, or email that was not resolved at the first point of contact.

Billing Accuracy

LUI performs due diligence by testing the consumption levels in correlation to the amount expensed to its customers. The utility also performs analysis of meter reading data and fixing any errors that may arise before it is communicated on the customer's bill.

Customer Satisfaction

Customer satisfaction survey results and customer engagements are important to the success of LUI. LUI is proactive and reactive in its customer engagement consultations, the majority of which provide helpful insight into the day-to-day operations of LUI. LUI engages RedHead Media in collaboration with other CHEC member utilities to control costs and to conduct an independent biennial telephone-based customer satisfaction survey since 2017. The purpose of the survey is to focus on addressing issues of concern raised directly by customers. The survey asks questions of both residential and general service customers on a wide range of topics including power quality and reliability, price, billing payment, communications, and the customer service experience. The feedback is then incorporated into LUI's planning process and forms the basis of plans to improve customer satisfaction, meet the needs of customers, and address areas of improvement.

2.3.1.2.2 Historical Performance (5.2.3b)

LUI sets a high standard for performance when it comes to customer care and is especially proud of the results considering the increase in customer concerns over proving and value across Ontario. LUI strives to deliver customer excellence and value through the execution of its investments and operations. LUI believes they have delivered the intended performance for each metric delivering customer satisfaction demonstrating credibility and trust.

Table 2-4: Performance Measures - Customer Satisfaction

Measure	2016	2017	2018	2019	2020	LUI Target
First Contact Resolution	99.96%	99.92%	99.14%	99.41%	99.77%	99%
Billing Accuracy	99.89%	99.97%	99.96%	99.95%	99.79%	98%
Customer Satisfaction Survey Results	76.10%	76.10%	80.70%	80.70%	77.70%	78%

It is a crucial part of LUI's business to ensure accuracy on their customer's bills. LUI performs due diligence by testing the consumption levels in correlation to the amount expensed to its customers. The utility also performs analysis of meter reading data and fixing any errors that may arise before it is input onto the customer's bill.

Overall customer satisfaction increased from 2017 which indicates that customers are satisfied. The scores provide an indication that LUI is actively listening to customer needs and providing service levels that meet their expectations. The results further indicate that Lakefront is using strong business practices to provide a needed commodity reliably to a community that has an appreciation for the service being provided.

2.3.1.2.3 Performance Trend into the DSP (5.2.3c)

LUI's outstanding performance on the measures indicates no substantial additional material projects are required. LUI continues to strive to better serve the customer with the highest excellence. LUI's intended action for the measure is to maintain the performance of the historical average.

LUI feels that once customers see the big picture of what happens on the local level, the value of the work LUI does to provide safe and reliable power and excellent customer service becomes more apparent. LUI will continue to use the bi-annual survey results to benchmark improvement and to identify additional opportunities to enhance customer satisfaction. On-going, daily interactions that leave the customer with the information they need will remain LUI's highest priority.

2.3.1.3 System Reliability

2.3.1.3.1 Methods and Measures (5.2.3a)

System reliability is an indicator of the quality of electricity supply received by the customer. System reliability and performance are monitored via a variety of weekly, monthly, annual, and on-demand reports generated by the SCADA system and the Outage Management System ("OMS"). LUI collects and reports outage data using the standard format and codes specified in the RRR document. LUI utilizes other methods of data collection and cataloging such as trouble reports collected by field employees and a newly implemented SmartMap software. Calculations are made to determine the reliability indices SAIDI, SAIFI, and CAIDI. The data is sorted to determine frequency and duration for each feeder as well as to determine the cause and affected components.

The reliability of supply is primarily measured by internationally accepted indices SAIDI and SAIFI as defined in the OEB's *Electricity Reporting & Record Keeping Requirements* dated May 3, 2016. SAIDI, or the System Average Interruption Duration Index, is the length of outage customers experience in the year on average, expressed as hours per customer per year. It is calculated by dividing the total customer hours of sustained interruptions over a given year by the average number of customers served. SAIFI, or the System Average Interruption Frequency Index, is the number of interruptions each customer experiences in the year on average, expressed as the number of interruptions per year per customer. It is calculated by dividing the total number of sustained customer interruptions over a given year by the average number of customers. An interruption is considered sustained if it lasts for at least one minute.

$$SAIDI = \frac{Total\ customer\ hours\ of\ sustained\ interruptions}{Average\ number\ of\ customers\ served}$$

$$SAIFI = \frac{Total\ customer\ interruptions}{Average\ number\ of\ customers\ served}$$

CAIDI or the Customer Average Interruption Duration Index is the average interruption time per customer affected and can be found by dividing the SAIDI value for the given year by the SAIFI value.

$$CAIDI = \frac{SAIDI}{SAIFI}$$

Loss of Supply ("LOS") outages occur due to problems associated with assets owned by another party other than LUI or the bulk electricity supply system. LUI tracks SAIDI and SAIFI including and excluding LOS. Major Event Days ("MED") are calculated using the IEEE Std 1366-2012 methodology. MEDs are confirmed by assessing whether interruption was beyond the control of LUI (i.e. force majeure or LOS) and whether the interruption was unforeseeable, unpredictable, unpreventable, or unavoidable.

Furthermore, LUI began tracking a Worst Performing Feeder ("WPF") list starting in Q3 2020. There are no pre-defined regulatory metrics used to determine Worst Performing Feeders. In assessing feeders that contribute to poor reliability performance, LUI uses the following metrics: Customer Hours Interrupted ("CHI") and the number of Customers Interrupted ("CI"). These two metrics are directly related to SAIDI and SAIFI, respectively. The WPF list is created based on a rolling two-year feeder performance. Planned outages, LOS and MEDs are excluded from the outage data. Abnormal feeder configurations were not excluded. Abnormal feeder configuration occurs when additional customers are temporarily added to a feeder to support construction or maintenance work performed on an adjacent circuit.

2.3.1.3.2 Historical Performance (5.2.3b)

LUI's historical performance for SAIDI, SAIFI and CAIDI is visualized in the figures below.

Figure 2-2: Performance Measure – SAIDI

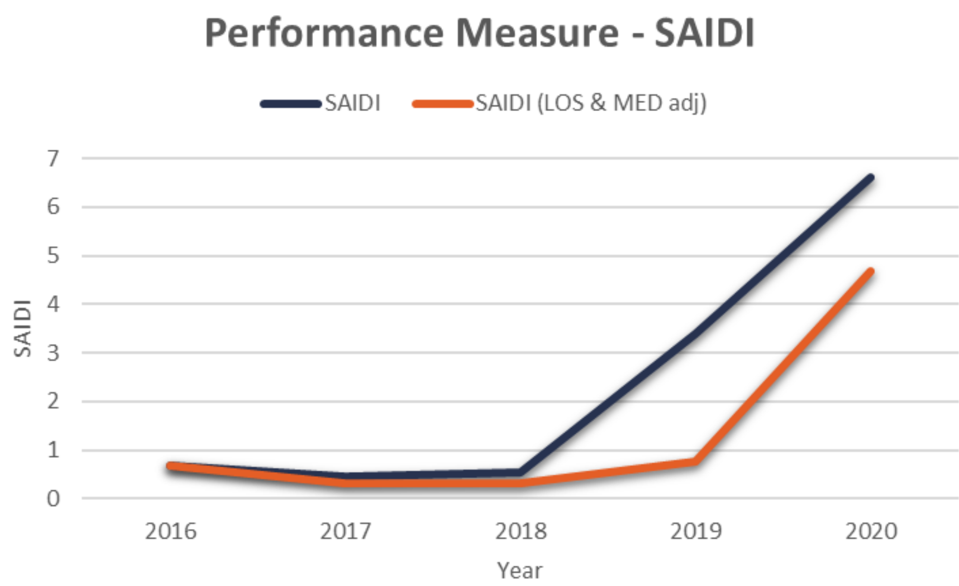


Figure 2-3: Performance Measure – SAIFI

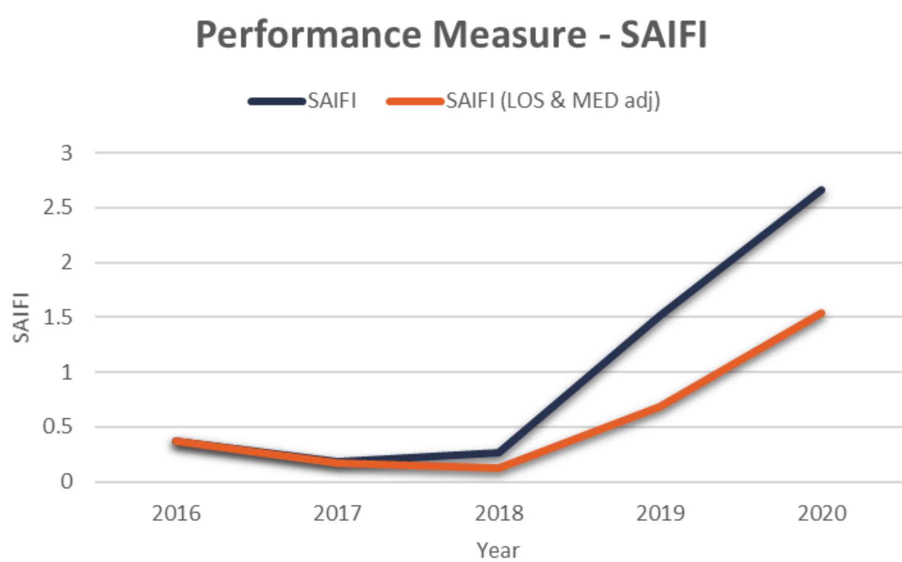
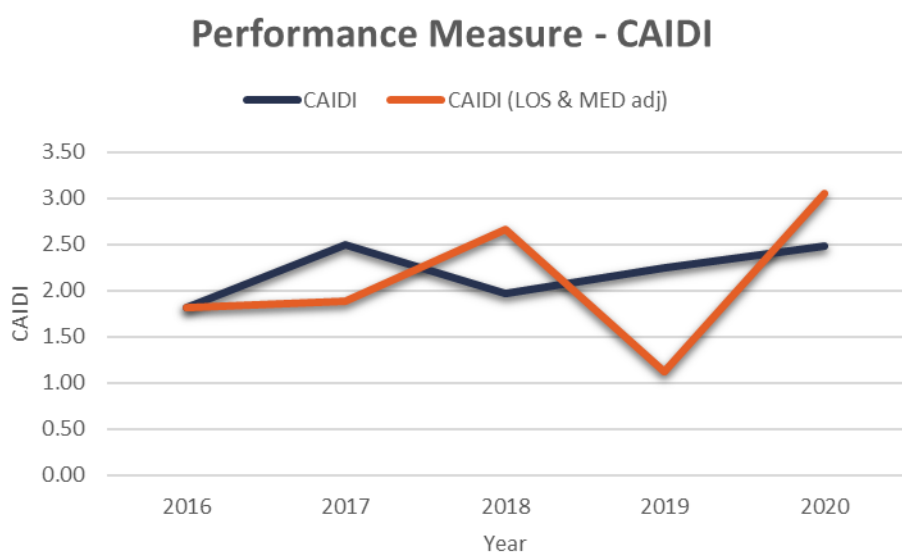


Figure 2-4: Performance Measure – CAIDI



Excluding 2020, LUI has historically met its targets for its reliability metrics demonstrating a slightly improving trend, once adjusted for LOS and MED. It should be noted that LUI experienced a poor performance year in 2019. This is mainly due to the significant outage cause code contribution of Loss of Supply. However, it is important to note that in any given year, outage hours will correlate with storm occurrences and severity. LUI's reliability metric values for the historical period, adjusting for LOS and MEDs, are shown in the tables below.

Table 2-5: Historical Reliability Performance Metrics – All Cause Codes

Metric	2016	2017	2018	2019	2020	Average	LUI Target
SAIDI	0.67	0.45	0.53	3.39	6.61	2.330	*0.59*
SAIFI	0.37	0.18	0.27	1.51	2.66	0.998	*0.46*
CAIDI	1.81	2.50	1.96	2.25	2.48	2.201	*1*

Table 2-6: Historical Reliability Performance Metrics - LOS and MED Adjusted

Metric	2016	2017	2018	2019	2020	Average
	Loss of Supply Adjusted					
SAIDI	0.67	0.32	0.32	0.76	4.69	*1.352*
SAIFI	0.37	0.17	0.12	0.68	1.54	*0.576*
CAIDI	1.81	1.88	2.67	1.12	3.05	*2.105*
	Loss of Supply and Major Event Days Adjusted					
SAIDI	0.67	0.32	0.32	0.76	4.69	*1.352*
SAIFI	0.37	0.17	0.12	0.68	1.54	*0.576*
CAIDI	1.81	1.88	2.67	1.12	3.05	*2.105*

Table 2-7 presents a summary of outages that have occurred within LUI's service territory providing three different categorizations. The table values indicate a slightly decreasing trend of outages with LUI's service territory, once excluding MED and LOS outages. A further breakdown by cause codes is provided in the following subsections.

Table 2-7: Outage summation

Categorization	2016	2017	2018	2019	2020
All interruptions	39	59	72	60	30
All interruptions excluding LOS	38	56	69	57	27
All interruption excluding MED and LOS	38	56	69	57	27

Outage Details for Years 2015-2019

The following sections and figures provide the breakdown of historical outages for the historical period regarding the number of outages, the number of customers interrupted, and the number of customer hours experienced by the outages. Tracking outage performance by cause code provides valuable information on specific outage causes that need to be addressed to improve negative trending. As with the reliability indices, the five-year historical performance range is used as a target and results outside this range indicate positive or negative trending.

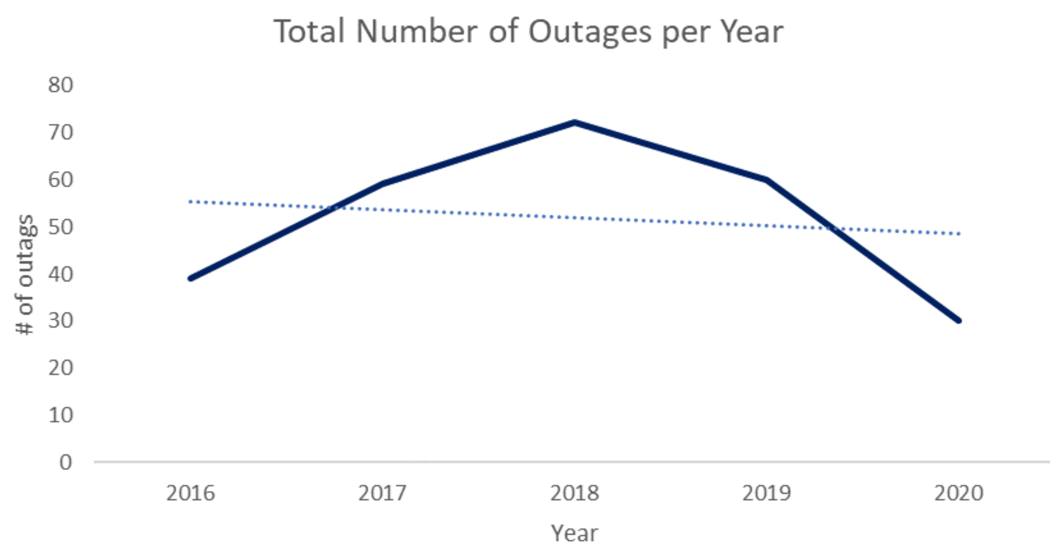
Outages Experienced

Table 2-8 presents the count of outages broken down by cause code for the historical period. The number of outages is an indication of outage frequency and impacts customers differently based on customer class. For example, residential customers may tolerate a larger number of outages with shorter duration while commercial and industrial customers may prefer fewer outages with longer duration thereby reducing the overall impact on production and business disruption. LUI continues to assess and execute capital and O&M projects to manage the number of outages experienced.

Table 2-8: Number of Outages by cause codes - Excluding MEDs

Cause Code	2016	2017	2018	2019	2020	Total Outages	Percent Share
0-Unknown/Other	7	7	4	4	4	26	10%
1-Scheduled Outage	8	31	38	25	3	105	40%
2-Loss of Supply	1	3	3	3	3	13	5%
3-Tree Contacts	3	1	1	6	3	14	5%
4-Lightning	1	0	0	0	0	1	0%
5-Defective Equipment	11	7	14	12	10	54	21%
6-Adverse Weather	2	1	6	0	0	9	3%
7-Adverse Environment	0	0	2	0	0	2	1%
8-Human Element	1	7	2	1	0	11	4%
9-Foreign Interference	5	2	2	9	7	25	10%
Total	39	59	72	60	30	260	100%

Figure 2-5: Total Number of Interruptions by Year



The total number of interruptions over the historical period varies from a low of 30 to a high of 72, with the overall trend decreasing in the period. This represents an average of 0.082 to 0.197 interruptions per day. The average is small enough that LUI's customers have not raised major concerns that would spark LUI to aggressively plan capital projects to address the deteriorating asset base. The observed decreasing trend indicates continuous renewal throughout the system in the correct places has allowed LUI to manage the number of interruptions it has control of.

The top three cause codes ranked by percentage share over the historical period are *Scheduled Outage, Defective Equipment* and *Foreign Interference.* The top three cause codes remain the same for the analysis of customer hours interrupted, however, when observing the total customers interrupted *Loss of Supply* is also a major contributor.

Scheduled Outages have remained steady over the historical period due to the execution of LUI's plans. Over the historical period, it has contributed to 40% of the total number of outages that occurred. These outages are due to the disconnection of service for LUI to complete capital investments or to perform maintenance activities on assets that require them to be disconnected for employee safety. A significant capital investment that contributes to this cause code is LUI's ongoing conversion from 4.16 kV to 27.6 kV system as this requires periodic disconnections**.** LUI continues to plan capital work and maintenance appropriately in times that would affect minimal customers and with short durations.

Defective Equipment outages are a major top three contributing cause to the total outages, total customers interrupted, and customer hours interrupted. *Defective Equipment* outages accounted for 21% of the total outages experienced at LUI. These failures result from equipment failures due to condition deterioration, ageing effects or imminent failures detected from reoccurring maintenance programs. LUI has planned investments to prioritize assets for replacement before experiencing a failure that may cause an outage. LUI utilizes evaluations such as the Asset Condition Assessment to assist in prioritizing investments in asset classes. In the historical period, the leading sub-causes for defective equipment that resulted in over 43% of outages are Broken Switch, Bad Connection, Switch Issue, Blown Transformer, Secondary Fault and Blown Fuse.

Foreign Interference continues to be a major top three contributing cause to the total outages, total Customer Interruptions and Customer Hours Interrupted. The outages contributing to the cause include animal interference, dig-ins, vehicle collisions and/or foreign objects. Some of these contributing factors can be minimized such as educating the public about calling before digging or installing animal guards in areas observed to have a high activity of animals, both of which LUI continues to do. However, other factors such as vehicle collisions can happen at random and depending on the extent and where the collision happens may result in a large impact.

Loss of Supply outages attributed to a small share of 5% of total outages throughout the historical period but despite this accounted for 42% of total Customers Interrupted (CI) and Customer Hours Interrupted (CHI). A major contributor to these high percentages is the 2019 and 2020 CI and CHI values which are significantly larger than the next leading cause. These outages are due to problems associated with assets owned outside of LUI in which LUI has no control over nor does it maintain. Although *Loss of Supply* outages has a minimal contribution in terms of outage counts, they have a significant impact on the total CI and CHI. One outage can affect a whole portion of LUI's system and may give LUI limited switching capability, resulting in customers' power not being restored quickly.

Customers Interrupted ("CI") and Customers Hours Interrupted ("CHI")

The number of Customers Interrupted ("CI") is a measure of the extent of outages. Customer Hours Interrupted ("CHI") is a measure of outage duration and the number of customers impacted. The tables and figures below provide the historical values and trends for both CI and CHI.

Table 2-9: Customers Interrupted by cause codes - Excluding MEDs

Cause Code	2016	2017	2018	2019	2020	Total CI	Percent Share
0-Unknown/Other	1807	606	30	1810	39	4292	8%
1-Scheduled Outage	1242	632	778	470	77	3199	6%
2-Loss of Supply	1	78	1585	8732	11880	22276	42%
3-Tree Contacts	32	1	2	8	189	232	0%
4-Lightning	40	0	0	0	0	40	0%
5-Defective Equipment	122	30	46	1323	12753	14274	27%
6-Adverse Weather	29	100	318	0	0	447	1%
7-Adverse Environment	0	0	85	1	0	86	0%
8-Human Element	20	419	33	3631	0	4103	8%
9-Foreign Interference	517	21	2	0	3326	3866	7%
Total	3810	1887	2879	15975	28264	52815	100%

Figure 2-6: Total Number of Customers Interrupted by Year

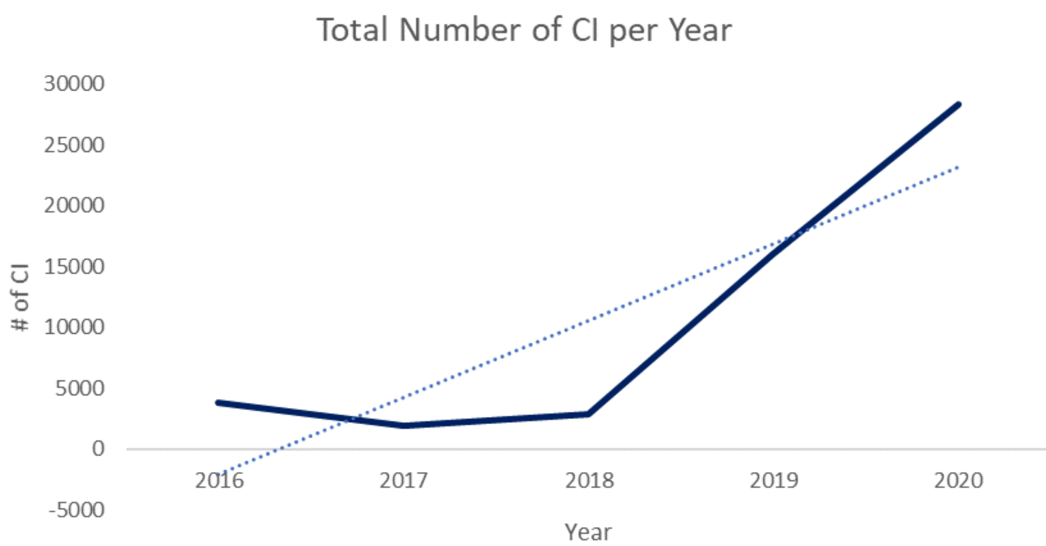
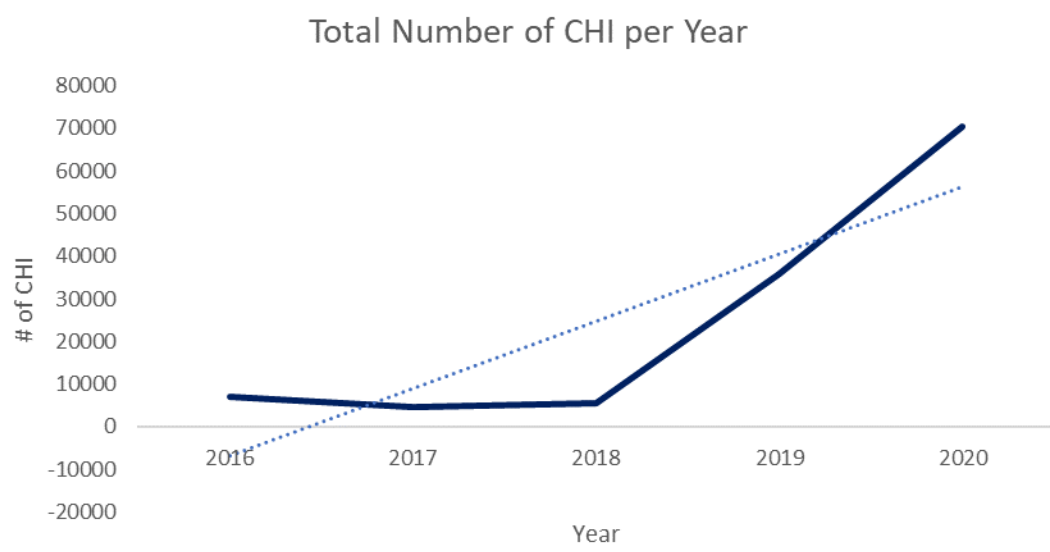


Table 2-10: Customer Hours Interrupted by cause codes - Excluding MEDs

Cause Code	2016	2017	2018	2019	2020	Total CHI	Percent Share
0-Unknown/Other	2950.2	627.2	94.2	913.8	35.3	4620.7	4%
1-Scheduled Outage	2896.5	1384.8	1862.2	1188.5	215.8	7547.8	6%
2-Loss of Supply	1.3	1348.5	2164.7	27885.8	20344.3	51744.6	42%
3-Tree Contacts	33.7	0.5	0.7	6.3	52.8	94	0%
4-Lightning	63.3	0	0	0	0	63.3	0%
5-Defective Equipment	140.5	23.3	112.8	1465.8	46938.5	48680.9	39%
6-Adverse Weather	27.8	75.0	1128.1	0	0	1230.9	1%
7-Adverse Environment	0	0	117.7	0.8	0	118.5	0%
8-Human Element	40.0	657.4	30.7	4481.7	0	5209.8	4%
9-Foreign Interference	762.2	556.0	62.0	0	2710.5	4090.7	3%
Total	6915.5	4672.6	5573.0	35942.6	70297.0	123400.7	100%

Figure 2-7: Total Number of Customer Hours Interrupted by Year



An increasing trend is seen for both the total customers interrupted and customer hours interrupted over the historical period. The significant increase in 2019 can be attributed to two major LOS outages, one in July that was caused by a short across 2 phases of the 44 kV system in LUI's service territory and one in August that was a true loss of supply from Hydro One. These two events contributed to the majority of CI and CHI in 2019. Furthermore, the increase in 2020 was significantly contributed by equipment failures at LUI's substations in short periods within occurring failures.

As seen in the tables, the top cause code that can be controlled and managed by LUI is *Defective Equipment.* LUI proposes continued investments into its AM strategy to manage the impact of outages on the total CI and CHI. The introduction of the Worst Performing Feeder metric will allow LUI to track outages and areas of poor reliability more efficiently and can assist in the effort of managing the total CI and CHI.

Worst Performing Feeder

LUI's focus on developing the Worst Performing Feeder ("WPF") list is based on the feeder's contribution to the overall system reliability as opposed to the reliability experienced by an average customer on the feeder. Outages that occurred on worst performing feeders will be analyzed to determine the nature and root causes of the outages, the condition of assets involved in the outages, and the capabilities for load transfer including outage restoration time. Based on the causes that are responsible for the poor performance of a feeder, the typical work that may be performed to mitigate poor reliability performance include installing new automated line reclosers, replacing overhead and underground conductors, installing new fault indicators, reframing poles to increase phase separation, installing animal/bird guards, repairing, or replacing deteriorated equipment, installing surge arresters on distribution lines, and proactive tree trimming. With a focus on the worst performing feeders, there is the potential to positively influence LUI's reliability performance experienced by its customers. LUI notes that not all outage causes are controllable, such as motor vehicle accidents and severe weather. However, measures can be implemented to reduce the impact of outages caused by these events.

2.3.1.3.3 Performance Trends into the DSP

LUI uses the CAIDI, SAIDI and SAIFI reliability indexes to gauge the system reliability performance and maintain tight control over capital and maintenance spending. LUI will also use the WPF analysis to provide more targeted mitigation measures. DSP investment priorities are expected to be in alignment with maintaining the historical average reliability performance.

Furthermore, LUI uses several programs to reduce the number of controllable outages. These programs include:

- Planned renewal of end-of-life assets such as poles and cables.
- Proactive vegetation management.
- Inspection of the plant to identify potential problems.
- Testing of wood poles.
- Design and construction of distribution circuits to meet CSA-Heavy standards.

2.3.2 Cost Efficiency and Effectiveness

2.3.2.1 Cost Control

2.3.2.1.1 Methods and Measures (5.2.3a)

Managing costs is a responsibility taken seriously at LUI. The levels of spending are measured and prudently controlled so that customer rates are minimally affected. Total cost per customer is calculated as the sum of LUI's capital and operating costs and dividing this cost figure by the total number of customers the utility serves:

$$Total\ Cost\ per\ Customer = \frac{\sum Capital\ \&\ O\&M\ costs}{Number\ of\ customer\ served}$$

LUI also collects the trend data on the total cost per kilometre of line. The total cost is calculated as the sum of LUI's capital and operating costs divided by the total kilometres of the line in service at LUI:

$$Total\ Cost\ per\ Kilometer\ of\ Line = \frac{\sum Capital\ \&\ O\&M\ costs}{Kilometers\ of\ line}$$

Additionally, LUI tracks the additional metrics introduced in OEB's newest Chapter 5 update: O&M Cost per customer, O&M Cost per kilometre of line and O&M Cost per MW of Peak Capacity. The metrics are calculated with the total O&M costs divided by the respective number for each metric, defined as follows:

$$O\&M\ \ per\ Customer = \frac{\sum O\&M\ Cost}{Number\ of\ customer\ served}$$

$$O\&M\ Cost\ per\ Kilometer\ of\ Line = \frac{\sum O\&M\ Cost}{Kilometers\ of\ line}$$

$$O\&M\ Cost\ per\ Average\ Peak\ Capacity = \frac{\sum O\&M\ Cost}{Average\ Peak\ Capacity}$$

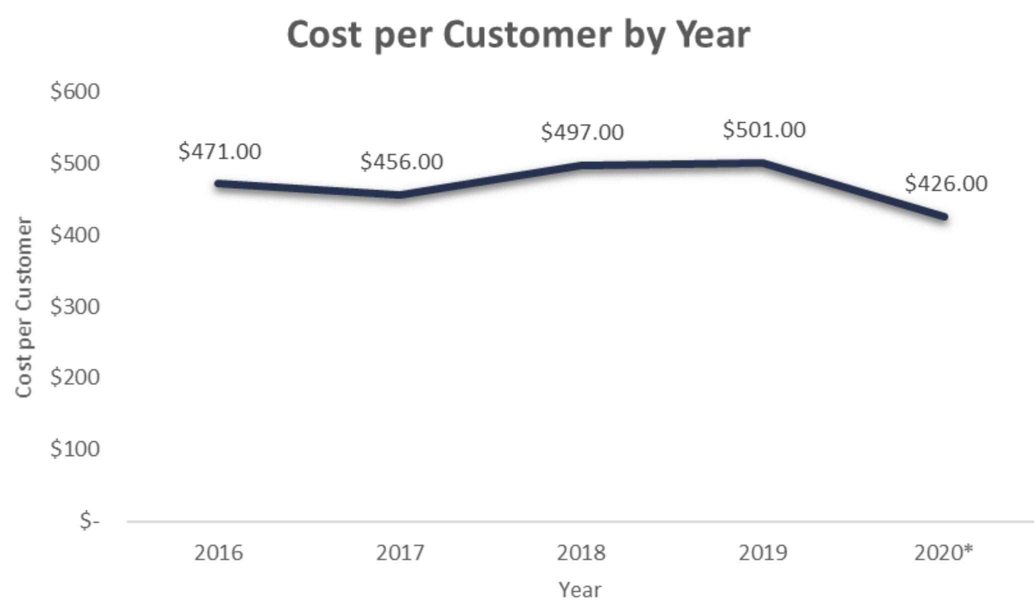
2.3.2.1.2 Historical Performance (5.2.3b)

The Ontario Energy Board, along with consultants from the Pacific Economics Group LLC (PEG), prepared a report to evaluate all LDCs efficiencies. These efficiencies are based on each utility's actual cost compared to the average levels predicted by a study conducted by PEG. Based on the efficiency levels achieved, each utility is grouped in their ranking with the most efficient being assigned to Group 1 and the least efficient to Group 5. Based on the above, LUI's efficiency assessment remains in Group/Cohort 2. LUI is projected to remain in Group 2 (between 10% and 25% below predicted costs) based on the DSP budget estimates.

Similar to most utilities in the province, LUI has experienced increases in its total costs required to deliver quality and reliable services to customers. Province-wide programs such as Smart Meters and Time of Use pricing, growth in wage and benefits costs for employees, increased customer engagement, increased information technology costs supporting new regulated and internal business processes, as well as investments in the renewal of the distribution system, have all contributed to increased operating and capital costs at LUI.

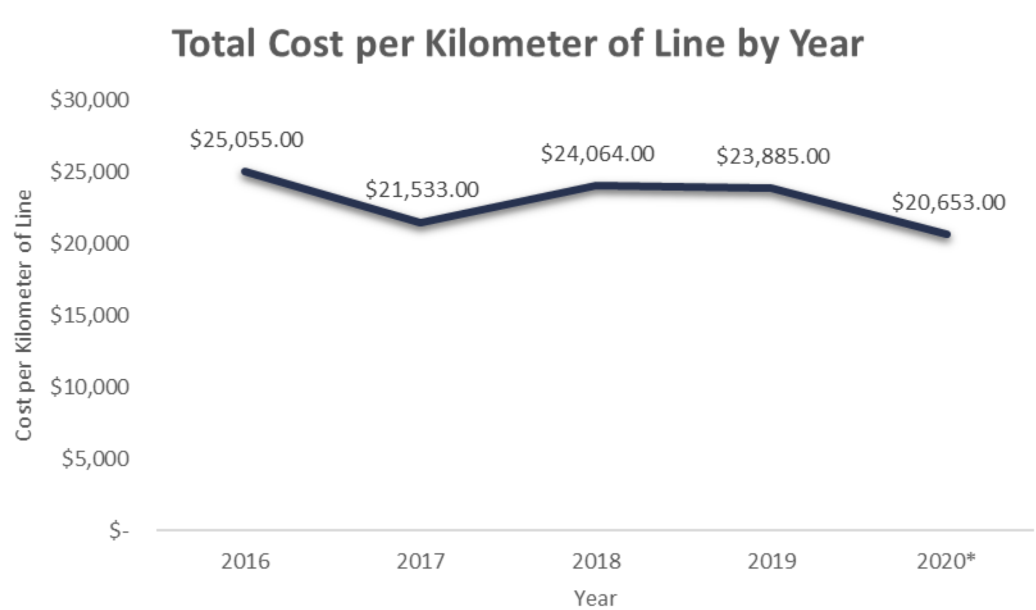
The Total Cost per Customer exhibits a flat trend year over year contributed by the capital renewal of the asset base. LUI intends to replace distribution assets proactively in a manner that balances system risks and customer rate impacts. Customer engagement initiatives continue to ensure customers have an opportunity to share their viewpoint on ERH's capital spending plans. The metric is visualized in Figure 2-8.

Figure 2-8: Performance Measure – Cost per Customer



Likewise, the Total Cost per Kilometer metric exhibits a flat trend over the historical period. LUI's capital focus is asset renewal which is simply replacing (and in some cases reducing) the same kilometres of line, not increasing the total kilometres. This results in levelized renewal costs each year, but with the same (or lower) total kilometres of line. LUI also experiences a low level of growth in its total kilometres of lines due to a low annual customer growth rate. The metric is visualized in Figure 2-9.

Figure 2-9: Performance Measure – Total Cost per Kilometer of Line



Operating costs are those associated with the maintenance, inspection, and operation of the system and those associated with metering, billing, and collections. LUI continued to experience increases in operation and maintenance of assets because of increased demand by customers for services. As a result, LUI had decreased its staffing levels to be more efficient while managing the same or increased workload. To reduce the impact of increasing costs, LUI follows the minimum requirements of the DSC to maintain its assets within the defined intervals for reliable service. The O&M cost metrics are visualized below in their respective figures. The 2020 values have been calculated with 2019 parameters and 2020 actual costs and are not reflective of the final value but are expected to be a close estimate.

Figure 2-10: Performance Measure – O&M per Customer

Figure 2-11: Performance Measure – O&M Cost per Kilometer of Line

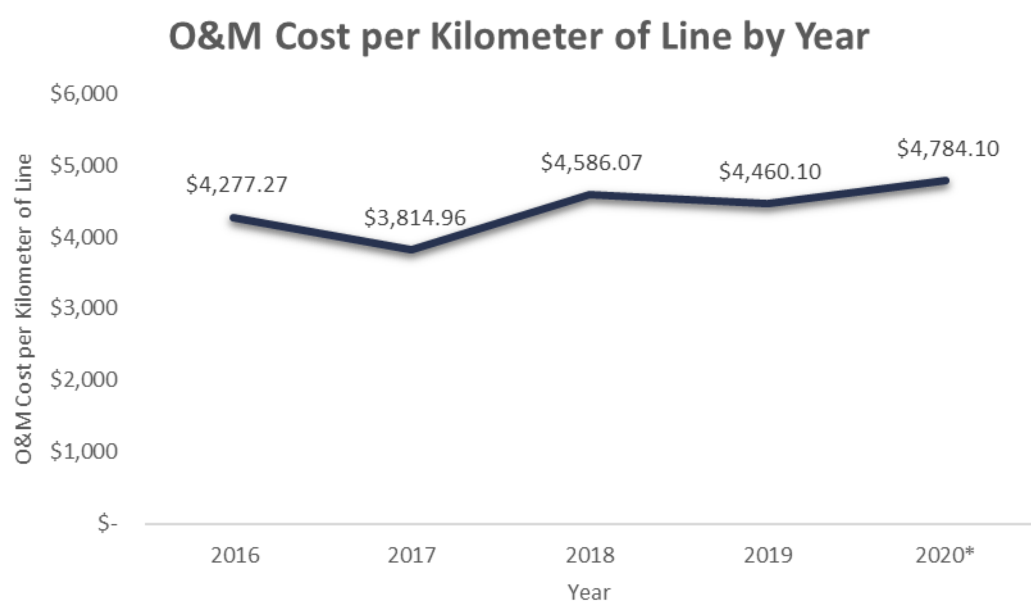
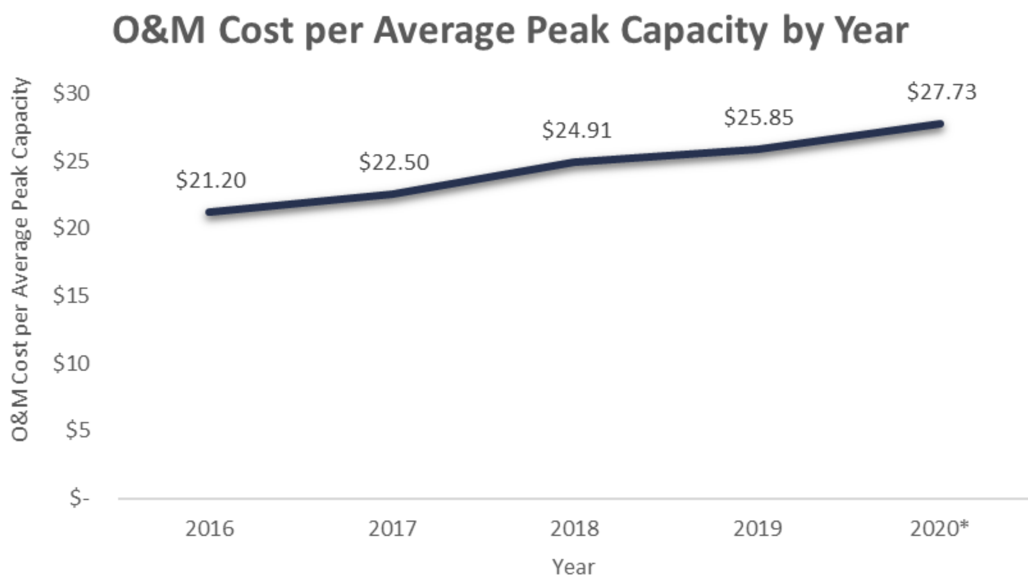


Figure 2-12: Performance Measure – O&M Cost per Average Peak Capacity



2.3.2.1.3 Performance Trend into the DSP (5.2.3c)

LUI continually strives to manage costs without unduly affecting service to customers or creating significant rate increases. LUI understands that the service it provides is an essential part of daily life for customers and increasing bills are a concern for all. LUI will continue to seek cost savings and improve efficiency while maintaining quality customer service and effective AM as detailed in the current rate application that sets out the capital and operating investment needs of the business for the next five years. With limited growth in the LUI service area, the cost metrics are expected to be in alignment with historical values over the DSP period. LUI considers the projects that would have a minimal cost impact on customers but return a benefit to the quality of the service. These trade-offs are considered and communicated with customers to understand their preferences. The projects and programs considered within this DSP period take a proactive approach so that LUI would be able to maintain its distribution system while minimizing the cost per customer as much as possible. LUI's intended goal for these measures is to maintain costs such that the annual increase does not exceed LUI's target.

2.3.2.2 Distribution System Plan Implementation Progress

2.3.2.2.1 Methods and Measures (5.2.3a)

LUI's DSP Implementation Progress metric comprises of two sub-metrics – DSP progress variance and annual project completion. The DSP progress variance is expressed as a percentage of budgeted gross capital spending compared to actual spending. Where forecast to year-end is materially greater than the budget, LUI reviews projects and determines if they can be deferred to a later date or reduce their scope. Mandatory projects for a given year are typically not subjected to deferral. The annual project completion measures the completion of planned projects at the beginning of the planning year to the actual projects completed at the end of the year. Where the forecast projects may change before the end of the year, LUI reviews the current project lists and determine if they can be completed still or not. The measure is not impacted or measured by budget costs. Tracking and measuring both metrics allows LUI to proactively manage the implementation of their DSP capital plans.

2.3.2.2.2 Historical Performance (5.2.3b)

LUI continues to strive in maintaining and achieving its communicated plans. The table below highlights LUI's historical performance for the DSP Implementation Progress metric. LUI is aligned with total DSP spending to date as variances to budget each year are typically addressed in the overall picture of the total five-year plan spending. Given the dynamic nature of the business, several issues emerge over a year that requires the management team to postpone, re-prioritize or otherwise amend the capital work plan adopted at the start of the year. External factors such as extremely cold weather and a deep frost line are the type of elements that can have an impact on the ground when executing the work and cause delays that are outside LUI's control.

Table 2-11: Performance Measure - DSP Implementation Progress

Measure	2016	2017	2018	2019	2020	LUI Target
DSP Implementation Progress	Complete	Complete	Complete	Complete	Complete	Complete

2.3.2.2.3 Performance Trend into the DSP (5.2.3c)

LUI makes every effort to maximize the utilization of assets without compromising reliability or safety and will continue to do so in the future while executing on the DSP.

As an effort to manage costs and keep rates low, LUI anticipates the total capital spending will remain reasonably stable and paced for the forecast planning horizon. Additionally, LUI anticipates delivering on its goals communicated through this DSP and to its customers.

2.3.3 Asset/System Operations Performance

2.3.3.1 Safety

2.3.3.1.1 Methods and Measures (5.2.3a)

LUI is committed to protecting its workforce, customers, the public and the environment. In addition to achieving compliance with applicable laws, LUI strives for excellence in their environmental, health and safety performance through adopting good management practices and setting clear objectives and targets for achieving continual improvement.

The Public Safety measure is generated by the Electrical Safety Authority and consists of three components:

- Component A – Public Awareness of Electrical Safety
- Component B – Compliance with Ontario Regulation 22/04
- Component C – Serious Electrical Incident Index

Public Awareness of Electrical Safety

This measure is a survey that measures the public's awareness of key electrical safety concepts related to electrical distribution equipment found in a utility's territory. The survey provides a benchmark of the levels of awareness identifying areas where education and awareness efforts may be needed.

Reg. 22/04

As with every other Ontario distributor, LUI's design, construction, inspection, maintenance practices are audited yearly as required by Ontario Regulation 22/04. The utility can be deemed to be in one of three performance categories:

1. In compliance
2. Needs Improvement
3. Not in compliance

LUI's target is to remain in compliance with all categories being audited.

Serious Electrical Incident Index

This component consists of the number of serious electrical incidents and fatalities, which may occur within a utility's service territory. This measure is intended to address the impacts and needs for improving public electrical safety on the distribution network.

2.3.3.1.2 Historical Performance (5.2.3b)

LUI continues to strive in maintaining its employee safety, health & wellness, and public safety measures and in compliance with Ontario Regulation 22/04. The table below presents LUI's historical performance for each of the three components.

Table 2-12: Performance Measure - Safety

Measure	2015	2016	2017	2018	2019	2020	LUI Target
Level of Public Awareness	79.00%	79.00%	83.30%	83.30%	83.00%	83.00%	80%
Level of Compliance with Ontario Regulation 22/04	C	C	C	C	NC	C*	C
Serious Electrical Incident Index	0	0	0	0	0	0	0

**Audit not yet completed, expected to be in compliance.*

2.3.3.1.3 Performance Trend into the DSP (5.2.3c)

LUI continues to promote continued education, awareness, and application of safe work practices and as such safety continues to play a key role in project prioritization. Additionally, LUI continues to demonstrate prudent compliance with O. Reg. 22/04 and as such ESA compliance continues to play a key role in project prioritization. The NC in 2019 was due to staff turn over due to which one of the projects submitted by the developer, was not properly signed and had not used LUI's standards. LUI has since put in place a procedure checklist to thoroughly review third-party and developer's design drawing throughout a project lifecycle. Any design changes made after final approval are submitted to LUI for re-approval. Ensuring a safe environment for workers and the public as well as ensuring compliance is maintained has been taken into consideration in the development of the DSP and LUI's asset management and capital expenditure planning process.

2.3.3.2 System Losses

2.3.3.2.1 Methods and Measures (5.2.3a)

LUI system losses are monitored annually. System design and operation are 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.

2.3.3.2.2 Historical Performance (5.2.3b)

LUI system losses over the historical period are shown below.

Table 2-13: Performance Measure – System Losses

Measure	2016	2017	2018	2019	2020	LUI Target
System Losses	4.13%	4.46%	4.84%	1.24%	5.39%	< 5.0%

Losses are averaging 3.99% over the historical DSP period, with the recent reporting year being 5.39%. According to data from the *2019 OEB Yearbook of Ontario Electricity Distributors*, the average annual loss factor in Ontario was 3.95% in that year. LUI's loss factor in 2019 is well below the provincial average. This is because from 2017 to 2018, two heavily loaded feeders on 4.16kV system were converted to 27.6kV system. It is evident LUI is performing well for this performance measure over the averaged historical period, as well as the continuous improvement year over year in losses experienced since the start of the voltage conversion program. LUI's continued investment in voltage conversions will maintain system loss improvement.

2.3.3.2.3 Performance Trend into the DSP (5.2.3c)

LUI has maintained progress in addressing the system line losses each year through the execution of its voltage conversion program. Though LUI may have succeeded in lowering its system line losses each year, a few areas are remaining in LUI's service area that operates on a lower voltage and would benefit from the voltage conversion. As such, LUI is continuing with its voltage conversion program which will assist LUI in maintaining line losses in specific areas of the system. For the DSP period, LUI has adopted a performance target of a maximum allowance of 5% system loss.

2.4 Realized Efficiencies due to Smart Meters (5.2.4)

The installation of smart meters provides LUI and its customers an operational advantage in maintaining its service while simultaneously improving upon it. These operational advantages include:

- Advanced metering infrastructure ("AMI") data in Smart Maps is used to monitor transformer loading. This allows for LUI to plan appropriately which areas require an upgrade before the transformer failing due to accelerated degradation or ageing. Effective planning reduces the overall cost impact experienced by customers. Transformer loading data is also used in designs to effectively size transformers for new and upgraded services.
- Smart meters provide more detailed energy use for customers throughout the day. This enables customers to proactively manage their energy consumption.
- The functionality of the meters is utilized in OMS to identify the extent of outages and devices that operated. This permits LUI to have faster outage detection and restoration of service.
- Smart meters are used for remote examination of meters (via pinging) to diagnose power-related issues without deploying a crew.
- LUI's power quality data collected from smart meters allow for LUI's engineers to observe voltage sags/swells which translate to identifiable power quality issues. Issues are corrected through appropriate planning to limit the cost impact.

3 Asset Management Process (5.3)

This section provides an overview of LUI's asset management process, a description of assets managed by LUI, and a presentation of LUI's asset lifecycle optimization policies and practices.

3.1 Asset Management Process Overview (5.3.1)

Key elements of the process that drive the composition of LUI's proposed capital investments are highlighted along with LUI's asset management philosophy. The relationship between the Renewed Regulatory Framework for Electricity ("RRFE") outcomes, corporate goals, asset management objectives, and the linkage to the selection and prioritization of LUI's planned capital investments is explained which control LUI's financial performance and planning.

The components of the asset management process that LUI has used to prepare its capital expenditure plan are identified, including data inputs, preliminary process steps and outputs. The information generally used throughout the DSP is based on available information established at the given moment.

3.1.1 Asset Management Objectives (5.3.1a)

LUI's asset management objectives form the high-level philosophy framework for its capital program. These objectives help to define the content of the programs and the major projects in the capital expenditure plan to be able to sustain LUI's electrical distribution system. The objectives guide LUI to make effective capital investment decisions, which inherently make the best use of, and maximize the value of the assets to the company. The objectives identify an initial starting point and continue to be developed, enhanced, or adjusted as necessary to be aligned with the business environment that the company operates in and help to encourage the process of continuous improvement. The asset management objectives have been qualitatively integrated into LUI's capital investment process to prioritize investments for several years including the bridge and test years.

Table 3-1: RRFE Outcomes - Corporate Objectives - Asset Management linkage

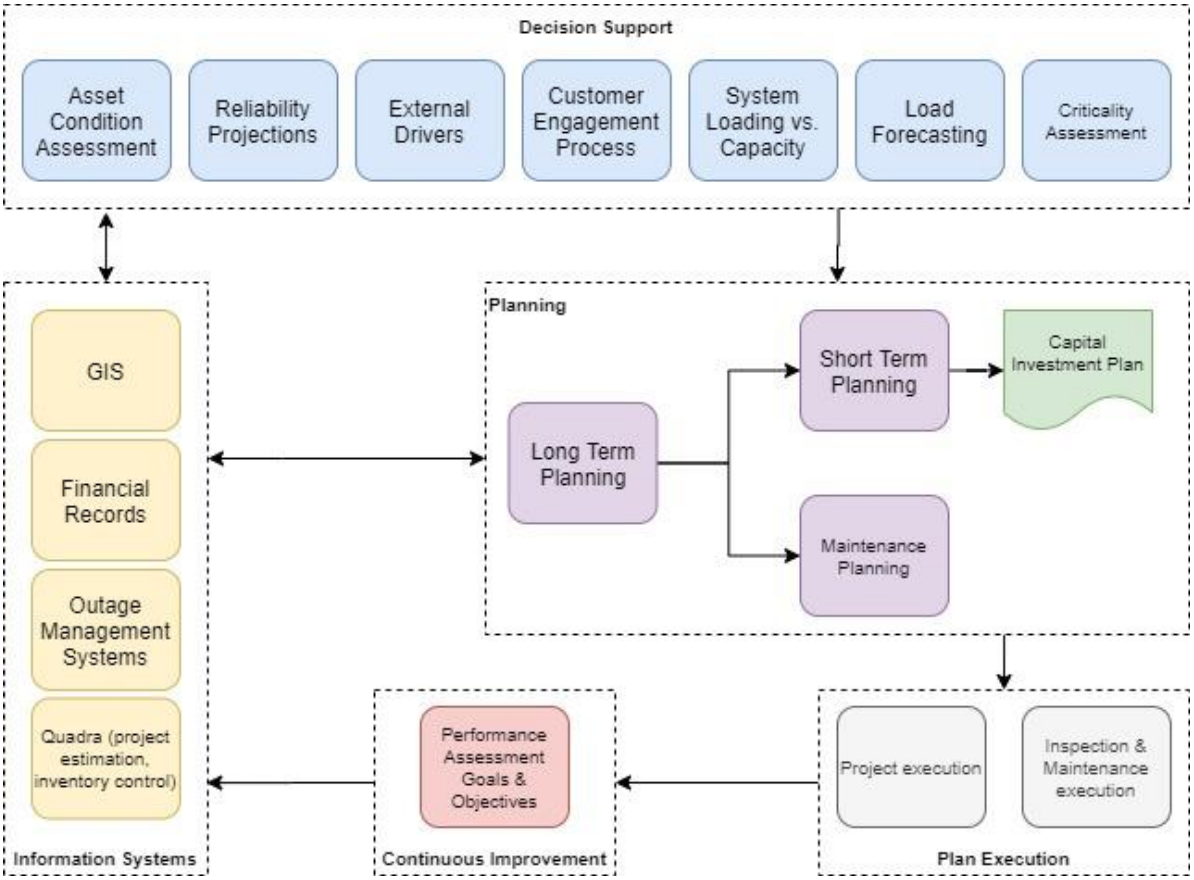
RRFE Outcomes	Strategic Corporate Goals	Asset Management Objectives	AM Objective Measure	AM Objective Target
Operational Effectiveness	Safety	Construct, maintain and operate all assets in a safe manner.	1. Lost/non-lost time 2. ESA Non-Compliance	1. WSIB rate class 10-year benchmarks 2. Zero (Max 1 NI)
	Reliability	Monitor and address asset condition issues promptly to ensure the continued reliable supply of electricity delivery.	1. SAIDI 2. SAIFI	1. SAIDI within range of past 5-year performance 2. SAIFI within range of past 5-year performance
Customer Focus	Customer Focus	Ensure capital and maintenance plans align with customer service expectations	1. Customer Survey	Customer survey results => previous year for: Customer Care Company Image Mgmt Operations Reliability
Financial Performance	Financial Performance	Actively manage investment planning to mitigate rate impacts while maintaining corporate financial stability and long-term sustainable performance	1. Investment Spending 2. Investment Scheduling	1. Group 2 (between 10% and 25% below predicted costs) 2. >90% annual projects/ programs completed on time
Public Policy Responsiveness	Public Policy Responsiveness	Ensure that environmental considerations are taken into account in the design and management of the distribution system.	1. Carbon emissions	1. Net-zero by 2030

3.1.2 Components of the Asset Management Process (5.3.1b)

LUI's Asset Management ("AM") process encompasses on a high-level its asset management direction, principles, and mandatory requirements. The AM process interprets the company's vision, mission, and values and serves as the connection between the top-level corporate goals and objectives through to the bottom-level asset management practices.

LUI's AM process is established in a way to coordinate activities to ensure the assets are optimally achieving the company's corporate and asset management objectives. Conceptually, the process includes items such as setting out the criteria for optimizing and prioritizing asset management objectives, lifecycle management requirements of the assets, stating the approach and methods by which the assets are managed, including performance, condition and criticality assessment, the approach to the management of risk, and identifying continuous improvement initiatives.

Figure 3-1: LUI's Asset Management System



LUI's AM cycle can be summarized as:

> **Plan:** Establishment of the asset management strategy, objective, plans, and performance measures needed to deliver results in alignment with LUI's policy and strategic plan.
>
> **Do:** Establish asset management supporting systems (e.g. GIS, staff, structure, tools, etc.) to develop and implement LUI's plans.
>
> **Check:** Monitor and measure performance results against asset management objectives.
>
> **Act:** Take actions to make sure that asset management objectives are achieved and to continuously improve the asset management system and the asset management performance.

The compiled plans outline the asset management practices which are part of an optimized lifecycle strategy for LUI's assets. Included in the plans are the programs and major projects required to sustain LUI's electrical distribution system. Further embedded in the plans are tasks that need to be completed to meet the asset management objectives. The plans include the documented planning methodology used, key assumptions made, the different interventions available and the options considered, the specific tasks and activities required to optimize costs, risk, and performance of the assets and the timelines by which the actions are to be achieved.

The goals and objectives used throughout LUI's asset management approach are embedded within the asset management system to integrate continuous improvements in LUI's plan. This includes any key tactical initiatives that help achieve the objectives. The goals and objectives, once identified, have targets established that determine the measure of success of the asset management programs and practices. Conceptually, objectives revolve around, but not be limited to safety, reliability, and cost-efficiency.

3.1.2.1 Inputs to the Asset Management Process

LUI uses several inputs to assess the status of its distribution system assets and to assist in determining the capital and operational investments to be made in the system. The main elements LUI considers within the asset management process include:

- Customer Engagement
- Inspection & Maintenance
- Information System
- System Loading & Capacity
- Reliability Analysis
- External Drivers
- Asset Condition Assessment
- Load Growth

Inspection & Maintenance

LUI maintains a full schedule of distribution asset inspection and maintenance programs operating on a three-year rotation as required by the OEB's DSC. Inspection, maintenance, and operational data are collected and stored which is used to support LUI's operating and capital expenditure plans.

Completion of the inspection and maintenance programs is not only a matter of compliance but the results from the inspection and maintenance programs allow a continual update of the asset database. The programs allow for assets to be inspected and assessed for any necessary actions that need to be taken promptly in a proactive approach. LUI's inspection and maintenance programs are audited every year as required by Ontario Regulation 22/04.

Information Systems

LUI's information systems/GIS is the designated asset register for field assets and serves as an accurate model of LUI's physical electrical distribution system. LUI's GIS asset database is the asset source data that supports the ACA process as well as LUI's capital planning process. Asset data in the GIS is captured from a multitude of sources including, but not limited to construction as-built records and legacy records. However, annual inspection and maintenance program results including inspection dates, transformer maintenance records, and third-party attachments are stored outside the GIS. As the asset is visited through planned inspections or maintenance, the asset data is verified and if needed corrected. The information in the GIS, such as location, asset ratings and specifics of the asset in whole describe the asset.

The combination of all of LUI's information systems is intended to hold asset attribute information as well as historical inspection information over each asset's lifecycle. The goal of the information systems is to contain the relevant information for ongoing development and optimization of assets inspection, maintenance, refurbishment, planning, replacement, support regulatory/legislative compliance and support IFRS accounting standards. Furthermore, the asset register can aid in cost control through optimization of the asset's lifecycle.

System Loading & Capacity

Load forecasting and capital growth planning continue to be the underlying basis for the near and longer-term capital requirements for new or enhanced capacity. The loading and capacity information are inputs to the asset condition assessment as well as for identifying system constraints. The information is collected on system peak loading at many points in the system including LUI supply point meters, substation feeder measurement devices and sub-feeder load measurement devices. The data is analyzed as needed to measure the risk of system overloading and to mitigate any concerns. LUI's efforts in forecasting these demand-based investments are more challenging due to the two distinct operating districts that LUI services, which have varying features between them such as differing demographics, economic conditions, and physical geography.

Reliability Analysis

LUI places a high level of importance on ensuring distribution system reliability meets the expectations of its customers. LUI strives to continually improve its processes for collecting, measuring, analyzing, and utilizing outage information within its asset management process to effectively manage distribution system reliability in its service territories.

Outage causes are analyzed for each feeder to evaluate feeder outage risk and develop prioritization for evaluation in the current capital investment planning process. The analysis is used to inform LUI's asset management process in developing the O&M programs and capital expenditure plan for each year.

External Drivers

External drivers may sometimes influence LUI's decision-making in determining the optimal plans for their system. External drivers include:

- Political – governments have their directions and strategies that LUI needs to be mindful of and to be in alignment with their plans.
- Economic – economic growth and decline within LUI's service area as well as the shift of business operations within residential units.
- Social – changes in the environment that illustrate customer needs and wants.
- Technological – innovation and development within the electrical/utility sector which includes automation, technology awareness, electric vehicle penetration, battery storage and new services.
- Environmental – ecological and environmental aspects that can affect LUI's operations or demand which includes renewable resources, weather or climate changes, and utility responsibility initiatives.
- Regulatory/Legal – legal allowances and/or changing requirements from the OEB as well as additional legal operations such as health and safety requirements, labour laws, and consumer protection laws.

LUI continues to remain cognizant of these external drivers when developing its capital and maintenance plans.

Asset Condition Assessment

An ACA was undertaken in 2020 to assess the condition of the system and to have empirical data on which to base the revised project prioritization. The ACA involves the interpretation of condition and performance data of key assets to assess the overall condition of the asset. Essentially, the ACA is a key supporting tool for developing an optimized lifecycle plan for asset sustainability. The results of the condition assessment were incorporated into a formalized capital plan and have resulted in the revision of project prioritization within the service area for the forecast period.

LUI intends to continue using the information from its ongoing proactive inspection and maintenance programs to optimize spending, with priorities considered in the scheduling. Under the proposed capital planning model, decisions to repair, refurbish or replace existing assets continues to be based on experienced judgment and knowledge of staff augmented with improved access to electronic records and structured evaluation processes.

Load Growth

A load growth study was undertaken in 2020 to assess the potential load growth in LUI's system. The load growth study is a key supporting tool for developing an optimized plan for meeting the expected system requirements and demand. The results of the load growth study were incorporated into a formalized long-term capital plan for the forecast period.

LUI intends to monitor the development of its actual load annually to appropriately adapt and reflect current conditions and projections within its plans.

3.2 OVERVIEW OF ASSETS MANAGED (5.3.2)

3.2.1 Description of the Service Area (5.3.2a)

LUI serves the Town of Cobourg and Village of Cramahe, where the travel distance between the two areas is approximately 23km. As of 2019, LUI served 10,546 customers covering 28 square kilometres of an urban area. The figures below present a general overview of each service area.

Figure 3-2: Town of Cobourg Service Area

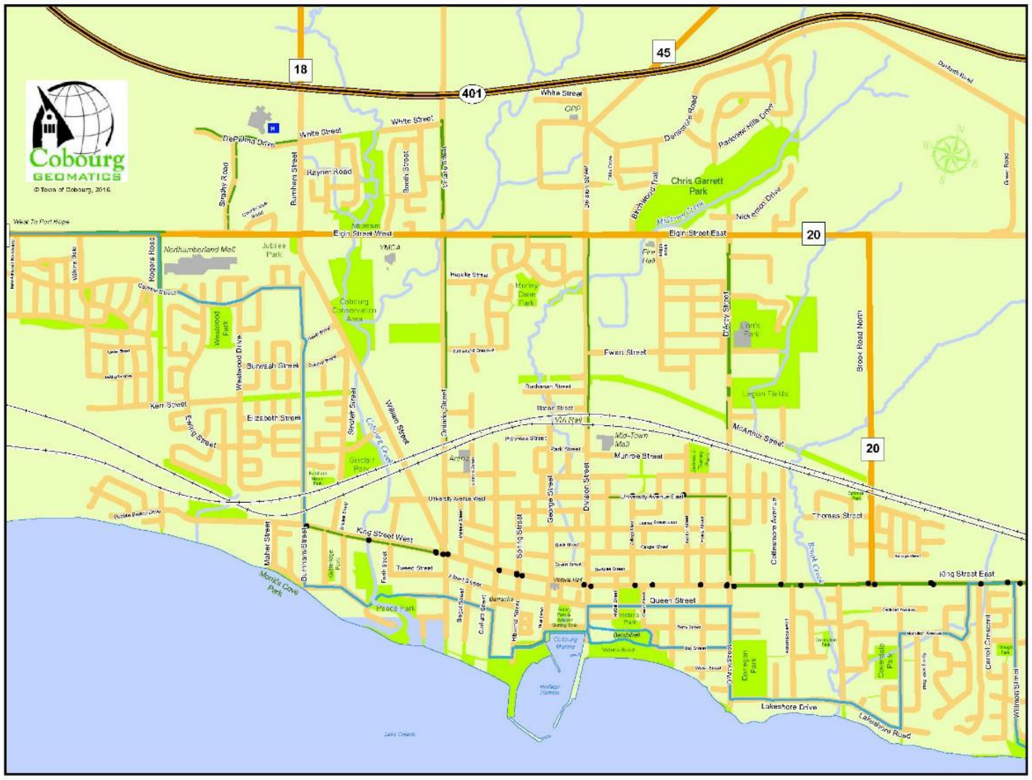
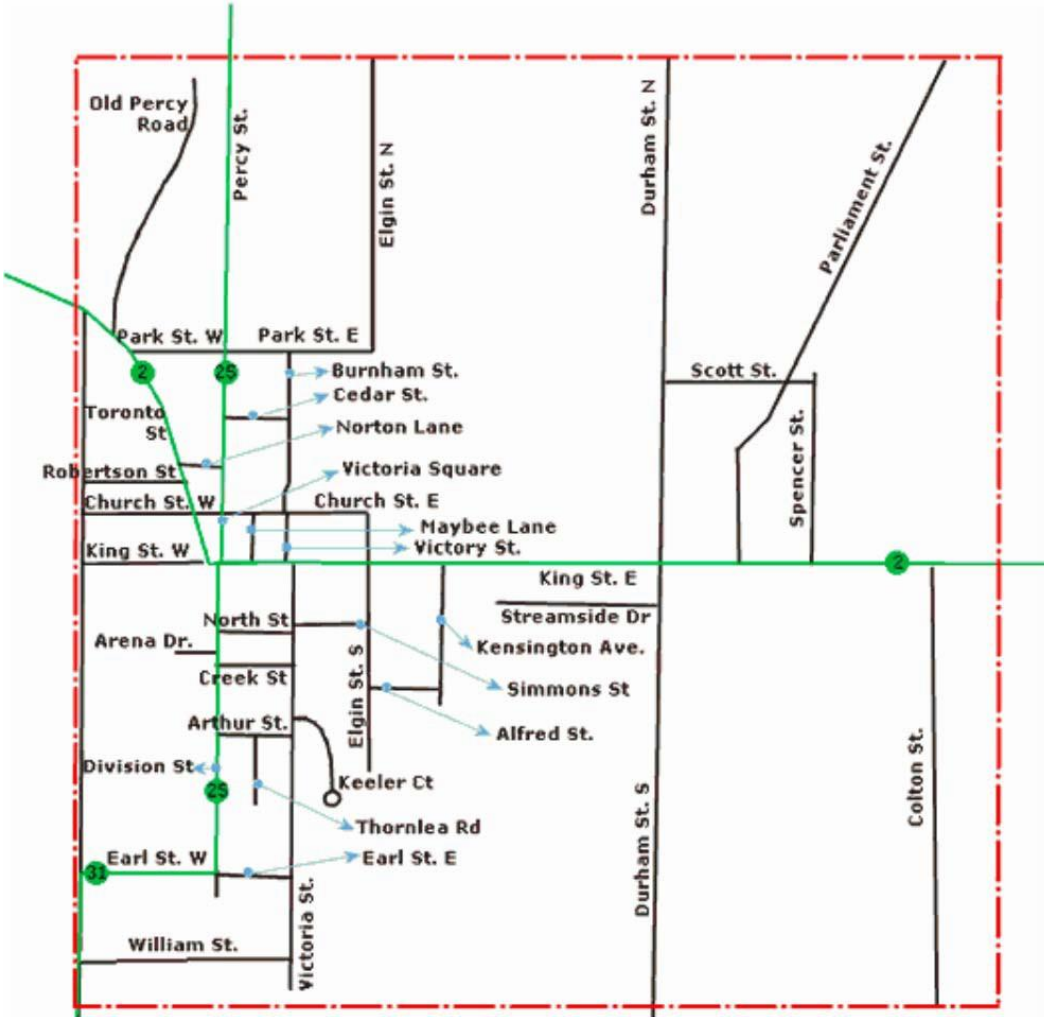


Figure 3-3: Village of Cramahe Service Area



Cobourg and Cramahe are in Southern Ontario, in the Northumberland County. Both are situated on Lake Ontario. The climate in the LUI service area is defined as a humid continental climate. The climate in Cobourg is temperate and the rainfall in Cobourg is significant, with precipitation even during the driest month. The average temperature in Cobourg is 7.5 °C and ranges between -15°C and 30°C. About 793 mm of precipitation falls annually with a monthly average of 78mm. The service area experiences an average of 150 to 170 frost-free days, typically beginning early May and ending early October.

3.2.2 Summary of System Configuration (5.3.2b)

LUI's distribution system is made up of approximately 147 kilometres of overhead primary circuits, 60 kilometres of underground primary circuits, 3138 poles, and 1164 distribution transformers. LUI's system is supplied from one transformer station and three 44 kV breakers, all owned and operated by Hydro One Networks Inc. The voltage is stepped down to provide electricity service within the service area. Currently, LUI operates primarily at 27.6 kV and 4.16 kV in the Cobourg portion of the service area and 4.16 kV in the Cramahe portion of the service area. The 44 kV is stepped down at seven distribution stations.

In Cobourg, there are two 44/27.6 kV distribution stations along with three 44/4.16 kV distribution stations. In Cramahe, there are two 44/4.16 kV distribution stations.

Table 9: Municipal Substation Listing

Cramahe			
Station	Voltage	Capacity (MVA)	Feeders
MS 1 - Victoria	4.16 kV	5	F1, F2, F3
MS 2 - Durham	4.16 kV	5	F4, F5
Cobourg			
Station	Voltage	Capacity (MVA)	Feeders
MS 2 – D'Arcy	4.16 kV	5	F10
MS 3 – Orr	4.16 kV	5	F13, F14, F15
MS 5 – Kerr	4.16 kV	5	F19, F20
MS 28-1 - Victoria	27.6 kV	20	F1, F2
MS 28-2 - Brook	27.6 kV	20/26/32	F4, F6

3.2.3 Results of Asset Condition Assessment (5.3.2c)

The Asset Condition Assessment ("ACA") study was carried out by METSCO for LUI to establish the health and condition of station and distribution assets in-service. The ACA is based on data compiled to the end of March 2020. Figure 3-4 and Figure 3-5 present the summary results of the ACA.

Figure 3-4: LUI Health Index Distribution for Major Distribution Assets

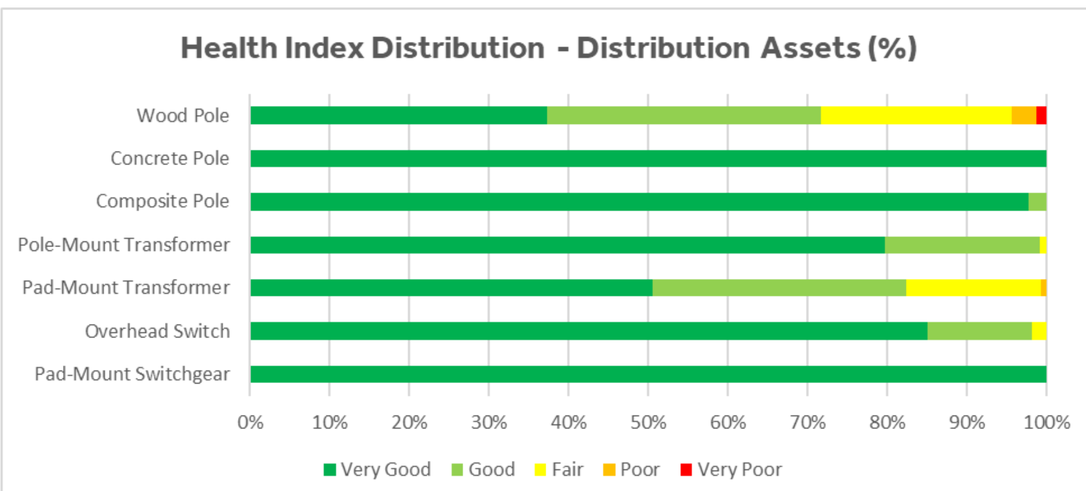
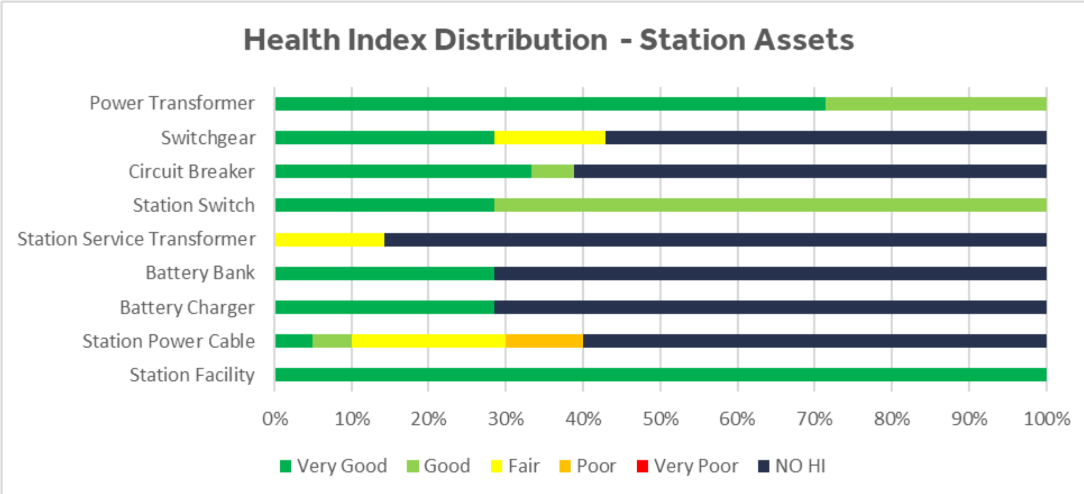


Figure 3-5: LUI Health Index Distribution for Major Station Assets

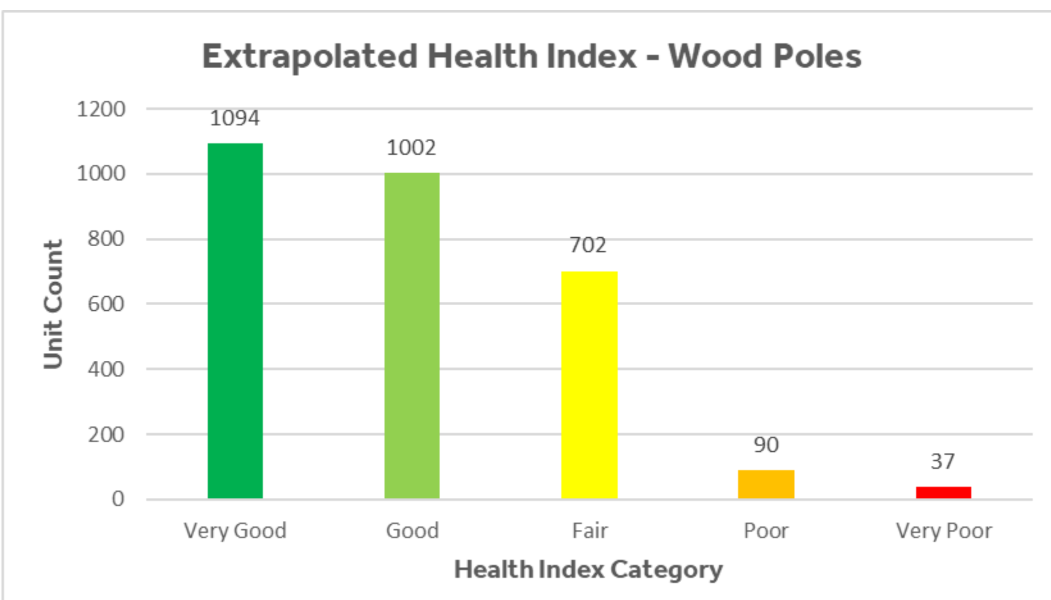


Where there is sufficient data to calculate a health score for an asset, the figures above indicate that the majority of LUI's distribution system is in a healthy condition, with only a few asset classes containing units in Poor and Very Poor condition – wood poles, pad-mounted transformers, and station power cables. The ACA report is found in Appendix F which contains detailed results for each asset class.

Poles

LUI owns 2,925 wood poles within its service territory. Annual visual inspections of LUI-owned poles are completed with internal resources. Each pole is visited on a three-year cycle, satisfying the inspection requirements of the DSC. The condition-based assessment allows LUI to monitor and identify defects concerning the integrity of the pole or other issues concerning the condition of the pole, supports and attachments including the conductor, cross arms, guys and guy guards, cable dips, etc. Such defects and concerns are identified in the inspection record and detailed further through commentary. The extrapolated HI distribution for wood poles is presented in Figure 3-6. Most of the poles are assessed to be in Very Good or Good condition with less than 5% of the total population being in Poor or Very Poor condition.

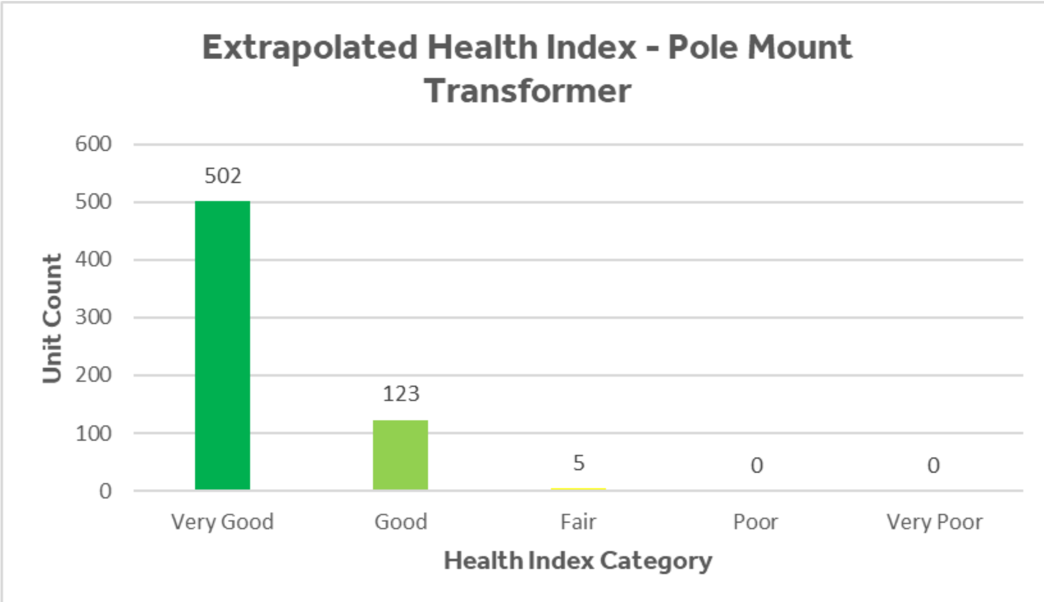
Figure 3-6: HI Results – Extrapolated Wood Pole



Overhead Distribution (Pole-Mount) Transformers

LUI owns 630 pole mount transformers within its service territory. The HI distribution for pole-mount transformers is presented in Figure 3-7 in which most of the population is assessed to be in Very Good or Good condition.

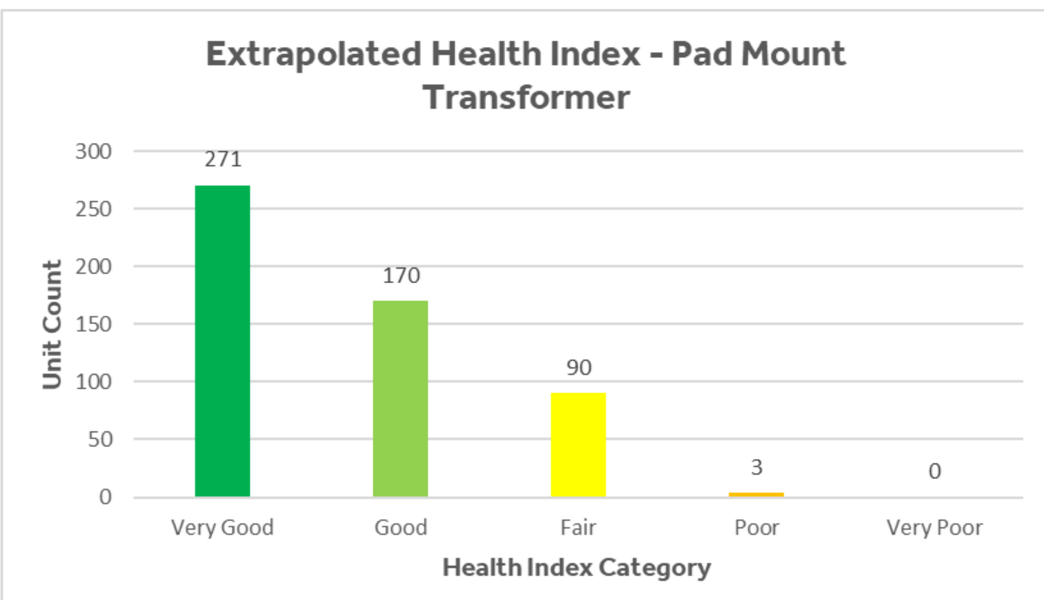
Figure 3-7: HI Results – Extrapolated Pole-Mount Transformer



Underground Distribution Transformers

LUI owns 534 pad-mount transformers within its service territory. Inspections of pad-mount transformers occur within the visual patrol of the underground distribution system and are therefore inspected on a three-year cycle. Deficiencies such as broken bushings, oil leaks or paint chips, among others, are noted in the inspection record. As illustrated in Figure 3-8, most of the assets are assessed to be in Very Good or Good condition.

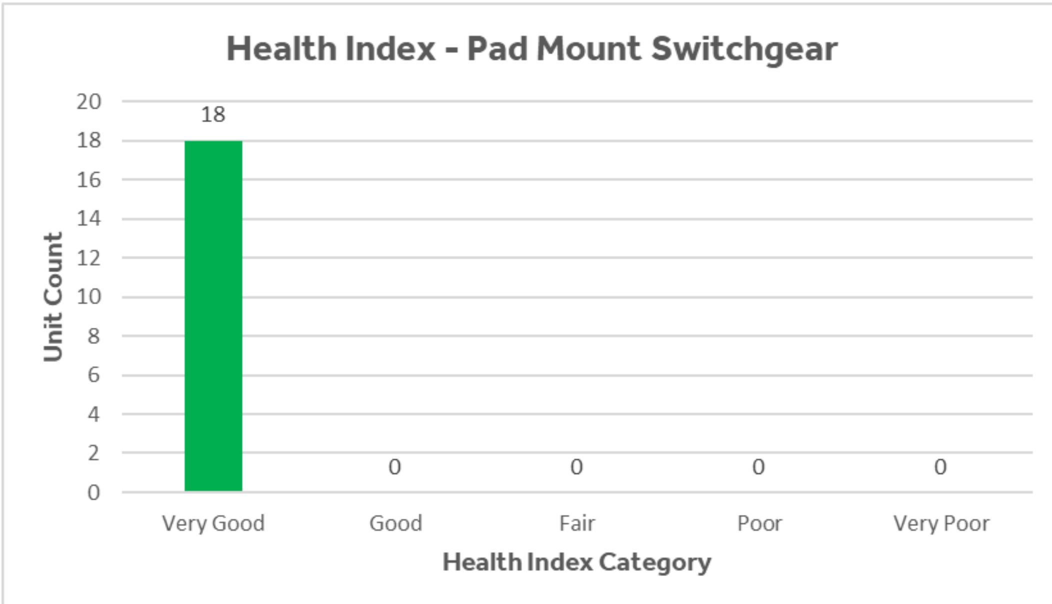
Figure 3-8: HI Results – Extrapolated Pad-mount Transformer



Distribution Switchgear

LUI owns 18 switchgear units within its service territory. Inspections of underground pad-mounted switches occur within the visual patrol of the underground distribution system and are inspected on a three-year cycle. Inspection operations include opening the enclosures so a visual check can be made of the asset's condition. The overall switchgear HI distribution is presented in Figure 3-9. All switchgears are assessed to be in Very Good condition.

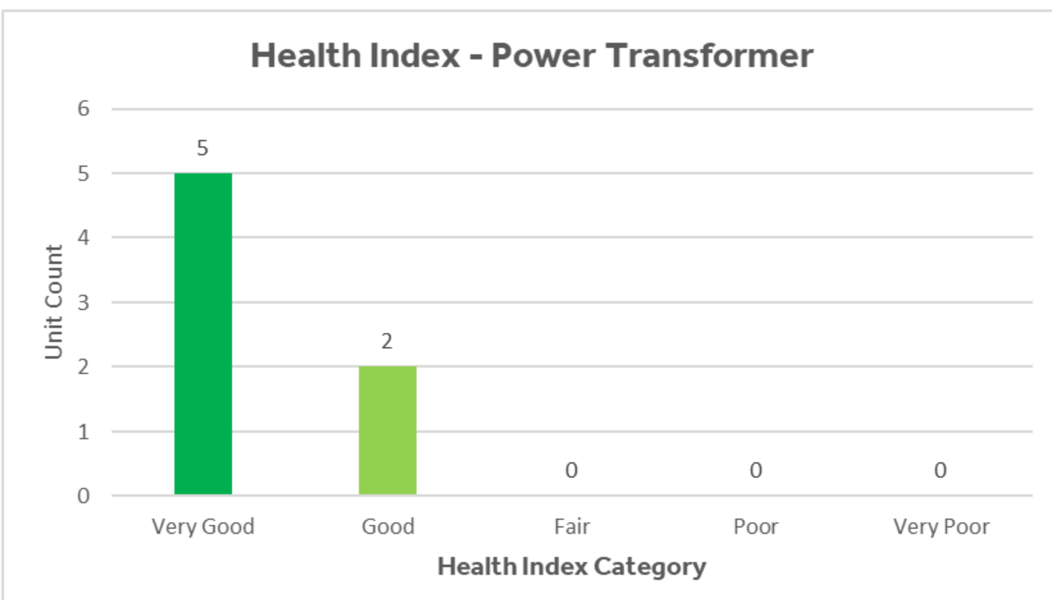
Figure 3-9: HI Results – Switchgears



Power Transformers

LUI owns seven oil-type power transformers. LUI's power transformer inspections, test results, and loading history were used to calculate the HI. The HI distribution for in-service power transformers is presented in Figure 3-10. All the power transformers are assessed to be in Very Good or Good condition.

Figure 3-10: HI Results – Power Transformer



3.2.4 System Utilization (5.3.2d)

The Town of Cobourg is normally supplied by two 44kV feeders (M2 & M4) from the Hydro One Port Hope Transformer Station, located 3.7km west of the Town boundary. A third feeder (M17) provides a backup supply during contingency conditions. The 44kV system supplies two 44/27.6kV substations, three 44/4.16kV substations and major commercial and industrial load. Identified through the Regional Planning Process Port Hope TS is identified to be replaced in 2023 due to ageing and not capacity constraints.

In addition, most new developments are supplied at 27.6kV, increasing the load on the 44/27.6kV substations. Furthermore, LUI is planning to convert its entire system in Cobourg to 27.6 kV, thereby eliminating the 4.16 kV stations in the Cobourg distribution system. Upon completion of the voltage conversion process, equilibrium loading should be achieved across the system, leaving the appropriate capacity to manage peak loading. As part of this design, distribution feeders are typically loaded to 50% to ensure that contingency situations can be managed.

For planning purposes, LUI's Distribution Stations ("DS") are configured and loaded to 100% normal rating. LUI does not plan for a DS transformer to be loaded above its normal rating during non-contingency situations. Operating above normal rating can result in a shortening of the transformer service life. Under contingency situations, the load is to be transferred to other distribution stations, without exceeding the normal rating of the distribution station transformers or circuits receiving the load, as soon as possible. However, in Cobourg, the Brook DS cannot be backed up to the Victoria station.

However, LUI's DSs do not have sufficient capacity to serve current and future loads while still maintaining a high degree of redundancy. DS transformer capacity constraints are therefore identified as being an investment driver over the five-year planning period. LUI plans to gain extra capacity on the 27.6 kV system by upsizing the cables at the stations and having the transformers fans certified at Victoria Cobourg. These actions defer the necessity to invest in a new station transformer until the late half of the DSP forecast period, at which point LUI intends to install a new station transformer. Once the new station transformer is in-service, the remaining 4.16 kV load can be transferred to the 27.6 kV system and the 4.16 kV infrastructure decommissioned. The station capacity study is attached as Appendix A.

3.3 Asset Lifecycle Optimization Policies and Practices (5.3.3)

3.3.1 Asset Lifecycle Optimization Policies and Practices (5.3.3a)

LUI owns all the distribution assets within its service area and is responsible for the management of all its distribution and substation assets. It maintains the efficiency and reliability of its distribution system through an active inspection, maintenance, and asset management program that focuses on customer service, employee safety, and cost-effective maintenance, refurbishment, and replacement of assets that can no longer meet utility standards.

LUI leverages practices that reflect practical and prudent business approaches for implementing the company vision and objectives. LUI uses its asset management program and capital investment process to evaluate and decide whether to replace equipment or have it repaired in addition to prioritizing the project within the overall capital program. The following description of LUI's practices demonstrates LUI's consideration in the management of its assets which aid in the reliable delivery of power to its customers.

3.3.1.1 Asset Replacement

LUI 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 can be prudent.

To optimize equipment value and minimize replacement costs, LUI considers the reuse of equipment from the field where safe to do so. This is done in compliance with *Ontario Regulation 22/04 (Reg. 22/04), Section 6(1) (b) – Approval of Electrical Equipment* and ensures used equipment meets current standards and poses no undue hazard for re-use in new construction. Examples of equipment subject to potential reuse are distribution transformers, load break switches and pad mount switchgear. All equipment subject to reuse must meet certain minimum condition criteria and must be deemed safe to use by a competent person. If this is the case, then the asset is returned to inventory.

If it has been determined that the asset cannot be reused, then a repair estimate is obtained to return the asset to a safe and useable condition in addition to an estimate of the expected remaining useful life. If the cost of the repair plus the Net Book Value ("NBV") of the asset is less than the replacement cost and the new expected useful life exceeds the original remaining useful life, then the asset is repaired, otherwise, the asset is replaced and disposed of. Plant equipment is replaced at the end of life when all refurbishment options have been exhausted.

3.3.1.2 Maintenance Planning

Maintenance is performed to ensure equipment continues to provide its essential functions safely over its lifecycle. Some assets require very frequent maintenance efforts (e.g. fleet vehicles), others require infrequent maintenance efforts (e.g. pole structures) and some are essentially maintenance-free (e.g. conductor). For most assets, uniform maintenance programs are established for consistency. For very large and critical assets (e.g. station transformers) maintenance programs can be unit-specific depending on the nature of asset issues discovered. All maintenance work performed meets the requirements of Reg. 22/04 and is signed off by qualified staff.

While fulfilling its asset management responsibilities, LUI engages in the following type of maintenance programs:

- Predictive Maintenance
    a. Visual Inspection - This addresses risk management and actively assesses the condition of the plant. It is also required to meet regulatory requirements. This is done on a third of the system each year.
    b. Testing - This addresses risk management and actively assesses the condition of the plant. It is more detailed and more focused than visual inspection and typically involves the measurement of some aspect of the asset. This is done on an interval basis.
- Preventative Maintenance
    a. Activities to extend the trouble-free operation of the asset so that the activity is economical and ensures the continued reliable operation of the asset. This is done on a cyclical basis and usually coincides with the inspection cycle.
- Condition-Based or Reactive Maintenance
    a. Occurrences where the plant is discovered to be out of specification or is malfunctioning and the condition needs to be corrected. The follow-up activities to restore the asset to full function are included here. Occasionally the most cost-effective way to remedy the situation is a replacement.

LUI completes inspections as prescribed in the DSC with an approach and frequency that addresses public safety and cost-efficiency. LUI does this by having predefined geographical areas designated for inspection so that the entire system is inspected on a three-year cycle. The individual areas to be inspected are indicated on maps produced in the GIS and communicated for the crews to use. The maps and the written deficiency reports are returned by the crews together to complete the inspection process. LUI has demarcated the inspection zones as follows:

Area 1: Cobourg: Ontario Street to West end of town, from the Lake to Hwy 401.

Area 2: Cobourg: D'Arcy St. to Ontario St. from the Lake to Hwy 401.

Area 3: Cobourg: East end, D'Arcy to the east end of town from the Lake to Hwy 401 and all of the Cramahe Area.

Figure 3-11: Inspection Areas for Cobourg

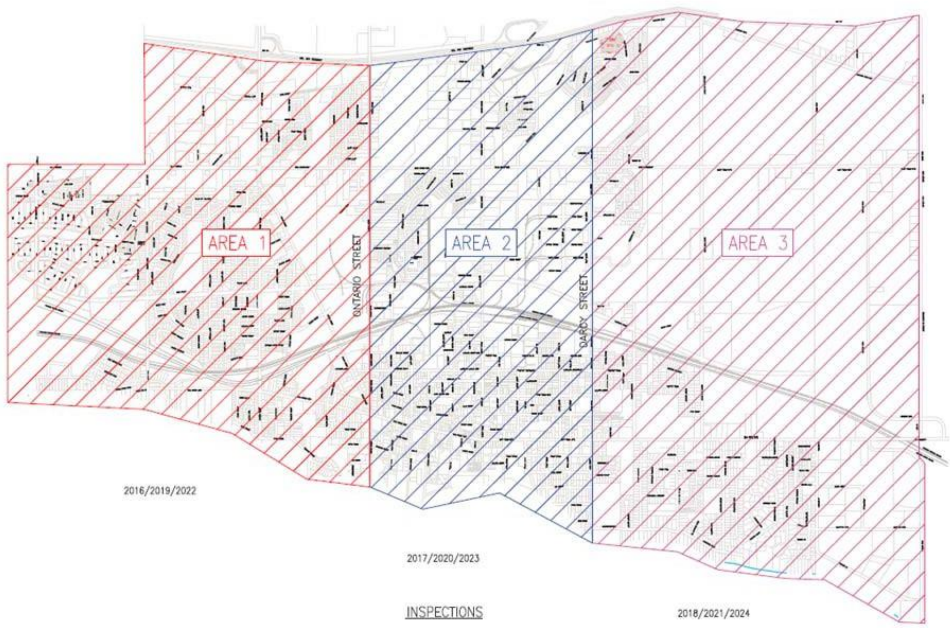
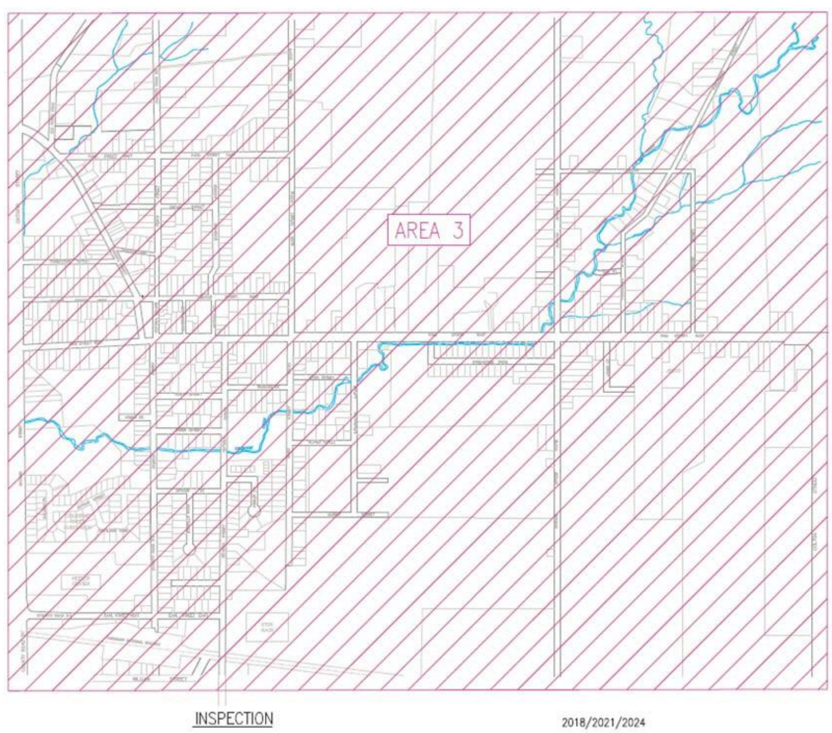


Figure 3-12: Inspection Areas for Cramahe



After the inspections are carried out, the information is processed that allows LUI to manage and complete all follow-up work within reasonable periods. The information is appropriately retained and is available for future review or verification should it be needed.

3.3.2 Asset Lifecycle Risk Management Policies and Practices (5.3.3b)

3.3.2.1 Predictive Maintenance of Overhead Assets

Inspections

LUI's supply area is served by a mostly urban distribution system supplying the Town of Cobourg and the Village of Cramahe. Its supply area is structured into two geographical zones for the implementation of systematic and routine visual patrols to comply with the OEB inspection requirements. These two geographical zones are further divided to result in a total of three inspection zones. LUI currently inspects the overhead distribution system in each inspection zone, completing approximately one-third of the distribution system each year, as per the *Minimum Inspection Requirements* of the DSC. The visual inspections of the major distribution facilities meet the level of detail for the *Patrol Inspection Definition* in the DSC. The *Minimum Inspection Requirements* defined in OEBs DSC documents, in detail, the inspection standards and cycles required within the DSC. The DSC identifies the maximum intervals for the inspection cycle patrols, which for most urban facilities is three years. LUI inspects all its assets on a three-year cycle.

The visual patrol serves as an inspection to assess the condition of overhead assets, including wood/concrete/composite poles and their supporting attachments, pole-mount distribution transformers, switches, and surrounding vegetation. If a defect is identified during the inspection, LUI identifies the equipment, location, and condition details. The inspection record is subsequently submitted for review by supervisors. Follow-up maintenance is prioritized and scheduled, through the issuance of a service order to a crew for correction of defects.

In general, the condition of assets is determined to ensure that:

- They continue to be operated safely for the public and for staff to work on.
- Meet the requirements of the DSC, Ontario Regulation 22/04, and additional relevant environmental standards.
- They are working within set specifications:
    - Within the device current and voltage capabilities.
    - With no deterioration to impair the 'normal' function of the asset.
    - Secure as it was when it was first properly installed.

In addition to fulfilling the requirements of the DSC, the inspections allow for deficiencies, including vegetation growth, to be documented and acted on with sufficient lead time to manage the risk of poor performance. Additionally, inspections allow for the general condition of system components to be documented for subsequent analysis in support of maintenance and capital planning activities such as an asset condition assessment to assess the probability of failure within the short term.

Thermographic Infrared Inspection

System-wide regular infrared (IR) thermography of overhead plant is performed annually. IR thermography is a relatively low-cost way of identifying otherwise hard to detect problems and risks. If this scan is carried out regularly as proposed, then it serves as an early warning system for problems and is an excellent way to mitigate risk. LUI intends to continue with the program and have it completed annually to manage the risk of failure of assets exhibiting hotspots. LUI plans to inspect the whole plant each year.

3.3.2.2 Preventative Maintenance of Overhead Assets

Vegetation Management

Vegetation management, or tree trimming, is a preventative maintenance program scheduled on a three-year cycle, where one of the three zones of the distribution system is completed each year. The activity focuses on trimming trees and other vegetation such as vines that are in proximity to LUI's assets and may contribute to a forced outage. Managing the surrounding vegetation around LUI's assets mitigates the risk of experiencing performance-related issues such as an increase in outage frequency or durations. This activity is executed by contract utility arborists as they have specialized knowledge of the growth rates of various vegetation.

Vegetation management schedules are as follows:

Area 1: Cobourg: Ontario Street to West end of town, from the Lake to Hwy 401. Cramahe: King Street to North End of town, from West limits to East limits.

Area 2: Cobourg: D’Arcy St. to Ontario St. from the Lake to Hwy 401. Cramahe: King Street to South End of town, from West limits to East limits.

Area 3: Cobourg: East end, D’Arcy to the east end of town from the Lake to Hwy 401.

Figure 3-13: Vegetation Management Areas for Cobourg

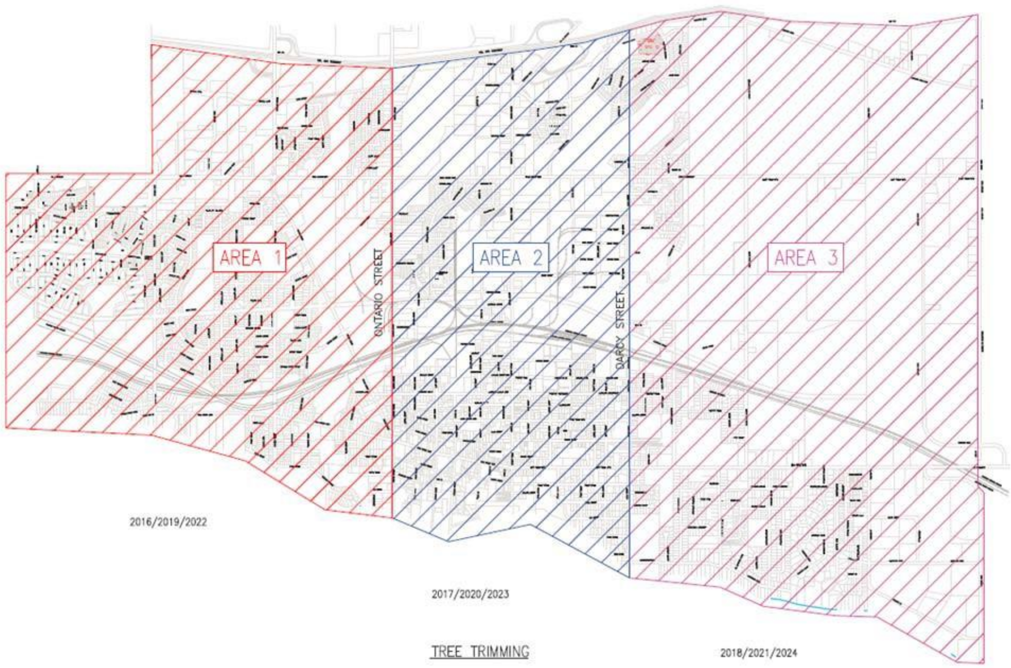
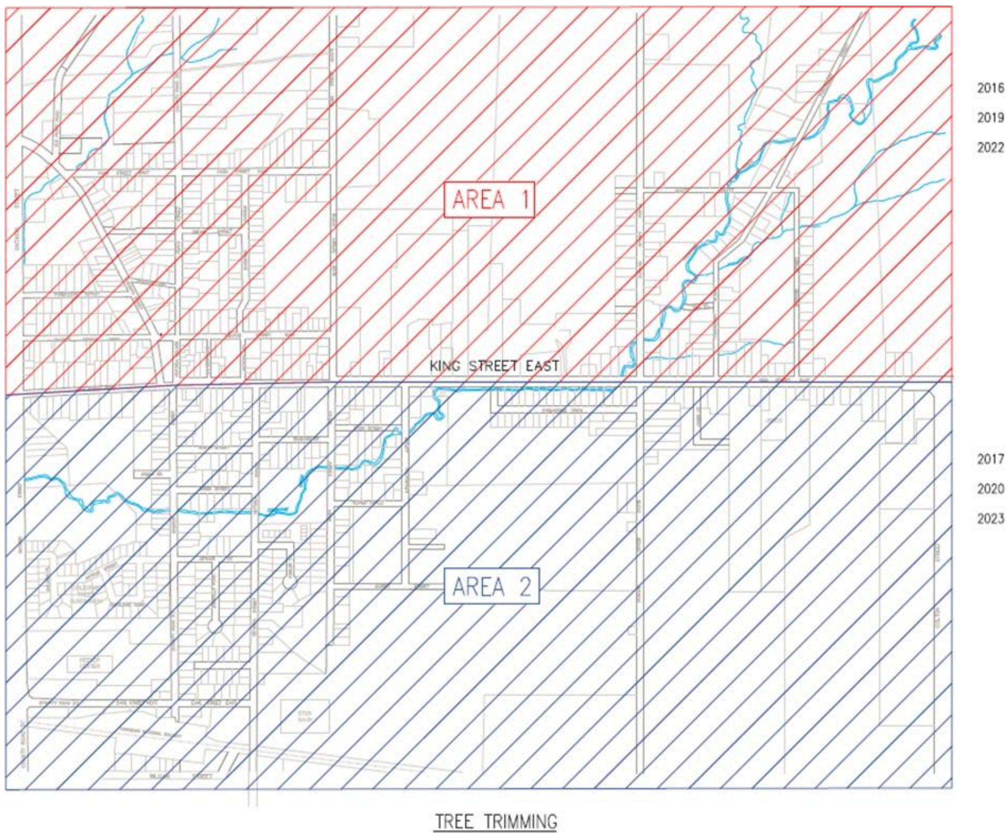


Figure 3-14: Vegetation Management Areas for Cramahe



Since growth rates vary with the weather and by plant species, LUI responds to these factors. For example, if there is a year with an exceptional growing season due to frequent rain, certain areas may be vulnerable to tree contacts two to three years from that year. The inspection program pays attention to this to prevent future problems. Also, some species of plants/trees grow faster than others. LUI uses a shorter trimming cycle if the trimming would be too severe on the regular cycle length. Additionally, some reactive maintenance is performed in response to requests from the public to trim or remove trees in proximity to power lines.

3.3.2.3 Condition Based Maintenance of Overhead Assets

Following Pole Inspections and Line Inspections

Poles that are identified as requiring attention in the inspection program will have a service order completed. Service orders are prioritized based on safety and risk for follow-up repair. The repairs are tracked, and all repairs are completed and signed off per the ESA requirements.

Following Thermographic Imaging

All items that require to be addressed following thermographic imaging are recorded in trouble reports. Trouble reports are prioritized based on safety and risk for follow-up repair. The repairs are tracked, and all repairs are completed and signed off per the ESA requirements.

3.3.2.4 Predictive Maintenance of Underground Assets

Inspections

Similar to the general overhead process of inspection and condition assessment, the underground distribution system is also inspected on a three-year cyclical basis to assess the condition of underground assets which include pad-mount transformers, pad-mount switches, transformer vaults and civil structures. The buried assets cannot be inspected visually like the overhead assets, but care is taken to inspect all assets that can be seen to assess their condition. Follow-up reactive maintenance is prioritized and scheduled, through the issuance of a service order to a crew for correction of defects.

Thermographic Infrared Inspection of Underground Assets

System-wide regular infrared ("IR") thermography of underground plant is performed. IR thermography is a relatively low-cost way of identifying otherwise hard to detect problems and risks. If this scan is carried out regularly as proposed, then it serves as an early warning system for problems and is an excellent way to mitigate risk. It is the intention to continue with this program and have it completed annually to manage the risk of failure of assets exhibiting hotspots. Hence the plan is to inspect the whole plant each year.

3.3.2.5 Preventative Maintenance of Underground Assets – Condition Based

For underground assets, LUI follows the same process defined for overhead assets with respect to responding to deficiencies discovered. A service order is issued and prioritized based on the identified defect. The defect is classified into a critical category based on the risk to the asset. The work is dispatched to the appropriate crew(s) and the work is completed. Once the work is completed, appropriate signoffs are made to ensure the distribution system is safe for the public and staff and that the system is restored to proper working order to ensure LUI controls the risk found.

3.3.2.6 Inspection and Condition Assessment of Distribution Stations

Regular monthly inspections are carried out on the distribution station yard and equipment to identify any risks of the assets. Also, planned maintenance is carried out by a specialized contractor on a three-year cycle. Any defects or deficiencies discovered are corrected as part of LUI's maintenance programs to manage the risk of the asset throughout its life. If a major deficiency is discovered through the monthly inspection process, it is addressed based on the risk of the deficiency it has on the asset and its intended function.

3.3.2.7 Preventative and Condition-Based Maintenance of Distribution Stations

LUI contracts with a specialized contractor to have the stations maintained on a three-year cycle. This entails a thorough condition review of the station and the correction of all deficiencies found to manage the risk throughout the asset's lifecycle.

3.3.2.8 Maintenance of Customer Substations

There are 44 customer-owned substations within LUI's service area, 37 in Cobourg and seven in Cramahe. Maintenance on these customer-owned substations is scheduled annually by the customer. LUI is notified of upcoming maintenance through a request system which assists LUI with prioritizing and planning maintenance tasks efficiently. Maintenance tasks include inspection and correcting any defects found to manage the risk of the asset.

3.4 System Capability Assessment for Renewable Energy Generation (5.3.4)

3.4.1 Applications Over 10 kW (5.3.4a)

As of January 1, 2021, there are no current applications from renewable generators over 10kW for connection in the LUI's service area.

3.4.2 Forecast of REG Connections (5.3.4b)

There are a total of 38 renewable energy generation installations presently connected to LUI's distribution system under the province's Feed-in-Tariff ("FIT") and micro FIT programs. In summary, the breakdown of these connections are:

- 15 FIT installations with generating capacity of 4,696 kW.
- 41 micro FIT installations with 316.18 kW installed capacity.
- 5 solar net-metering installations with 140 kW installed capacity.

LUI continues to perform connection impact assessments for Net Metering application. Although the connection requests in the forecast period are assumed by LUI to be equal to the historical period, LUI recognizes the pace of change in the business model due to continuous technological innovations, efficiency improvements, evolving customer expectations and the potential for a policy change. Specifically, the connection requests pertain to Distributed Energy Resources (DER) such as solar photovoltaics (PV), battery energy storage and electric vehicle (EV) charging stations as these investments by customers are becoming more frequent.

Currently, the business and regulatory pathways for DER remain largely uncertain, however, this is inevitable to which LUI needs to be prepared. The potential of additional system loading may develop when one neighbour purchases an EV or PV and the surrounding neighbours follow suit. Though the first connection may not cause an issue for the distribution system, subsequent and increased connections may surpass the available capacity found on the local distribution transformer or put a strain on the feeder and power transformer. Anticipating these capacity issues allows for LUI to plan appropriately and accordingly in advance.

Capacity Available (5.3.4c)

Under conservative assumptions of the maximum permissible generation capacity at a distribution station being equal to 60% of the power transformer nameplate rating plus the minimum station load (equal to 15% of station rating) and 90% power factor, the approximately available capacities for connecting renewable energy generation to various municipal stations are indicated in Table 3-2 and Table 3-3:.

The 27.6kV and 4.16kV feeders employ varying conductor sizes. As LUI works on upgrading the existing 4.16kV to 27.6kV, the 336kcmil conductor size is the applied standard for conductor size. If a customer requires a generation connection and the conductor size is insufficient, LUI will upgrade the conductor to the standard.

As shown, based on the application currently in hand or anticipated to be received during the next five years, there are no significant system constraints except for the conductor size where the system has not yet been converted to 27.6kV. Therefore, some capital investment may be required on an as needed basis.

Table 3-2: 27.6 kV Stations Distributed Generation Connection Capacity

Distribution Station	Approximate Available Capacity (MW) for Generation Connections	System Constraints for Connection of Generation
MS#28-2 BROOK	0.065*	Available capacity
MS#28-1 VICTORIA	1.48*	Conductor Size

Table 3-3: 4.16 kV Stations Distributed Generation Connection Capacity

Distribution Station	Approximate Available Capacity (MW) for Generation Connections	System Constraints for Connection of Generation
MS#3 ORR	0.633*	Conductor Size
MS#2 D'ARCY	0.08*	Available Capacity
MS#2 DURHAM	0.166*	Conductor Size
MS#5 KERR	0.083*	Available Capacity
MS#1 VICTORIA	0.75*	Conductor Size

* Available capacity was determined by taking one-third of the minimum load connected to each station and subtracting existing generators as per IEEE1547.

3.4.3 Constraints – Distribution and Upstream (5.3.4d)

LUI is not aware of any constraints for renewable generation connections within its 27.6 kV distribution system. However, there can be limitations with respect to connecting to the 4.16 kV system. Projects with a capacity greater than 7% of the feeder minimum capacity would be too large to connect to a 4.16 kV feeder. The 4.16 kV system has small conductors installed and connecting REG projects most likely can cause issues with voltage and power quality. LUI allows up to 7% of the minimum feeder load for renewables on the 4.16 kV system (F Class feeders). Connection Impact Assessments ("CIA") for generators connected to the 4.16 kV system will need to consider plans for voltage conversion to 27.6 kV and the requirement that they would be converted to 27.6 kV soon.

LUI's distribution stations are supplied from Hydro One's Port Hope TS. HONI's station capacity is an approximate amount of generation that can be added to each bus. The list shows approximate values only and the actual capacity can only be determined by completing a CIA. Information from the list related to HONI TS that supply LUI is in the table below. Should LUI have more renewable generation to connect than its allocated capacity, it would have to apply to Hydro One for the additional capacity.

Table 3-4: HONI Station Capacity Information

Station	Service Area	Short Circuit Capacity (MVA)	Thermal Capacity (MW)
Port Hope (BY Bus)	Cobourg	334.3	67.2
Port Hope (JQ Bus)	Cramahe	789.8	57.0

3.4.4 Constraints – Embedded Distributor (5.3.4e)

There are no constraints for an embedded distributor that may result from connections of REGs.

4 CAPITAL EXPENDITURE PLAN (5.4)

This section describes LUI's five-year capital expenditure plan over the forecast period, including a summary of the plan, an overview of LUI's capital expenditure planning process, an assessment of LUI's system development over the forecast period, a summary of capital expenditures, and justification of capital expenditures.

4.1 SUMMARY

LUI's DSP details the program of system investment decisions developed based on information derived from LUI's asset management and capital expenditure planning process. Investments, whether identified by category or by a specific project, are justified in whole or in part by reference to specific aspects of LUI's asset management and capital expenditure planning process.

LUI's DSP includes information on prospective investments over a five-year forward-looking period (2022 – 2026) as well as planned and actual information on investments over the historical period (2016 – 2021).

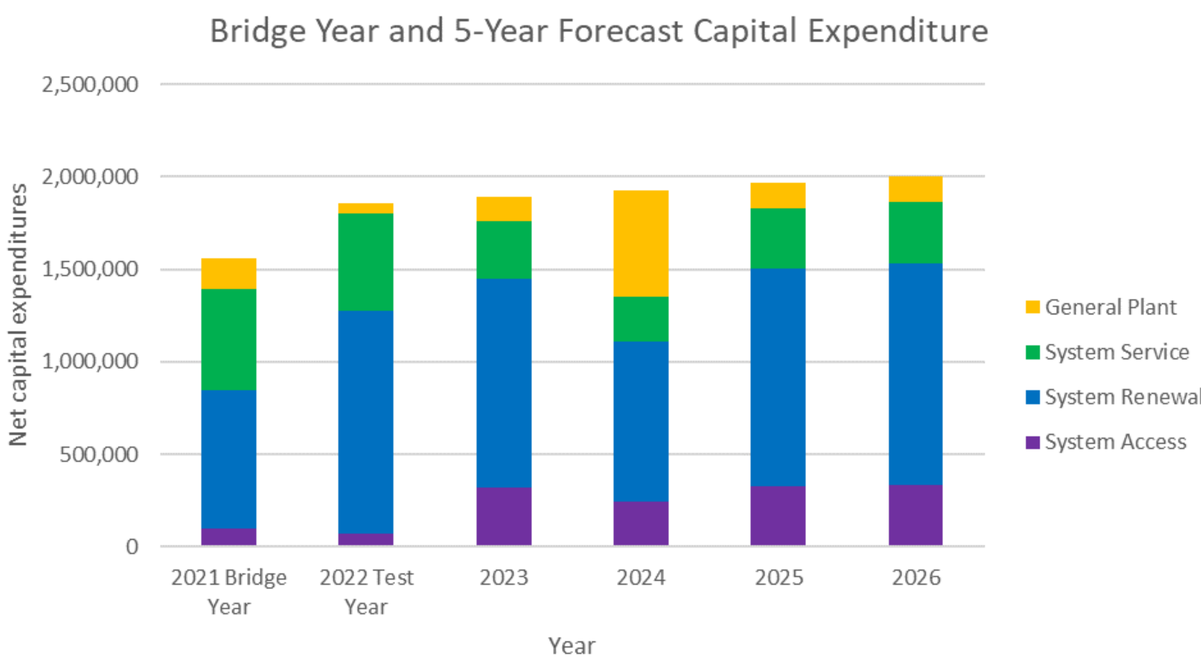
4.1.1 Capital Expenditures over the Forecast Period

The following table summarizes the planned capital expenditures, by investment category, throughout the DSP forecast timeline.

Table 4-1: Net planned capital expenditures by investment category ($ '000)

Category	2022($)	2023($)	2024($)	2025($)	2026($)	Avg. ($)
System Access	75	318	244	330	336	***261***
System Renewal	1,200	1,131	869	1,173	1,195	***1,113***
System Service	525	315	242	327	333	***348***
General Plant	60	131	574	135	138	***208***
Total Capital	**1,860**	**1,894**	**1,929**	**1,965**	**2,002**	***1,842***

Figure 4-1: Planned capital expenditures by investment category



The figures and table above demonstrate that over the forecast period of the DSP, LUI plans to pace and prioritize capital expenditures to produce a predictable impact on rates and prevent spikes in spending. LUI plans to invest an average of $1.84M in capital expenditures per year across all four investment categories.

4.1.2 Capital Planning for 2022-2026

LUI has developed a prudent capital budgeting process combined with a system of capital project prioritization that considers customer preferences, business performance and accountability. This system reflects its long-term strategy and addresses the need for LUI to remain flexible enough to respond to priority shifts as they occur. The capital budget process considers the relative priorities of the proposed investments including both non-discretionary and discretionary budget items.

Non-Discretionary items include:

- Projects that accommodate the company's obligation to connect including new customers as well as load growth.
- Projects to accommodate municipal, regional and Ministry requirements.
- Projects or expenditures to satisfy regulatory initiatives, environmental or health & safety risks and the company's conditions of service.

Discretionary Items include:

- Infrastructure Renewal Projects
- Distribution Automation
- Information Technology
- Fleet/Tools

The combination of LUI's asset management and capital expenditure planning process leads to a capital expenditure plan consisting of a five-year capital expenditure forecast which includes a one-year detail capital budget.

4.1.2.1 System Access

Expenditures in this category are driven by external requirements such as servicing new customer loads and relocating distribution plants to suit road authorities. The timing of investment is driven by the needs of the external parties. These expenditures are mandatory. Specific project scopes are rarely known at the time that the budget is set, and total expenditures can vary from year to year. Most of the forecasted investments in this category are based on historical requirements. Specific projects such as relocations are budgeted based on LUI's estimates and historical averages, in conjunction with information from external agencies (such as Cobourg and Cramahe) of the work required over the project life cycle. LUI's proposed 2022 – 2026 System Access forecast investments are found in the table below.

Table 4-2: Forecasted System Access Investments

Category	2022($)	2023($)	2024($)	2025($)	2026($)	Avg. ($)
System Access	75,000	317,937	244,325	329,809	335,911	***260,596***

System Access investments consist of the following major items: customer connections, new services, and metering. Customer connections include connecting existing customers to the system specifically those that are affected by the voltage conversion efforts. New services include supplying electrical equipment and materials to residential, commercial, and industrial accounts where no electrical supply currently exists. Metering includes supplying metering equipment and materials to residential, commercial, and industrial accounts.

4.1.2.2 System Renewal

Expenditures within the System Renewal category are largely driven by the condition of distribution system assets and play a crucial role in the overall reliability, safety, and sustainment of the distribution system. LUI's ACA recommends assets for renewal based on condition data from tests and inspections. The asset management process outlines the strategy used to determine the criteria for asset replacement. The output of the asset management process drives the development of the capital expenditure plan and prioritization for System Renewal. LUI's proposed 2022 – 2026 System Renewal forecast investments are found in the table below.

Table 4-3: Forecasted System Renewal Investments

Category	2022($)	2023($)	2024($)	2025($)	2026($)	Avg. ($)
System Renewal	1,200,000	1,130,684	868,898	1,172,906	1,194,605	***1,113,419***

System Renewal investments comprise of two main components: the asset renewal projects and the Pole Replacement program. As part of the asset renewal projects, LUI plans to replace overhead and underground assets which exhibit signs of deterioration consistent with End-of-Life ("EOL") criteria as defined by the utility's asset management standards. These investments are aimed at maintaining the safety and reliability of the distribution system while mitigating the cost impacts to customers. The Pole Replacement program focuses on replacing wooden poles which exhibit signs of deterioration consistent with EOL criteria as defined by the utility's asset management standards. Older, deteriorated poles that lose their structural integrity pose a safety risk to the employees servicing them and the public. Moreover, in-field failures of deteriorated poles can affect system reliability performance, potentially resulting in outages that would be longer and can cost more under a reactive replacement than under a proactive replacement approach.

4.1.2.3 System Service

Expenditures in this category are driven by the need to ensure that the distribution system continues to meet operational objectives (such as reliability, grid flexibility and DER integration) while addressing anticipated future customer electricity service requirements (i.e. station capacity increases, feeder extension, etc.). LUI 2022 – 2026 System Service forecast investments are found in the table below.

Table 4-4: Forecasted System Service Investments

Category	2022($)	2023($)	2024($)	2025($)	2026($)	Avg. ($)
System Service	525,000	315,174	242,202	326,944	332,992	***348,462***

The main investment comprising of the System Service expenditures is voltage conversion. LUI's voltage conversion program goal is to convert sections of LUI's system from 4.16 kV to 27.6 kV, which involves renewing and upgrading the infrastructure as required. It is a continuation of the program put together in the historical period. The voltage conversion allows LUI to mitigate losses in the system and upgrade the system to the latest standards. A voltage conversion in an area comprises of two phases. The first phase is to build the required 27.6 kV infrastructure before transitioning the 4.16kV system onto the 27.6kV system. The second phase involves the actual 4.16kV load transferred to the 27.6kV system. Once this load transfer is complete, the 4.16kV system will be decommissioned appropriately.

In addition, LUI had commissioned a study of its current system loading capacity and future growth potential which identified constraints to be expected within the forecast period. Specifically, the load growth of the system is expected to exceed the current load and a new station power transformer is needed to be installed to maintain system load performance. Currently, LUI is planning to install the new unit in the forecast period.

4.1.2.4 General Plant

Expenditures in this category are driven by the need to modify, replace or add to assets that are not part of the distribution system but support the utility's everyday operations (i.e. land, buildings, tools and equipment; rolling stock and electronic devices and software used to support day to day business and operations activities). While these items are important and contribute to a safe and reliable operation, General Plant investment levels and timing are generally subject to a greater degree of discretion than other investment categories. However, if ignored over a significant period, it may result in larger issues and investments needed without any discretionary to continue daily operations. In addition, an assessment of LUI's fleet has determined that material fleet investments are required for a bucket truck renewal. LUI 2022 – 2026 General Plant forecast investments are found in the table below.

Table 4-5: Forecasted General Plant Investments

Category	2022($)	2023($)	2024($)	2025($)	2026($)	Avg. ($)
General Plant	60,000	130,615	574,031	135,493	**137,999**	***207,628***

4.1.3 Customer Engagement and Preferences (5.4a)

4.1.3.1 Customer Engagement

LUI regularly seeks customer feedback to help shape the direction and development of the community investment. LUI prioritizes efforts to connect with customers to ensure that their expectations are being met and to implement suggestions on how LUI can improve their overall customer experience.

The goal for Lakefront is to cut through the fog of fear, misinformation, and confusion that exists amongst its customers regarding a myriad of subjects while retaining a very high level of trust, respect, and credibility. LUI provides customer-facing representation and represents a culture of leadership in its community by delivering distribution excellence for customers and employees. LUI takes its responsibility of informing, educating, and responding to customer needs as a top priority.

LUI has become more customer-centric by historically investing in new capabilities, programs, and technologies that allow LUI to communicate more effectively and efficiently with its customers. LUI has a wide range of customer engagement activities that enable two-way communications between the utility and the customer. New communication channels are evolving rapidly, whether that is providing a growing number of online options, the ability to log on to mobile applications or browsers, or the choice of calling up any number of social media platforms. LUI currently utilizes Silverblaze, LiveChat, Facebook, Twitter, and LinkedIn. Additionally, topics of interest and importance are communicated through community events, retail locations, a web portal, local newspapers, and bill inserts. Items communicated include infrastructure investments, planned outages, energy conservation and conservation programs, financial assistance programs and time-of-use pricing. Social media is used and has been a benefit, especially in relation to notifying customers with daily updates or with emergency updates such as major storms. LUI's eCare portal allows customers to view their usage, consumption, and payment history in addition to being able to compare current and previous bills.

Additionally, LUI participates in several community events throughout the year raising awareness of conservation and promoting bidirectional dialogue with its customers regarding infrastructure investment. While programs through SaveOnEnergy have been vital to conservation education, public events also provide opportunities for the utility to interact with customers in a less formal environment.

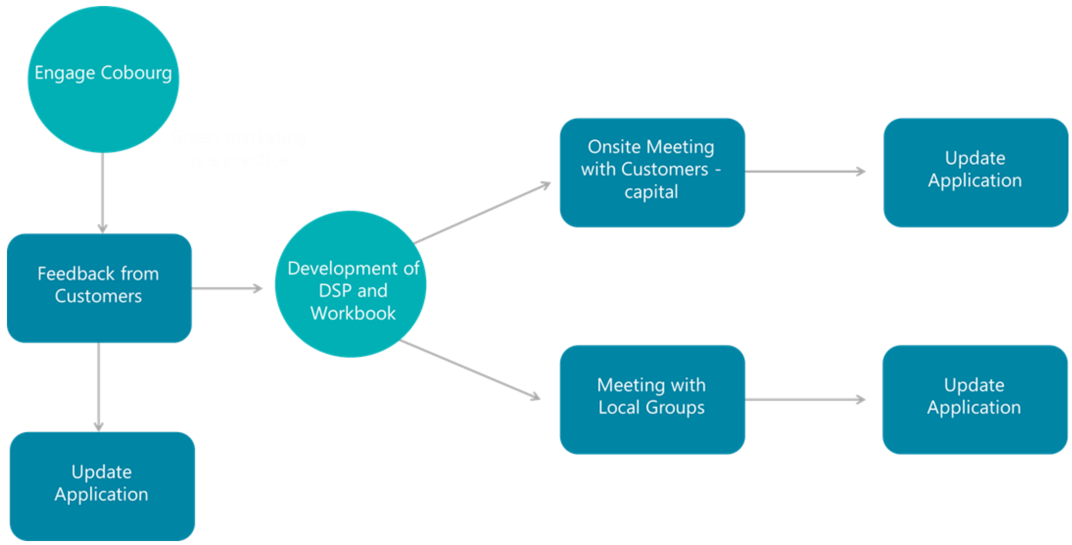
In 2020 and early 2021, LUI engaged its customers through means of townhall meetings and survey feedback. Supplementary material was developed by LUI including presentations and workbooks to communicate LUI's current and future objectives to be achieved through the rate application. The workbook covered a wide range of issues relating to customer satisfaction, service levels, business operations, reliability, conservation efforts and smart grid. Additionally, LUI had engaged customers who have installed load displacements generation projects such as combined heat and power systems or other load displacement projects to provide direct feedback to LUI's proposed rate. Lakefront believes its approach to customer engagement fulfills two fundamental principles:

1. Ensure that everyone who wants to have a say can participate, while also making sure that we hear from all types of customers.

2. Ensure the views collected are informed views that reflect customer judgment rather than simply their first impressions. Thus customer education is a key component of every consultation.

LUI's approach to the customer engagement process is visualized in Figure 4-2. Further details on the process can be found in Exhibit 1.

Figure 4-2: Flowchart of the customer engagement process



4.1.3.2 Customer Preference

Many of the customer engagement process findings corroborated what LUI had been hearing recently from customers, via the ongoing dialogue through the day-to-day engagements. Of the few key learnings that emerged from the customer engagement process, the following directly pertain to LUI's DSP:

1. Lakefront has positive reliability stats, but there is room for improvement. There is a positive perception that the utility provides a reliable power supply; however, the number of outage complaints was higher than experienced in other years and as indicated in the survey feedback, customers would like more communication surrounding an estimated time of restoration.

   Lakefront believes that its DSP centred around a risk-based optimization program can allow for maintenance, or improvement, of reliability and power quality while maintaining prudent and consistent capital spend level in accordance with recent historical years.

2. One of the most suggestions received from the customer consultations was to keep rates low. LUI recognizes the need to keep distribution rates reasonable and affordable for its customers and believes it has addressed this by budgeting efficiently and carefully for the future in this application.

Furthermore, Lakefront had various engagement activities related to capital projects. Lakefront was proactive in using these sessions to communicate directly with their customers about the capital projects that would be affecting them. The customer engagement activities invited customers to learn about Lakefront and the industry, tell LUI about things that are important to them, and prioritize or assess various capital projects and programs, operational plans, and other initiatives for considering in LUI's development of its DSP and this application.

The sessions created an opportunity for customers to learn the basics of the distribution system so they can provide a more informed point of view. During this phase, Lakefront focused on determining whether, and to what scale the DSP needs to be adjusted to closely reflect the views of customers. Lakefront worked closely with the customers to ensure they understood the utility's plans and where there is optionality within the plan (i.e. discretionary vs non-discretionary spending). In the context of the overall spending envelope of the DSP, Lakefront wanted to determine if we have set the right priorities and found the right balance between what customers want and expect from the utility and the responsibility to fun a safe, reliable local distribution system. . In some cases, Lakefront strived to show a direct link between funding and the deterioration of reliability or conversely, the improvement in reliability in response to an increased spend.

Although the events were not well attended, Lakefront conducted in-depth discussions with those in attendance and followed up with phone calls and emails with other customers that could not attend the sessions. Further, the pattern of responses from this sample of participating customers indicates that this engagement process garnered sufficient qualitative feedback to indicate customer preferences. Customer preferences resulted in no major changes to the proposed projects or priority of projects for the DSP period.

4.1.3.3 Projects in Response to Customer Preference, Technology, and Innovation

In direct response to customer preferences, LUI is not introducing additional projects or modifications to existing projects. Furthermore, at this time LUI has not included any costs for technology-based opportunities, innovative projects, or demonstrations in the forecast period to manage low customer bills through the DSP period.

4.1.4 System Development over the Forecast Period (5.4b)

4.1.4.1 Ability to Connect New Load/Generation

Steady load growth in Cobourg and Cramahe is expected in the forecast period. This results in the system load capacity approaching the maximum allowance and requires additional capacity to accommodate future connections. The station capacity study is attached as Appendix A.

In addition, the system can connect generator customers depending on the connection location. However, the number of generator connections to the system has been minimal and LUI does not expect a sudden increase of connections in the forecast period. LUI has limited expenditures planned to address the ability to connect generation customers. All applications to connect significant load or generation requires a CIA before connecting.

Table 4-6: Summary of Available Feeder Capacity for Generation

Summary of Available Feeder Capacity for Generation						
Municipality	**Transformer Station**	**Distribution Station**	**Feeder Number**	**Voltage**	**Generation Load (kW)**	**Available Feeder Capacity (kW)**
Cobourg	50M2	MS2	F10	4.16kV	0	740
	50M2	MS3	F13	4.16kV	29.8	605
	50M2	MS3	F14	4.16kV	0	1597
	50M2	MS3	F15	4.16kV	40	908
	50M2	MS5	F19	4.16kV	30.23	168

	50M2	MS28-1	F1	27.6kV	229.04	2554
	50M2	MS28-1	F2	27.6kV	745.76	1840
	50M4	MS28-2	F4	27.6kV	1217.2	1796
	50M4	MS28-2	F6	27.6kV	546	1539
	50M2			44kV	250	30000
	50M4			44kV	0	25000
	50M2 Total			44kV	1324.83	6 MW (TAA)
	50M4 Total			44kV	1763.2	
Cramahe	50M16	MS1	F1	4.16kV	0	614
	50M16	MS1	F2	4.16kV	5	437
	50M16	MS1	F3	4.16kV	10	202
	50M16	MS2	F4	4.16kV	15	363
	50M16	MS2	F5	4.16kV	40	794
	50M16 Total			44kV	70	18000

4.1.4.2 Load and Customer Growth

LUI connects approximately 100 new customers per year. LUI anticipates that this rate continues through the forecast period and has budgeted for this in its capital plan under System Access projects.

4.1.4.3 Grid Modernization

For the current forecast period, very few smart grid initiatives are planned over the forecast period. Planned projects centre on enabling easier exchange of data to and from the customer, and leveraging information gathered via smart meters and SCADA, or can involve very small, low-cost initiatives that can improve efficiencies with respect to grid operation (i.e. installation of fault indicators, and/or voltage and line current sensors). The cost-benefit to customers to automate high voltage switches cannot be justified currently for the LUI system.

4.1.4.4 REG Accommodation

LUI is supplied by one HONI owned TS. HONI maintains their TS, and as of the last discussions with Hydro One, have no plans to further modify the station specifically for renewable generation capacity. However, approximately one to two new net-metering services have been installed each historical year. Hence, LUI projects to connect similar to historical levels of new net-metering service a year over the 2021-2025 forecast period.

4.1.4.5 Climate Change Adaptation

LUI employs proven storm hardening techniques such as installing stainless steel equipment for below-grade applications, moving below grade equipment to above grade (where possible) where flooding is a strong possibility, designing the system to Canadian Standard Association ("CSA") Heavy Loading conditions and utilizing stronger, treated poles in new constructions.

4.2 CAPITAL EXPENDITURE PLANNING PROCESS OVERVIEW (5.4.1)

4.2.1 Tool and Methods for Risk Management (5.4.1a)

LUI prepares its capital plans with consideration to business risks known to the utility. Preparations include consultations with key parties, incorporating historical performances into actionable items for the forecast plan, tailoring asset management goals, processes and practices and adopting the latest industry standards to achieve the best value out of its system while managing the risk categories such as safety, cybersecurity, and changing environments. LUI relies on a set of tools to assist in achieving the desired goals with consideration to corporate business risk. These are explained further in sections 3.1, 3.3, and 4.2.2. To support the tools and methodologies, a set of planning objectives, assumptions and criteria are applied to reflect LUI's system. The supporting items are explained in the description below.

Planning Objectives, Assumptions, and Criteria

The following high-level planning objectives are considered, assessed, and collectively contribute to the final capital investment budget:

- Municipally driven projects
- Regulatory initiatives e.g., Smart meters and the Green Energy and Green Economy Act
- Elimination of environmental/health or safety risks
- System reliability
- Distribution Automation
- Infrastructure renewal projects
- Fleet/Tools
- Information technology and corporate administration

These inputs result in three main drivers of LUI's capital investments. These drivers align with corporate goals which are, in turn, aligned with the RRFE Outcomes.

1. Obligation to connect a customer in accordance with Section 28 of the Electricity Act, 1998, Section 7 of LUI's Electricity Distribution License and the Distribution System Code.
2. Voltage conversions within the service area enhance line efficiency and reduce the number of municipal substations thereby reducing maintenance costs and maintaining system reliability.
3. Planned system renewal to proactively replace plant at end of life to meet LUI's commitment to maintaining a safe and reliable supply of electricity to its customers.

Municipally driven projects

Downtown revitalization

The Town of Cobourg has a Downtown Vitalization Action Plan. This plan was formed through extensive consultation and in partnership with the Downtown Business Improvement area and the County Chamber of Commerce to address challenges to vitalization in the downtown core. Occasionally, the Town submits requests to LUI with beautification of the downtown area or for third-party relocations as construction occurs.

Waterfront

Part of the revitalization efforts also includes the development and master planning of the waterfront area. Streetscaping visions could require plant relocations and other work to realize the final goals and vision.

Projects that result from these efforts are evaluated as the requests are made from the Municipality. LUI continues to work closely with the Municipality to ensure that the needs are met while maintaining the most prudent course of action for ratepayers.

Regulatory Initiatives

Smart metering within the service area consistently follows OEB directives. Included in this are upgrades to meters in various customer classes and the conversion of customers to interval metering.

Elimination of environmental/health or safety risks

While LUI adheres to its safety policies and procedure to minimize incidents and near misses, these actions cannot always remove the risks inherent in the system or due to the nature of the work. Any system state that would require the mitigation of a safety risk would be immediately moved to the forefront of implementation and the projects within the capital spending envelope would be adjusted to account for this expenditure.

Furthermore, LUI is committed to achieving net-zero emissions by 2030. To achieve this, LUI intends to explore initiatives to transition to electronic records thus reducing paper waste, introducing electric vehicles to the fleet and the removal of multiple old and lower voltage rated substations with a single station. Additionally, LUI's planning objectives are to enhance its internal processes to further support its direction of understanding and managing environmental risks. This includes but not limited to evaluating infrastructure material when purchasing or disposing of, evaluating and reviewing carbon footprint reductions, and continuous growth and education of staff and customers in daily environmental interactions.

System Reliability

With pockets of ageing infrastructure and areas of mixed-use adjacent to residential areas, LUI intends to design resilience into its distribution system which, in turn, results in better reliability for the customer. Through infrastructure renewal and system service projects, LUI expects to see a steady evolution of its measures of system reliability. In areas that experience sustained or frequent outages (by monitoring the worst performing feeder list), LUI targets these sections for improvement and allocated funding for projects within the overall budget envelope set for forecast years.

Distribution Automation

LUI has started to use reclosers to improve automation and reliability in conjunction with its station rebuild projects. Reclosers can communicate via SCADA through the upgraded communications systems. In part, this is to help minimize outages by reclosing the circuits after momentary disturbances. This helps to improve both the reliability and resilience of the system and assists LUI to manage the system more effectively.

Infrastructure Renewal Projects

As assets continue to age and degrade, infrastructure renewal is required to maintain the existing performance levels and safe operations of the system. LUI is planning for the replacement of assets most at risk of failure as efficiently as possible.

Fleet/Tools

Due to the ageing of its fleet assets, renewals are a necessity to continue safe operations. LUI is planning for the replacement of older and deteriorated vehicles through the forecast period before a failure and restricting operations and execution of a planned project.

Planning Assumptions

As part of the DSP and the plans outlined, the following assumptions are applicable:

- Equipment maintenance, refurbishment and replacement programs are in place to ensure that the capacity and capability of the distribution system are maintained at a reasonable level of risk of disruption due to lifecycle-related equipment failure.
- Incidences of extreme weather continue to be manageable under existing standards of design and construction.
- Historical trends continue unless other information is available otherwise.

- The level of activity in REG continues to be in alignment with historical connection requests or more likely to be less.
- External assumptions such as limited growth found in the municipality and developers of the region are held constant and up to date.
- LUI connects approximately 100 new customers per year. LUI anticipates that this rate continues through the forecast period and has budgeted for this in its capital plan under System Access projects.

Planning Criteria

In terms of the overall planning criteria, LUI has adopted a deterministic or redundancy standard for distribution system planning. The redundancy standard triggers an investment when the capacity of an asset, such as a station transformer, is exceeded under normal or contingency operating standards depending on the type of asset. Redundancy, in terms of capacity, is built into the distribution system to deal with unique contingency situations. However, customers can experience an interruption, upon loss of a distribution system element, while backup capacity is engaged, or an asset is replaced.

LUI, like other distribution utilities, strives to ensure its distribution system provides a reliable level of service to customers and connection capacity for forecasted demand growth and as such must be able to handle customer supply needs during normal and certain contingency situations. Overloading of distribution equipment, because of inadequate investment, is avoided as much as possible.

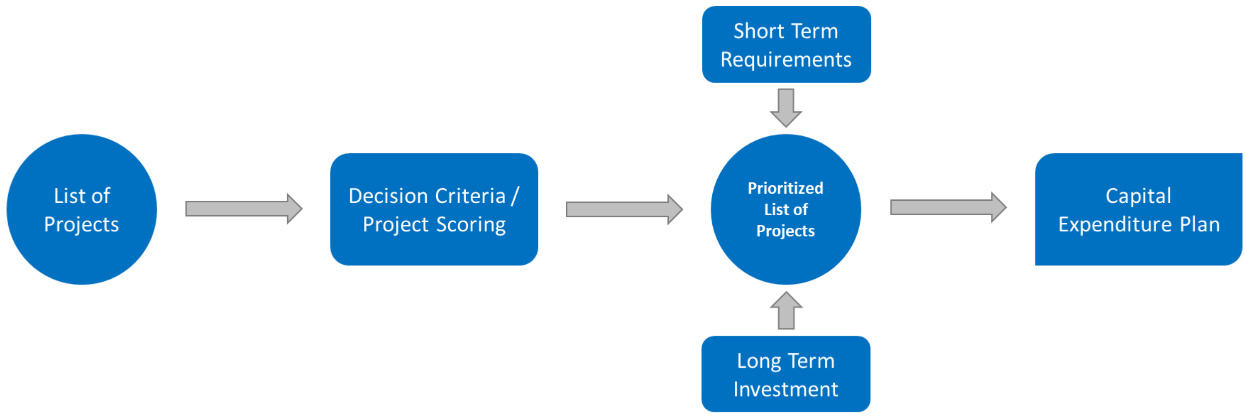
It is LUI's planning policy that the distribution networks shall be designed, constructed, operated, maintained, and renewed in an efficient manner which:

- Supports LUI's strategic goals and asset management objectives.
- Supports the OEB's RRFE outcomes.
- Implements LUI's business plan.
- Complies with regulatory and statutory requirements.
    - Health and safety of workers and the public.
    - Electricity supply quality and reliability.
    - Environmental Protection.
    - Good utility practice.
    - Financial and IFRS accounting practice.
- Effectively controls and balances service levels with asset lifecycle costs and risks.

4.2.2 Processes, Tools, and Methods (5.4.1b)

With its corporate emphasis on business performance and accountability, LUI has developed a prudent capital budget process and system of prioritization. This system reflects its long-term investment strategy, recognizes shorter-term requirements, and can address the ongoing need for LUI to respond to external and internal priority changes. It respects the priorities of a wide range of stakeholders, LUI's corporate strategies and regulatory requirements.

Figure 4-3: Capital Expenditure Overview Process



Project Identification

Capital spending is driven by customer value and capital needs identification through LUI's asset management process.

System Access projects such as development and municipal plant pole relocation projects are identified throughout the year by way of engagement with external proponents. These projects are mandatory and are budgeted and scheduled to meet the timing needs of the external proponents.

System Renewal projects are identified through LUI's asset management process. The project needs for a specific period are supported by a combination of asset inspection, individual asset performance, and asset condition assessments as summarized in the asset management process.

System Service projects are identified through LUI'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 promptly.

General Plant projects are identified internally by specific departments (engineering, finance, operations, administration, etc.) and supported through specific business cases for the specific need.

Project Selection, Risk Management, and Prioritization

Non-discretionary projects are automatically selected and prioritized based on externally driven schedules and needs. System Access projects fall into this category and may involve multi-year investments to meet customer or developer requirements. A system of project prioritization is applied that considers growth rates, safety, reliability and performance, condition and age, and other drivers internal or external to LUI. All remaining projects residing beyond System Access are deemed discretionary. These projects are selected and prioritized based on value and risk assessments for each project. Evaluating the absolute or relative importance of these proposed investments can be an intricate task as they may have competing requirements for available resources in any year. The end decision of whether to proceed with an individual project in the current year is made by senior management based upon the best information available at the time.

In general, the overall approach used to select candidate capital projects to be considered in any year is consistent. The criteria considered for capital projects are divided into a value score and a risk score, with the sum being the project score. The value score criteria encompass customer complaints, financial value, service quality, community image, regulatory and safety. The risk score criteria encompass the project consequences concerning financial, technical, socio-political, environmental, and legal. Although safety and regulatory compliance are prerequisites for all projects, the scoring of the criteria can vary depending on the current system requirements and the relative impact of each project. Judgment is required when operating under the current planning approach but, the decision-making process is expected to be enhanced with better access and support to system and asset data. The table below shows the scoring criteria and weighting.

Table 4-7: LUI Capital Investment Process Scoring Criteria

Value Score		Risk Score	
Criteria	**Weighting**	**Criteria**	**Weighting**
Service Quality	30%	Environmental Consequence	30%
Safety	30%	Technical Consequence	20%
Financial	10%	Socio-Political Consequence	20%
Community Image	10%	Legal Consequence	20%
Customer Complaints	10%	Financial Consequence	10%
Regulatory	10%	Total	100%
Total	100%		

The project scoring process is used to create an optimum portfolio of investments that provides the most value across the company's strategic objectives. It minimizes the company's risk profile given any combination of budget, value, risk, reliability, and/or mandatory investment constraints. The criteria/strategic objectives making up this strategic value framework are defined by the senior management staff of LUI and are aligned with the company's business strategies and mission. The criteria, which are detailed below, are suitably applied to the specifics of discretionary candidate capital projects and work to convert subjective (qualitative) issues into objective (quantitative) results to aid in project comparisons.

<u>Value Scoring</u>

Safety (Public and Employee): Public safety considers whether there is any impact on public safety or is the project very likely to reduce the risk of a public injury or damage over the next 10 years. Worker safety considers whether there is any impact on worker safety or is the project likely to reduce the risk of a worker injury in the next 10 years. Where the risk of safety is known, and the probability of occurrence and degree of harm are unacceptable, remedial action is taken and the investment is treated as non-discretionary.

Regulatory: Considers to what extent the project impacts on the regulatory requirements LUI is required to follow. How the project value relates to the OEB's requirements and to what extent the license or franchise may be affected.

Service Quality: Considers to what extent the project impacts the power system reliability and customer service. If it eliminates a sustained feeder outage, the economic benefit can be determined. If the reliability improvement is more global as with redundancy investments, then it is necessary to apply judgment to determine the value of the new assets to its distribution system and its customers.

Financial: Considers whether the project is a positive financial impact or return on investment. In each case, while financial return must be considered and appropriately managed as part of any project, financial return is not the only deciding factor.

Community Image: Considers whether the project is perceived as having value to the public, such as having a positive impact on the public, the immediate area, or an individual customer. In each case, while customer perception must be considered and appropriately managed as part of any project, perception is not the only deciding factor.

Customer Complaints: Considers whether completing the capital project or not completing the project would have an impact on customer complaints/issues. The criterion considers whether the project can disturb commercial customers or larger customers unfavourably.

<u>Risk Scoring</u>

Financial Consequence: Considers the impact of not completing the capital project on the cost of a future project. Additionally, the criterion considers if the project is delayed, can it negatively impact future costs.

Technical Consequence: Considers effects of not completing the project that could have on other capital projects.

Socio-Political Consequence: Considers both social and political factors. The risk considers demographic changes, trends in customer demands, etc. An example includes upgrading a line for a new generation activity.

Environmental Consequence: Considers both the likelihood and impact on the risk of an environmental incident (i.e., does the project reduce the risk of an environmental incident once every 10 years). The degree of harm, probability of occurrence and financial impact of deferred remediation is to be assessed under this criterion. It also considers the project's impact on Lakefront's environmental footprint. As a leader in conservation and energy efficiency, LUI must manage its corporate image in this area very carefully and set a high standard for its customers to encourage CDM, energy efficiency and renewable generation.

Legal Consequence: Considers both the likelihood and impact on the risk of litigation related to the project not being done.

In addition to the project scoring criteria, capital investment decisions are made on short-term requirements and long-term investment requirements including the current day evaluation of reliability, safety, risk, and priority. Factors such as the age of the existing plant, the condition of the plant as well as accommodation of future upgrades, especially in areas where 4.16 kV systems are being converted to 27.6 kV systems, are considered. In determining reliability priorities, LUI considers the following characteristics of its distribution system:

- Failure of one 27.6 kV feeder line interrupts approximately 10% of the total system load.
- Failure of one 4.16 kV feeder line interrupts approximately 4% of the total system load.
- Overhead lines take hours to repair while underground cables take days.

<u>Project Pace</u>

Project pace for System Access projects is generally determined by external schedules and needs. Although System Renewal, System Service and General Plant projects tend to be "lumpy" in nature and most are paced to begin and be completed within a particular budget year, LUI takes efforts to minimize the variance of the budget within a given fiscal year. These three investment types are paced with consideration of available resources and managing the program cost impacts on the customer's bill. Project pacing for each project is further explained in the respective project descriptions.

4.2.3 REG Investment Prioritization (5.4.1c)

LUI does not use a separate prioritization for REG investments. In addition, LUI assesses that the distribution system has sufficient capacity to accommodate foreseeable renewable generation connections within the period covered by the DSP. LUI's planning objective concerning renewable generation is to continue to facilitate the connection of renewable generation promptly consistent with the provisions of the DSC.

4.2.4 Non-Distribution System Alternatives to Relieving System Capacity (5.4.1d)

LUI does not have any specific policy or procedure related to utilizing non-distribution system alternatives for system capacity or operational constraint relief. LUI's activities in this area are delivered through LUI's CDM programs in accordance with the CDM requirement included in LUI's licence as issued by the OEB. In addition, LUI's CDM programs are consistent with the OEB policy and the OEB's CDM Guidelines of putting conservation first into distribution planning. The CDM programs are designed to reduce electricity consumption and draw from the grid upstream of the customer.

4.2.5 System Modernization (5.4.1e)

LUI plans to modernize its grid by replacing assets that no longer meet LUI's design standards with assets that can contribute to operational efficiencies where applicable such as automated switches and maintain the integrity of the system. Additionally, through renewal investments, LUI may investigate options and act where it can modernize its system to alleviate feeder capacity constraints in specific areas forecasted to experience growth beyond the DSP forecast period. Additionally, through the feeder voltage conversion activities, LUI considers options where it can modernize its system to provide additional visibility to its customers. For example, adding line sensors, automated switches, etc. However, system modernization depends on multiple factors and limits and is evaluated on a project-by-project basis.

4.2.6 Rate-Funded Activities to Defer Distribution Infrastructure (5.4.1f & 5.4.1.1)

As part of LUI's planned voltage conversion in parts of its distribution system, the projects support the reliability performance and operational efficiency as expected by customers as well as employees. Also, the voltage conversions reduce distribution system losses, mitigating the cost impact on customers.

4.3 Capital Expenditure Planning Summary (5.4.2)

The capital expenditure summary provides a snapshot of LUI's capital expenditures over the ten-year DSP window. For summary purposes, the entire costs of individual projects have been allocated to one of the four OEB investment categories based on the primary driver for the investment:

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

The categorization is derived from the capital expenditure planning process that prioritizes items based on whether they are discretionary or non-discretionary.

Table 4-8: Historical capital expenditures and system O&M

Category	Historical														
	2017			2018			2019			2020			2021		
	Plan	Act.	Var.	Plan	Act.	Var.	Plan	Act.	Var.	Plan	Act.	Var.	Plan	Act.*	Var.
	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		
System Access (*net*)	180	400	*122*	120	215	*79*	120	223	*86*	180	51	*-72*	200	100	*-50*
System Renewal (*net*)	1,220	1,620	*33*	1,420	480	*-66*	1,100	827	*-25*	970	591	*-39*	1,470	745	*-49*
System Service (*net*)	250	33	*-87*	75	40	*-47*	120	0	*-100*	50	1,109	*2118*	50	550	*1000*
General Plant (*net*)	120	105	*-13*	155	96	*-38*	430	71	*-83*	500	89	*-82*	200	168	*-16*
Total (*net*)	1,770	2,158	*22*	1,770	831	*-53*	1,770	1,121	*-37*	1,700	1,841	*8*	1,920	1,563	*-19*
System O&M	745	835	*12*	797	991	*24*	853	986	*16*	912	1,057	*16*	976	975	*0*

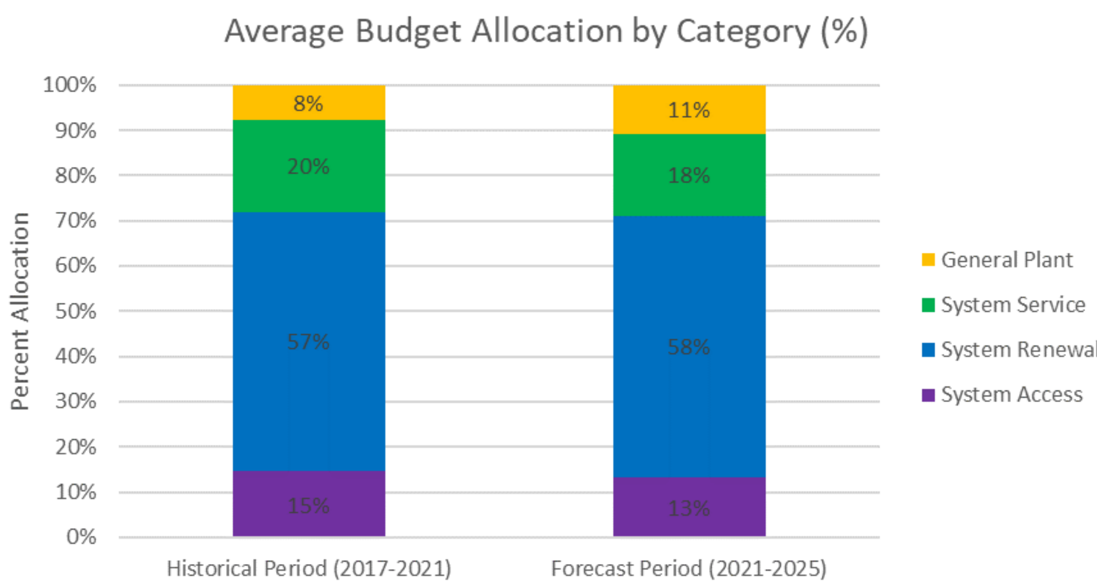
**Projected actual spend*

Table 4-9: Forecast capital expenditures and system O&M

Category	Forecast				
	2022	2023	2024	2025	2026
	$ '000	$ '000	$ '000	$ '000	$ '000
System Access (*net*)	75	318	244	330	336
System Renewal (*net*)	1,200	1,131	869	1,173	1,195
System Service (*net*)	525	315	242	327	333
General Plant (*net*)	60	131	574	135	138
Capital Contributions	100	0	0	0	0
Total (*net*)	1,860	1,894	1,929	1,965	2,002
System O&M	1,020	1,039	1,058	1,078	1,098

A comparison can be made of LUI's annual budget allocation between the historical period and the forecast period, shown in Figure 4-4. It is evident LUI wants to maintain forecast expenditures near the historical expenditures amongst all project categories while also improving its system where needed and appropriate without significant bill impacts to the customer. In addition, due to the uncertainty associated with System Access projects, if the budget does not get used within the planning year, LUI intends on diverting the funds to other needed investments where appropriate to achieving LUI's objectives in addition to meeting the customer's expectation of the system's performance.

Figure 4-4: Percent allocation of capital project categories



4.3.1 Variances in Capital Expenditures

Assessing and understanding the variances is an important step for LUI to promote continuous improvements in its estimation and budgeting process. Excluding projects identified as mandatory, LUI creates each project budget based on preliminary designs and historical costs for planning its programs annually. Once detailed designs are complete and ready to be issued for construction, the project estimate is revised to reflect any changes in the design. The revised estimate is used to track against the actual costs, which are reviewed monthly. Customer demand projects are budgeted using averages from previous years. These projects are mostly unplanned and tracked in real-time to balance the total annual budget with other discretionary projects (i.e. LUI may take action to reduce System Renewal projects to ensure the total annual actual expenditures remain in line with the total annual proposed budget). Likewise, if the actual budget of System Access projects is less than the forecasted budget, LUI may plan to allocate the budget to other System Access planning years or to other project categories where appropriate to maintain consistent annual expenditures.

The breakdown below is provided by each category for each year. Variances that exceed +/- 10% are explained and are in reference to Table 4-8. LUI is identifying in advance that some variances are significantly high in some years for a few categories. However, the overall actual spending in each year is less than the forecasted amount as means to control cost and minimize customer bill impacts while addressing the system needs and intended performance. Year-over-year variance explanations can be found in Exhibit 2.

System Access

System Access projects are customer-driven and are typically not planned. They are budgeted based on a rolling five-year historical average. System Access expenditures can be categorized into smaller categories such as road relocations, subdivision connections and primary and secondary service requests. No sub-category can be planned for with a high degree of accuracy. However, LUI attempts to minimize the variances with proactive engagements with developers, city departments and customers. LUI is often aware of future proposed subdivisions and road relation projects, but development can often be slow, and projects may remain in the preliminary stages for many years before implementation which is beyond LUI's control. In 2017, the high variance was attributed to LUI's decision to implement an outage management system. Furthermore, between 2017 and 2019, the variance was further contributed by the addition of meter replacement projects due to their seal expiring. In the years 2020 and 2021, there were fewer System Access related projects than forecasted.

System Renewal

<u>2017 Budget Variances (33%)</u>

Overall, System Renewal projects actual spending was lower than budgeted. Specific projects that contributed to the variance include:

- *Westwood Dr.* project was partially completed and partially deferred.
- *King St.* project cancelled/deferred at approximately $112K.
    - *John St / Spencer St E* substituted in place at approximately $65K.
    - *Division St - University to CP Rail* substituted in place at approximately $71K.
- *Durham St. Stn.* the project combined with *Durham St Stn. Viper Switches* project.
- *Victoria St Stn. Additional* project carried over from 2016 at approximately $300K.
- *Victoria St Stn. Primary Feeder* project carried over from 2016 at approximately $120K.

<u>2018 Budget Variances (-66%)</u>

Overall, the System Renewal projects actual spending was lower due to many projects being deferred to later years. Specific projects that contributed to the variance include:

- *Albert St.* project includes the addition of an SF6 pad mount switchgear from 2017.
- *44 kV System ROW Cobourg* project deferred to 2019/2020 by the Town of Cobourg at approximately $285K.
- *Glenwatford* renewal project deferred to 2020 at approximately $303K.
- *Rail Crossing* renewal project deferred to 2020 at approximately $58K.
- *Voltage Conversions* project deferred at approximately $194K.

<u>2019 Budget Variances (-25%)</u>

The System Renewal project's actual spend was lower than budgeted with many renewal projects being completed in 2019 including overhead rebuilds for Albert St. (Hibernia St. to Third St.), Albert St. (Bagot St. to Hibernia St.), University Avenue, and King St. (Cramahe).

Additionally, the System Renewal project's actual spend was lower than budgeted as well as a few projects being deferred to later years. Specific projects that contributed to the variance include:

- *King St.* project partial deferral at approximately $292K.
- *Victoria St*. renewal project deferred at approximately $157K.
- *Durham St.* renewal project deferred at approximately $132K.

<u>2020 Budget Variances (-39%)</u>

The *Pebble Beach* project was originally planned to be a System Renewal project, however, upon further analysis and planning, the project drivers shifted from renewal to a service category.

<u>2021 Budget Variances (-49%)</u>

The variance was attributed mostly to LUI's reallocation of projects between System Renewal and System Service. Specific projects that contributed to the variances in this year include:

- Victoria Street Station – Station Egress. The capital work corrects the current aerial trespass without easement on the next-door property. Further, the existing two-pole lines are being consolidated into one pole line and corrects a safety hazard where 44 kV circuits are currently constructed under 27.6 kV circuits. The capital work provides room for future planned feeder egress and the critical feeder circuits are being updated for reliability improvement.

- Victoria Street – Station to Ontario. The capital work includes the replacement of existing poles at end of life. Further, the existing two-pole lines are being consolidated into one pole line and correct a safety hazard where 44 kV circuits are currently constructed under 27.6 kV circuits.

System Service

<u>2017 Budget Variances (-87%)</u>

The System Service variance was significantly contributed by deferral of planned projects into later years. Additionally, a few planned projects were combined with another project for an increased cost and work efficiencies. These include:

- *Durham St Stn. Viper Switches* project combined with *Durham St Stn.* project at approximately $100K.
- *Durham St Stn. Feeder Cables* project cancelled at approximately $80K.
- *SF6 Pad mount Switchgear* project deferred to 2018 at approximately $135K.

<u>2018 Budget Variances (-47%)</u>

The System Service variance was significantly contributed by deferral of planned projects into later years. These include:

- *King St W* project deferred at approximately $66K.
- *William St* project deferred at approximately $66K.

<u>2019 Budget Variances (-100%)</u>

- *135 Chapel St.* project deferred to 2020 at approximately $55K.
- *OMS Implementation* project deferred at approximately $40K.

<u>2020 Budget Variances (2118%)</u>

- The completion of the *Pebble Beach* project had contributed to the variance of the system category. The project was the replacement of existing backyard constructed underground infrastructure which has reached its end of life, the requirement to reduce loading on Orr St. station for contingency, and the elimination of the Kerr St. substation. Additionally, all secondary services were required to be moved to the public ROW from the backyard.
- LUI had begun its voltage conversion work which was not in the original DSP forecast plan in its last submission. The bulk of this work had contributed to the variance in this year.

<u>2021 Budget Variances (1000%)</u>

- LUI continued its voltage conversion work which was not in the original DSP forecast plan in its last submission. The bulk of this work had contributed to the variance in this year.

General Plant

<u>2017 Budget Variances (-13%)</u>

The variance was mostly attributed to lower costs than originally budgeted.

<u>2018 Budget Variances (-38%)</u>

- The vehicle Replacement project was deferred.

2019 Budget Variances (-83%)

- The vehicle Replacement project was deferred.

2020 Budget Variances (-82%)

- The vehicle Replacement project was deferred.

2021 Budget Variances (-16%)

The variance was mostly attributed to lower costs than originally budgeted.

4.4 JUSTIFYING CAPITAL EXPENDITURES

4.4.1 Overall Plan (5.4.3.1)

LUI has previously stated its objective is to meet all regulated requirements and manage its assets in a manner that minimizes the cost to LUI customers and ratepayers. LUI delivers value to customers by controlling costs concerning its proposed investments through appropriate optimization prioritization and pacing of capital-related expenditures.

With this objective in mind, LUI has been carefully examining and monitoring its distribution system through the historical period in addition to understanding industry trends and practices to identify appropriate technologies and opportunities for integration. Based on the condition assessments that have been performed, it is evident that LUI's asset base is ageing and requires maintenance, refurbishment and potentially replacement of assets in a timely, planned, and controlled manner. Although LUI can extend the life of its in-service assets, this does not preclude it from having a plan and performing asset maintenance to maintain the high level of reliability demanded by its customers.

Continuing to operate and maintain the existing system indefinitely would mean a progressively more expensive maintenance program with increasing difficulty in finding parts with the risk of failing equipment due to age and service life.

Continuing without a planned and controlled maintenance program could result in diminished reliability standards and progressively more incidents resulting in potential hazards to both staff and the public. Operating the system without performing maintenance would result in an inability to meet customer needs and expectations.

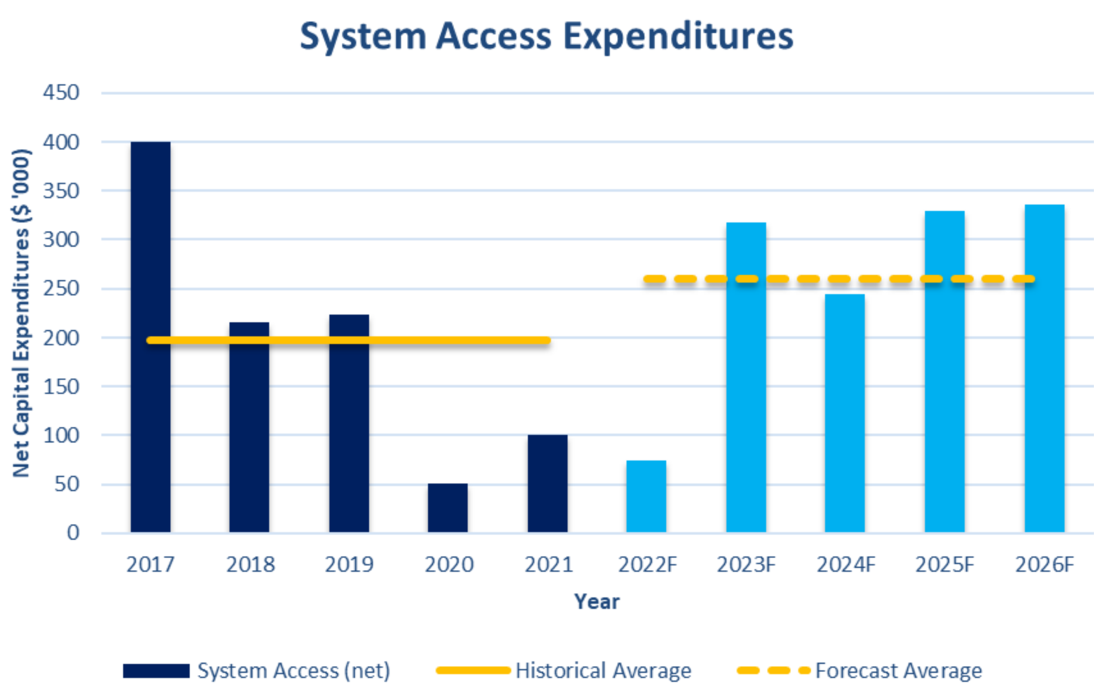
The alternative to this is the path chosen by LUI which is currently being implemented and involves the measured, strategic, and planned upgrade, replacement, and refurbishment of the electrical distribution system. As a prudent utility, LUI has realized the costs of this action would be prohibitive if considered in a single year. Consequently, LUI has developed its current plan to maintain customer-driven reliability while eliminating lumpy investments and volatile rate impacts. Pursuing this path through the forecast period and beyond can ultimately reduce overall operating and maintenance costs by eliminating the 4.16 kV MS's and simultaneously enabling the system capacity to accept distributed generation and additional load. For LUI to convert its existing 4.16 kV system to 27.6 kV, it must first develop infrastructure in the conversion area and a plan for the load transfer. This piecewise conversion to 27.6 kV will result in lower line losses due to the higher operating voltage, operations and maintenance saving due to the elimination of 4.16 kV substations, enhanced public safety through the relocation of utility plant from backyards to public rights of way and the satisfaction of customer expectation for a system with high-reliability standards.

4.4.1.1 Comparative Expenditures by Category over the Historical Period

System Access

The historical trend with System Access was significantly variable year over year due to customer connection service requests and metering upgrades. As shown in Figure 4-5, the forecast average is 32% more than the historical average. This allows for LUI to have adequate resources and funds in place to accommodate potential future connections and projects that are deemed mandatory. However, these projects are difficult to forecast with high accuracy and may still change as these are dependent on developers and city plans.

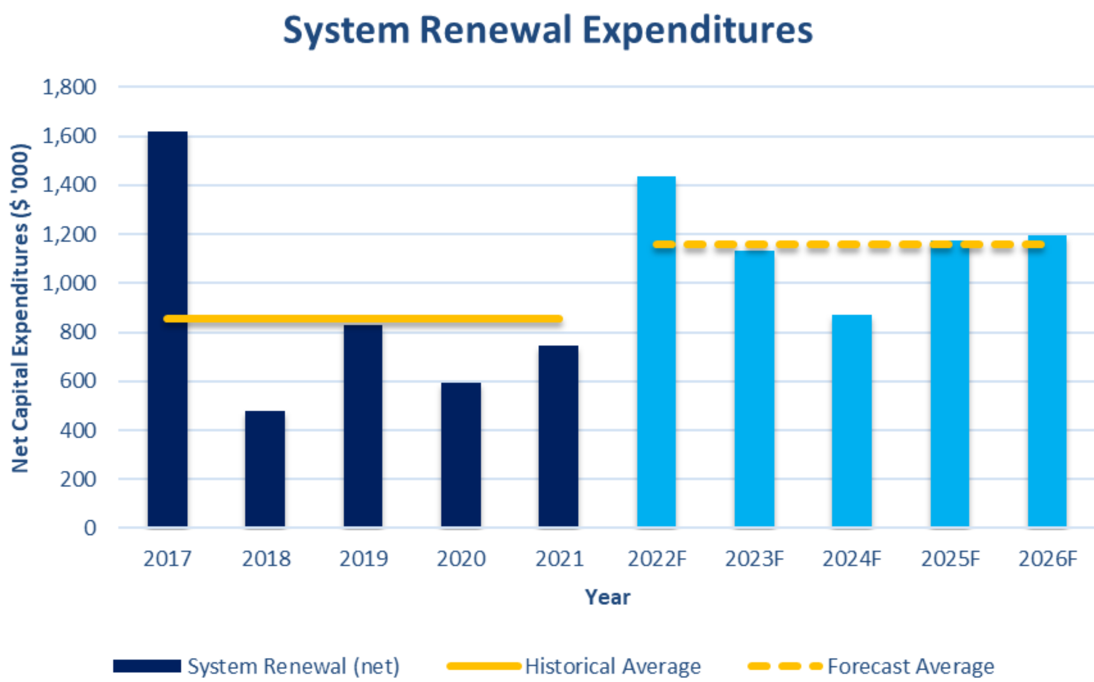
Figure 4-5: System Access comparative expenditures



System Renewal

Expenditures for System Renewal were occasionally shifted to accommodate additional priority investments for the system to meet the expected performance by LUI's customers. This had resulted in a small backlog of renewal investments that LUI is planning to address in the upcoming forecast period. As shown in Figure 4-6, the forecast average is 31% more than the historical average. LUI intends on having a more constant level of spending on renewal projects to manage the system's health and performance. Should additional funds be remaining from System Access due to fewer customer service requests than planned for, LUI intends to re-allocate funds into renewal projects to address additional at-risk assets.

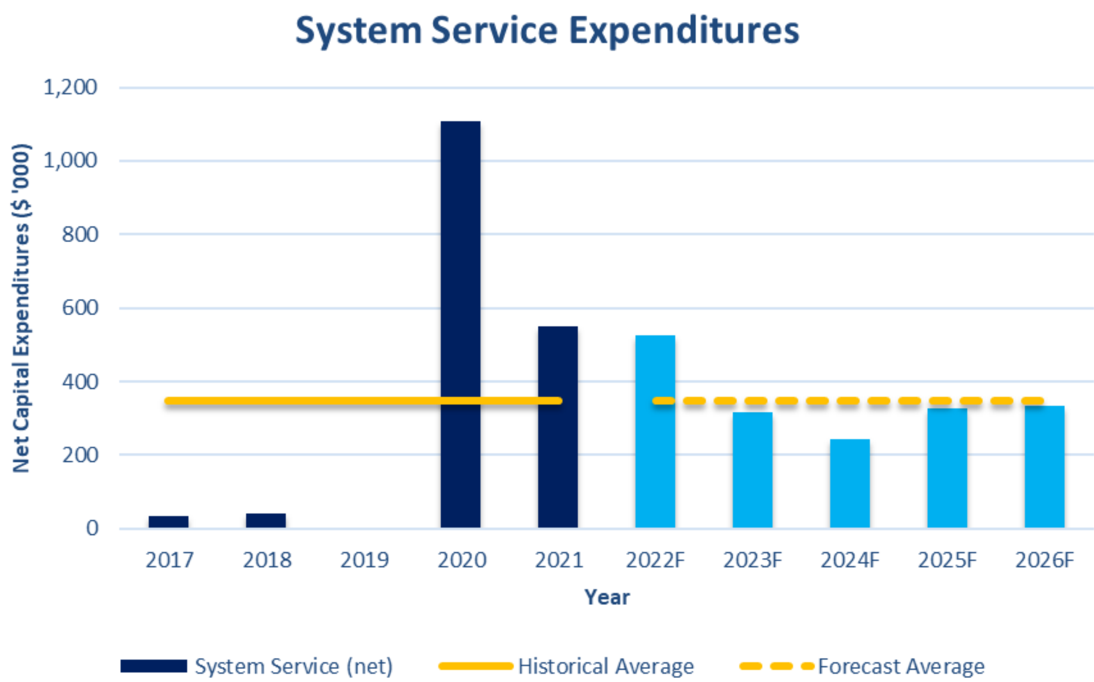
Figure 4-6: System Renewal comparative expenditures



<u>System Service</u>

As shown in Figure 4-7, the forecast average is 1% more than the historical average. This is largely due to the ongoing voltage conversion efforts undertaken at LUI continuing into 2022 and 2023. LUI is currently not planning for the installation of additional automation capabilities into the current system.

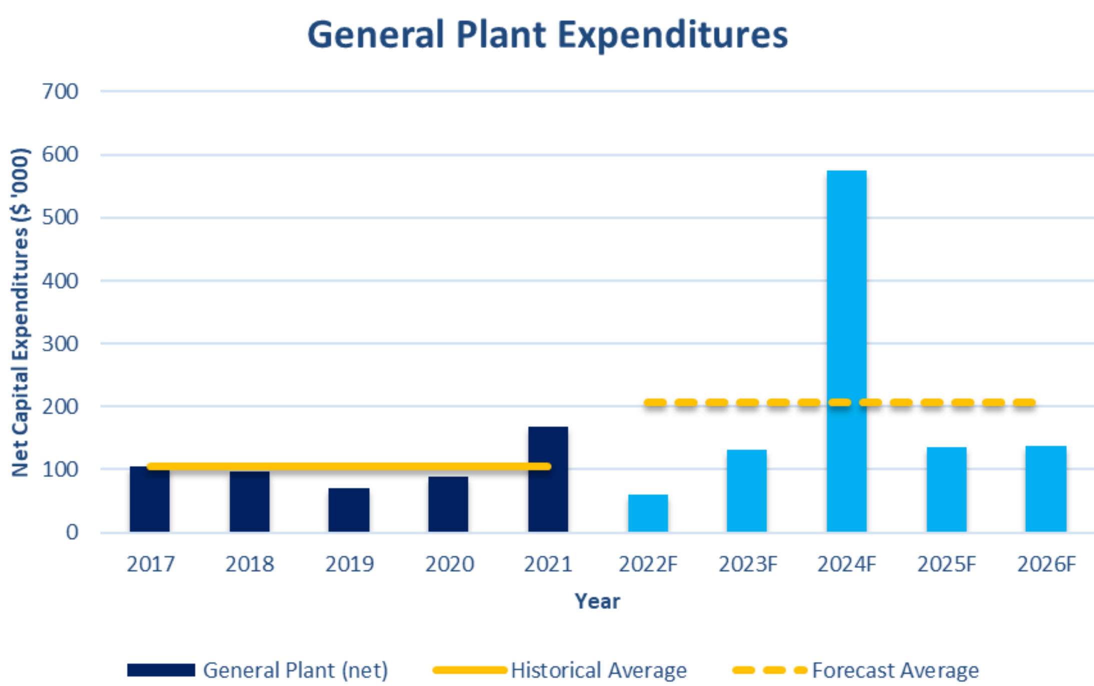
Figure 4-7: System Service comparative expenditures



General Plant

As shown in Figure 4-8, the forecast average is 96% more than the historical average. The historical expenditures had minimal spending in the General Plant category, addressing only critical items that were needed to maintain and continue operations at LUI. LUI continues to use the same framework moving forward to address only the critical issues needed to maintain the existing facilities, fleet, and IT assets. In the current forecast period, this includes the replacement of a bucket truck in which is needed to continue operations and execute LUI's planned projects. Removing the investment of replacing the bucket truck, the forecast average is only 13% more than the historical average which is a minor increase to the account of depreciating assets.

Figure 4-8: General Plant comparative expenditures



4.4.1.2 Forecast Impact of System Investment on System O&M Costs

System investments can result in:

- the addition of incremental plant (e.g. new poles, switchgear, transformers, etc.);
- the relocation/replacement of existing plant (e.g. Cobourg Downtown Revitalization);
- the replacement of the end-of-life plant with the new plant (e.g. cables, poles, transformers, etc.)
- new/replacement system support expenditures (e.g. fleet, software, etc.)

In general, incremental plant additions (e.g. new DS c/w transformer, switchgear, land, etc.) will be integrated into the asset management system and will require incremental resources for ongoing O&M purposes. This is expected to put upward pressure on O&M costs.

Relocation/replacement of an 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 periodically as required per the DSC). There may be some slight life advantages when a working older piece of equipment is replaced with a newer one that would impact O&M repair-related charges. Overall, the planned system investments in this category are expected to put neutral pressure on O&M costs.

Replacement of end-of-life plant with the 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 the 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, a new primary cable installed in the duct replaces direct buried primary cable and is expected to provide higher reliability. This will shift response activity for a cable failure from repair (O&M) to replacement (capital). If assets approaching the 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 in 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.

System support expenditures (e.g. GIS, Asset Condition Assessment studies) are expected to provide a better overall understanding of LUI's assets that can lead to a more efficient and optimized design, maintenance and investment activities going forward. Asset Condition Assessment studies have been conducted and data gaps have been identified. To improve the quality of data used in the ACA studies, increased data collection efforts may be implemented which can increase pressure on O&M costs. Collected data will be inputted into the GIS as attribute information for each piece of plant. Improved asset information can allow existing resources to partially compensate for growth related increases in O&M activities. Fleet replacement expenditures result in reduced O&M for new units however this will be offset by increasing O&M of remaining units as they get older. Overall, the system investments are not expected to have a significant impact on total O&M costs in the forecast period.

4.4.1.3 Investment Drivers by Category

System Access

System Access investments include the following drivers:

- Customer service requests - continued development of the Town of Cobourg requiring new customer connections (site redevelopment; subdivisions).

System Renewal

System Renewal investments include the following drivers:

- Failure risk - multiyear planned cable and pole replacement programs that address assets in "very poor" and "poor" condition. The historical trend has seen increasing investments due to ageing infrastructure.
- Emergency needs - emergency reactive replacement of distribution system assets (poles, transformers, switches, switchgear, cable, conductor, insulators, guys, anchors, etc.) due to unanticipated failure, storms, motor vehicle accidents, vandalism, etc.

System Service

System Service investments include the following drivers:

- System constraints – voltage conversion, line extensions and feeder interconnections to accommodate grid load growth and modernization of the system.
- System operational objectives – investments to maintain system reliability and efficiency of distribution stations.

General Plant

General Plant investments include the following drivers:

- System Maintenance support – replacement of rolling stock, tools and replacing fleet units. Historical investments have resulted in specific rolling stock and tool replacement as required. Replacement of major fleet units tends to be a high lumpy cost in a particular investment year when compared to the replacement costs of small fleet units.
- Business Operations efficiency – GIS development, data collection efforts and computer upgrades to support daily operations and to better understand and analyze the system needs.

4.4.2 Material Investments (5.4.3.2)

The focus of this section is on projects/activities that meet the materiality threshold set out in Chapter 2 of the Filing Requirements.

Category	Project Name	Estimated Cost
System Access	New Services	$45,000
	Seal Expiry Meter Replacement	$30,000
System Renewal	Elgin St. – Birchwood to Chipping Park	$260,000
	Parliament St. – 25 Parliament to 89 Parliament	$150,000
	ROW 44/27.6kV – Pole 73 to Burnham St.	$240,000
	Kerr St. ROW – Victoria Station to Division St.	$195,000
	Victoria St. – Victoria Station to King St.	$160,000
	Underground Miscellaneous	$45,000
	Overhead Miscellaneous	$45,000
	Pole Replacements	$50,000
System Service	Brook F5 Feeder/Kerr St. ROW Pole Line	$380,000
	Buck St. – 28kV Conversion	$35,000
	Covert St. and King St. Backyard – 28kV Conversion	$110,000
General Plant	Tools	$10,000
	Facilities - Buildings	$10,000
	IT Hardware & Software Upgrades	$40,000
Total		**$1,805,000**

APPENDIX C – CAPITALIZATION POLICY

Capitalization Policy Overview

Lakefront Utilities Inc.'s current capitalization policies and principles are based on IFRS and guidelines set about by the Ontario Energy Board, where applicable. LUI converted to IFRS January 1, 2015 and as such the capitalization policy in effect for the 2016 Bridge Year and 2017 Test Year is compliant with MIFRS.

LUI reviewed its capitalization policy in anticipation of transitioning to IFRS; componentization of assets, depreciation changes and overheads were the focus of the review in light of the July 17, 2012 Board letter indicating that changes to depreciation expense and capitalization policies were required in 2013. Lakefront Utilities confirms that the changes to its capitalization policy are consistent with the Board's regulatory accounting policies as set out for MIFRS as contained in the *Report of the Board, Transition to International Financial Reporting Standards*, EB-2008-0408, the Kinetrics Report dated July 8, 2010, and the APH, effective January 1, 2013.

PP&E includes expenditures that are directly attributable to the acquisition of the asset. The cost of self-constructed assets includes the cost of materials, direct labour and other costs directly attributable to bringing the asset to a working condition of its intended use.

Assets with a cost in excess of $2,000 and expected to provide future economic benefit greater than one year will be capitalized. Expenditures that create a physical betterment or improvement of an asset will be capitalized.

Guidelines for Capitalization

Capital assets include property, plant, and equipment that are held for use in the production or supply of goods and services and provide a benefit lasting beyond one year. Capital expenditures also include the improvement or "betterment" of existing assets. Intangible assets are also considered capital asset's and are defined as assets that lack physical substance.

Betterment

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

Capitalization by Component

When parts or components of an item of property, plant, and equipment have different useful lives, they are accounted for as individual items (major components) of property, plant, and equipment. Component costs must be significant in relation to the total cost of the item and depreciated separately over the component's useful life. Components are those which:

a) are significant in relation to the total cost of the item; and

b) have different depreciation methods or useful life.

Components with similar useful lives and depreciation methods are grouped in determining the depreciation charge. Parts of the item that are not individually significant (remainder of the items) are combined and categorized as a single component best suited for the sum of the parts.

LUI's capital assets, and their designated useful life, are categorized in Table 2.17.

Table 2.17: Assets Designated Service Life

USoA Account Number	Description	Useful Life
1611	Computer Software (Formally known as Account 1925)	5.00
1808	Building	50.00
1820	Distribution Station Equipment <50kV	45.00
1830	Poles, Towers & Fixtures	45.00
1835	Overhead Conductors & Devices	55.00
1840	Conduit	50.00
1845	Underground Conductors & Devices	35.00
1850	Line Transformers	35.00
1855	Services (Overhead & Underground)	55.00
1860	Meters	25.00
1860	Meters (Smart Meters)	15.00
1915	Office Furniture & Equipment	10.00
1920	Computer Equipment - Hardware	5.00
1930	Transportation Equipment - cars	5.00
1930	Transportation Equipment - trucks	8.00
1940	Tools, Shop & Garage Equipment	10.00
1945	Measurement & Testing Equipment	10.00
1960	Miscellaneous Equipment	10.00
1980	System Supervisory Equipment	20.00
1995	Contributions & Grants	25.00

Customer Contribution changes

LUI recorded customer contributions as an offset to the Cost of Capital Assets and amortized accordingly. Under MIFRS, LUI cannot capitalize these customer contributions as part of its net capital assets, but instead will classify the contributions as a liability under deferred revenue and amortize the costs to revenue over the life of the asset the contribution relates to. For financial reporting purposes, LUI has classified forecasted Customer Contributions for the 2016 Bridge Year and 2017 Test Year as deferred revenue and amortized the contribution to revenue over the life of the related asset. For rate setting purposes, these costs are included as an offset to rate base and the related amortized revenue as an offset to depreciation expense. Historical contributed capital costs are included in account 1995 and forecasted contributed capital costs are included in account 2440, however, both are included in the fixed asset continuity schedules and within the rate base calculation.

Depreciation

Depreciation is recognized on a straight-line basis over the estimated useful life of each significant identifiable component of an item of property, plant, and equipment. Land and land rights are not depreciated. Construction in progress assets are not depreciated until the project is complete and in service.

Lakefront Utilities has used the principles in the Kinectrics Report as its basis for determining the estimated service life of assets. 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. For rate setting purposes, in the first year of service, deprecation is calculated using the half-year rule in accordance with the Board's Filing requirements. Depreciation of an asset ceases when the asset is retired from active use, sold or is fully depreciated.

Overhead Policy

LUI has reviewed its overhead policy, including the capitalization component, to follow a more direct allocation of costs. LUI does not capitalize general administrative costs related to Administration or Finance.