Exhibit 2:

Rate Base

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2.1 Rate Base

2.1.1 Overview

The following Exhibit provides details and analysis of Rate Base forecast for ENWIN Utilities Ltd. ("ENWIN").

ENWIN has prepared its Rate Base for the purpose of calculating the revenue requirement in this Application following Chapter 2 of the Filing Requirements for Electricity Distribution Rate Applications - 2018 Edition for 2019 Rate Applications issued on July 12, 2018 ("Filing Requirement"). In accordance with the Filing Requirements, ENWIN has calculated the rate base as an average of the net capital balances at the beginning and the end of the 2020 Test Year, plus a working capital allowance, which is 7.5% of the sum of the cost of power and controllable expenses. The use of a 7.5% rate is consistent with the Board's letter of June 3, 2015 and the Filing Requirements as issued by the OEB. ENWIN has not completed a lead-lag study or equivalent analysis to support a different rate and has submitted this application using the default value of 7.5%.

The net fixed assets include those distribution assets that are associated with the delivery of electricity to the inhabitants of the City of Windsor. ENWIN's rate base calculation excludes work-in-progress as well as inventory held for capital projects. Controllable expenses used in the calculation of working capital allowance include operations and maintenance, billing and collections, community relations, eligible donations and administration expenses.

ENWIN adopted International Financial Reporting Standards ("IFRS") effective January 1, 2012 and has prepared this Application in accordance with the requirements of the OEB for regulatory accounting, reporting and filing. Such requirements include certain modified accounting treatments for regulated utilities reporting under IFRS as specified by the OEB in its *Report of the Board: Transition to International Financial Reporting Standards* dated July 28, 2009 ("IFRS Report"). Specifically, the OEB requires modified IFRS ("MIFRS") filings and reporting requirements for utilities that have adopted IFRS. ENWIN has incorporated the MIFRS requirement specified in the IFRS Report within the accounting and reporting components of the Application.

For financial reporting purposes, the OEB requires distributors adopting IFRS to present one year of comparative information in its first IFRS financial statements. The comparative year for ENWIN is 2011.

ENWIN has provided its rate base continuity schedule as follows: 2009 Board Approved (CGAAP); 2009 Actual (CGAAP); 2010 Actual (CGAAP); 2011 Actual (CGAAP); 2011 Actual restated to MIFRS; 2012 Actual (MIFRS); 2013 Actual (MIFRS); 2014 Actual (MIFRS); 2015 Actual (MIFRS); 2016 Actual (MIFRS), 2017 Actual (MIFRS); 2018 Forecast (MIFRS); 2019 Bridge Year (MIFRS); 2020 Test Year (MIFRS) in Table 2-1 below.

Line No.	Description	2009 Board Approved	2009 Actual	2010 Actual	2011 Actual	2011 Actual	2012 Actual	2013 Actual
1	Accounting Standard	CGAAP	CGAAP	CGAAP	CGAAP	MIFRS	MIFRS	MIFRS
2	Gross Fixed Assets	$ 287,510,899	$ 279,715,738	$ 296,741,352	$ 307,119,413	$ 189,556,682	$ 201,149,553	$ 210,781,135
3	Accumulated Depreciation	-$ 112,565,204	-$ 110,625,593	-$ 117,445,651	-$ 130,864,724	-$ 9,919,958	-$ 18,448,348	-$ 27,357,937
4	Net Book Value	$ 174,945,695	$ 169,090,145	$ 179,295,701	$ 176,254,689	$ 179,636,724	$ 182,701,204	$ 183,423,198
5	**Average Net Book Value**	**$ 171,628,658**	**$ 169,758,598**	**$ 174,192,923**	**$ 177,775,195**	**$ 179,466,212**	**$ 181,168,964**	**$ 183,062,201**
6	Total Working Capital	$ 187,845,977	$ 181,791,517	$ 212,867,302	$ 214,360,712	$ 227,382,946	$ 240,405,180	$ 243,806,751
7	Working Capital Allowance Factor	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
8	**Working Capital Allowance**	**$ 28,176,897**	**$ 27,268,728**	**$ 31,930,095**	**$ 32,154,107**	**$ 34,107,442**	**$ 36,060,777**	**$ 36,571,013**
9	**Rate Base**	**$ 199,805,554**	**$ 197,027,325**	**$ 206,123,018**	**$ 209,929,301**	**$ 213,573,654**	**$ 217,229,741**	**$ 219,633,214**

Line No.	Description	2014 Actual	2015 Actual	2016 Actual	2017 Actual	2018 Forecast	2019 Bridge Year	2020 Test Year
1	Accounting Standard	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS
2	Gross Fixed Assets	$ 244,555,564	$ 262,227,260	$ 278,561,538	$ 291,774,606	$ 306,298,963	$ 327,380,001	$ 346,126,500
3	Accumulated Depreciation	-$ 40,712,899	-$ 52,449,682	-$ 64,817,955	-$ 77,965,436	-$ 91,726,235	-$ 104,505,526	-$ 116,054,661
4	Net Book Value	$ 203,842,665	$ 209,777,578	$ 213,743,584	$ 213,809,170	$ 214,572,728	$ 222,874,475	$ 230,071,840
5	**Average Net Book Value**	**$ 193,632,932**	**$ 206,810,122**	**$ 211,760,581**	**$ 213,776,377**	**$ 214,190,949**	**$ 218,723,602**	**$ 226,473,157**
6	Total Working Capital	$ 263,069,519	$ 271,778,739	$ 308,610,220	$ 277,994,129	$ 276,629,949	$ 292,392,975	$ 286,657,938
7	Working Capital Allowance Factor	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	7.5%
8	**Working Capital Allowance**	**$ 39,460,428**	**$ 40,766,811**	**$ 46,291,533**	**$ 41,699,119**	**$ 41,494,492**	**$ 43,858,946**	**$ 21,499,345**
9	**Rate Base**	**$ 233,093,360**	**$ 247,576,933**	**$ 258,052,114**	**$ 255,475,496**	**$ 255,685,442**	**$ 262,582,548**	**$ 247,972,502**

TABLE 2-1: Rate Base Continuity Schedule

ENWIN's assets fall into two broad categories - The first is distribution plant, which includes assets such as distribution, substation buildings, poles, conductor, overhead and underground electricity distribution infrastructure, transformers, meters and substation equipment. The second is general plant which includes assets such as the operations/service center buildings, office furniture, transportation equipment, communications technology, computer equipment and software, general equipment and tools.

2.1.2 Fixed Asset Continuity Statements

ENWIN has completed the Fixed Asset Continuity Schedules (Board Appendix 2-BA) for the Historical Actuals for 2009 through 2017, the Forecast for 2018, the 2019 Bridge Year and the 2020 Test Year.

These schedules are provided in Attachment 2-B of this Exhibit and have also been filed in live excel format.

The above continuity schedules reconcile to the annual recorded depreciation expense. Table 2-2 below reconciles between annual change in accumulated depreciation and depreciation expense. The most significant reconciling item is the depreciation expensed through the Management Services Agreement (MSA). This represents the amount charged to affiliates for a share of depreciation on shared assets, such as the buildings and computer software, such as the SAP ERP system and the NorthStar CIS system. ENWIN's arrangements with these affiliates are subject to the Ontario Energy Board's Affiliate Relationships Code (the "ARC"), which is a code prescribed by and issued pursuant to the Ontario Energy Board Act, 1998. This is discussed in further detail in section 3.4.4 of Exhibit 3 and section 4.5 of Exhibit 4.

Line No.	Depreciation Expense	2009 Actual CGAAP	2010 Actual CGAAP	2011 Actual CGAAP	2012 Actual MIFRS	2013 Actual MIFRS	2014 Actual MIFRS
1	Accumulated Depreciation Closing	110,625,593	117,445,651	130,864,724	18,448,348	27,357,937	40,712,899
2	Accumulated Depreciation Opening	99,331,879	110,625,593	117,445,651	9,919,958	18,448,348	27,357,937
3	Change in Accumulated Depreciation	11,293,714	6,820,058	13,419,073	8,528,390	8,909,589	13,354,962
4							
5	Add Back Disposals	392,471	6,906,609	1,264,155	50,636	55,582	66,933
6	Add Back Deferred Revenue	-	-	-	24,118	60,605	96,070
7	Less Depreciation Expensed through MSA	- 639,424	- 1,476,592	- 1,938,658	- 1,362,179	- 1,338,753	- 1,819,475
8							
9	Depreciation Expense	11,046,761	12,250,076	12,744,570	7,240,966	7,687,023	11,698,490

Line No.	Depreciation Expense	2015 Actual MIFRS	2016 Actual MIFRS	2017 Actual MIFRS	2018 Forecast MIFRS	2019 Bridge MIFRS	2020 Test MIFRS
1	Accumulated Depreciation Closing	52,449,682	64,817,955	77,965,436	91,726,235	104,505,526	116,054,661
2	Accumulated Depreciation Opening	40,712,899	52,449,682	64,817,955	77,965,436	91,726,235	104,505,526
3	Change in Accumulated Depreciation	11,736,783	12,368,273	13,147,482	13,760,799	12,779,291	11,549,135
4							
5	Add Back Disposals	178,090	104,686	152,628	-	-	487,374
6	Add Back Deferred Revenue	221,142	273,286	321,333	366,000	423,835	512,060
7	Less Depreciation Expensed through MSA	- 1,925,482	- 2,008,475	- 2,093,279	- 2,129,038	- 1,655,522	- 1,236,897
8							
9	Depreciation Expense	10,210,532	10,737,770	11,528,163	11,997,760	11,547,604	11,311,672

TABLE 2-2: Depreciation Continuity Schedule

2.1.3 Rate Base Variance Analysis

ENWIN has prepared the following table to illustrate the rate base variances for each required comparator. The overall changes in rate base can be attributed to either Gross Assets or Working Capital Allowance. For detailed variance explanations of these, please see Section 2.2.2 and Section 2.3 respectively.

Line No.	Description	2009 Board Approved	2009 Actual	2010 Actual	2011 Actual	2011 Restated	2012 Actual	2013 Actual
1	Accounting Standard	CGAAP	CGAAP	CGAAP	CGAAP	MIFRS	MIFRS	MIFRS
2	Gross Fixed Assets	$ 287,510,899	$ 279,715,738	$ 296,741,352	$ 307,119,413	$ 189,556,682	$ 201,149,553	$ 210,781,135
3	Accumulated Depreciation	-$ 112,565,204	-$ 110,625,593	-$ 117,445,651	-$ 130,864,724	-$ 9,919,958	-$ 18,448,348	-$ 27,357,937
4	Net Book Value	$ 174,945,695	$ 169,090,145	$ 179,295,701	$ 176,254,689	$ 179,636,724	$ 182,701,204	$ 183,423,198
5	**Average Net Book Value**	**$ 171,628,658**	**$ 169,758,598**	**$ 174,192,923**	**$ 177,775,195**	**$ 179,466,212**	**$ 181,168,964**	**$ 183,062,201**
6	Total Working Capital	$ 187,845,977	$ 181,791,517	$ 212,867,302	$ 214,360,712	$ 227,382,946	$ 240,405,180	$ 243,806,751
7	Working Capital Allowance Factor	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
8	**Working Capital Allowance**	**$ 28,176,896.6**	**$ 27,268,728**	**$ 31,930,095**	**$ 32,154,107**	**$ 34,107,442**	**$ 36,060,777**	**$ 36,571,013**
9	**Rate Base**	**$ 199,805,554**	**$ 197,027,325**	**$ 206,123,018**	**$ 209,929,301**	**$ 213,573,654**	**$ 217,229,741**	**$ 219,633,214**
10			**2009 Board Approved vs. 2009 Actual**	**2009 Actual vs. 2010 Actual**	**2010 Actual vs. 2011 Actual**	**2011 Actual vs. 2011 Restated**	**2011 Actual vs. 2012 Actual**	**2012 Actual vs. 2013 Actual**
11	Accounting Standard		CGAAP	CGAAP	CGAAP	MIFRS	MIFRS	MIFRS
12	Gross Fixed Assets		-$ 7,795,161	$ 17,025,614	$ 10,378,061	-$ 117,562,731	$ 11,592,871	$ 9,631,583
13	Accumulated Depreciation		$ 1,939,611	-$ 6,820,058	-$ 13,419,073	$ 120,944,766	-$ 8,528,390	-$ 8,909,589
14	Net Book Value		-$ 5,855,550	$ 10,205,556	-$ 3,041,012	$ 3,382,035	$ 3,064,480	$ 721,994
15	**Average Net Book Value**		**-$ 1,870,060**	**$ 4,434,325**	**$ 3,582,272**	**$ 1,691,018**	**$ 1,702,752**	**$ 1,893,237**
16	Total Working Capital		-$ 6,054,460	$ 31,075,785	$ 1,493,410	$ 13,022,234	$ 13,022,234	$ 3,401,571
17	Working Capital Allowance Factor		15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
18	**Working Capital Allowance**		**-$ 908,169.0**	**$ 4,661,368**	**$ 224,011**	**$ 1,953,335**	**$ 1,953,335**	**$ 510,236**
19	**Rate Base**		**-$ 2,778,229**	**$ 9,095,693**	**$ 3,806,283**	**$ 3,644,353**	**$ 3,656,087**	**$ 2,403,473**

Line No.	Description	2014 Actual	2015 Actual	2016 Actual	2017 Actual	2018 Forecast	2019 Bridge Year	2020 Test Year
1	Accounting Standard	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS
2	Gross Fixed Assets	$ 244,555,564	$ 262,227,260	$ 278,561,538	$ 291,774,606	$ 306,298,963	$ 327,380,001	$ 346,126,500
3	Accumulated Depreciation	-$ 40,712,899	-$ 52,449,682	-$ 64,817,955	-$ 77,965,436	-$ 91,726,235	-$ 104,505,526	-$ 116,054,661
4	Net Book Value	$ 203,842,665	$ 209,777,578	$ 213,743,584	$ 213,809,170	$ 214,572,728	$ 222,874,475	$ 230,071,840
5	**Average Net Book Value**	**$ 193,632,932**	**$ 206,810,122**	**$ 211,760,581**	**$ 213,776,377**	**$ 214,190,949**	**$ 218,723,602**	**$ 226,473,157**
6	Total Working Capital	$ 263,069,519	$ 271,778,739	$ 308,610,220	$ 277,994,129	$ 276,629,949	$ 292,392,975	$ 286,657,938
7	Working Capital Allowance Factor	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	7.5%
8	**Working Capital Allowance**	**$ 39,460,428**	**$ 40,766,811**	**$ 46,291,533**	**$ 41,699,119**	**$ 41,494,492**	**$ 43,858,946**	**$ 21,499,345**
9	**Rate Base**	**$ 233,093,360**	**$ 247,576,933**	**$ 258,052,114**	**$ 255,475,496**	**$ 255,685,442**	**$ 262,582,548**	**$ 247,972,502**
10		**2013 Actual vs. 2014 Actual**	**2014 Actual vs. 2015 Actual**	**2015 Actual vs. 2016 Actual**	**2016 Actual vs. 2017 Actual**	**2017 Actual vs. 2018 Forecast**	**2018 Forecast vs. 2019 Bridge Year**	**2019 Bridge Year vs. 2020 Test Year**
11	Accounting Standard	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS
12	Gross Fixed Assets	$ 33,774,429	$ 17,671,696	$ 16,334,278	$ 13,213,068	$ 14,524,357	$ 21,081,038	$ 18,746,499
13	Accumulated Depreciation	-$ 13,354,962	-$ 11,736,783	-$ 12,368,273	-$ 13,147,482	-$ 13,760,799	-$ 12,779,291	-$ 11,549,135
14	Net Book Value	$ 20,419,467	$ 5,934,913	$ 3,966,005	$ 65,586	$ 763,559	$ 8,301,747	$ 7,197,364
15	**Average Net Book Value**	**$ 10,570,730**	**$ 13,177,190**	**$ 4,950,459**	**$ 2,015,796**	**$ 414,572**	**$ 4,532,653**	**$ 7,749,556**
16	Total Working Capital	$ 19,262,769	$ 8,709,220	$ 36,831,481	-$ 30,616,091	-$ 1,364,180	$ 15,763,026	-$ 5,735,037
17	Working Capital Allowance Factor	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	7.5%
18	**Working Capital Allowance**	**$ 2,889,415**	**$ 1,306,383**	**$ 5,524,722**	**-$ 4,592,414**	**-$ 204,627**	**$ 2,364,454**	**-$ 430,128**
19	**Rate Base**	**$ 13,460,146**	**$ 14,483,573**	**$ 10,475,181**	**-$ 2,576,618**	**$ 209,945**	**$ 6,897,107**	**$ 7,319,428**

TABLE 2-3: Rate Base Variance Summary

2.2 Gross Assets – Property, Plant & Equipment and Depreciation

2.2.1 Breakdown by Function

ENWIN categorizes assets into four categories; distribution plant, general plant, contributions and grants and intangible assets. In accordance with the Uniform System of Accounts ("USoA"), ENWIN has included gross assets as follows:

- Intangible Plant Assets – includes USoA accounts 1611 to 1612, these accounts capture assets such as software.
- Distribution Plant Assets – includes USoA accounts 1805 to 1860, these accounts capture assets such as transformer station equipment, poles, wires, transformers and meters.
- General Plant Assets – includes USoA accounts 1905 to 1990, these accounts capture assets such as operation service center buildings, computer hardware, transportation equipment and tools.
- Contribution and Grants – includes USoA accounts 1995 and 2440, these accounts capture all contributions in aid of capital that ENWIN has received or forecasted to be received per the Distribution System Code.

Detailed breakdown by major plant accounts is included in the variance analysis on gross assets in Section 2.2.2 below.

2.2.2 Variance Analysis on Gross Asset Additions

The following variance analysis has been prepared based on ENWIN's materiality threshold; per the materiality calculation being noted in Exhibit 1, Section 1.9 of this Application. Accordingly, ENWIN has chosen to use $250,000 as its basis for the variance analysis on Gross Asset Additions.

ENWIN's forecasts, reports and analyzes gross asset additions on a project categorization basis. ENWIN has prepared its variance analysis herein on the same basis.

2009 Board Approved versus 2009 Actual

ENWIN experienced an overall decrease in gross assets between the 2009 Board Approved and 2009 Actual of ($7,795,161) based on GAAP, as can be seen in the following Table 2-4.

Line No.	USoA	Description	2009 Board Approved CGAAP	2009 Actual CGAAP	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	20,629,790	$ 13,201,788	-$ 7,428,002
3	1612	Land Rights (Formally known as Account 1906)	30,889	$ 30,889	$ -
4		**Subtotal**	**20,660,680**	**$ 13,232,677**	**-$ 7,428,002**
5	**Distribution Plant**				
6	1805	Land	104,771	$ 100,519	-$ 4,251
7	1808	Buildings	64,527	$ 89,273	$ 24,746
8	1815	Transformer Station Equipment >50 kV	30,662,039	$ 30,317,891	-$ 344,147
9	1820	Distribution Station Equipment <50 kV	2,334,680	$ 2,333,532	-$ 1,148
10	1830	Poles, Towers & Fixtures	74,356,284	$ 78,436,069	$ 4,079,785
11	1840	Underground Conduit	69,373,249	$ 68,774,086	-$ 599,164
12	1850	Line Transformers	53,825,359	$ 53,366,473	-$ 458,886
13	1855	Services (Overhead & Underground)	2,387,698	$ 2,021,827	-$ 365,870
14	1860	Meters	9,134,873	$ 8,547,019	-$ 587,854
15		**Subtotal**	**242,243,478**	**$ 243,986,689**	**$ 1,743,211**
16	**General Plant**				
17	1905	Land	1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	21,292,695	$ 21,461,354	$ 168,659
19	1915	Office Furniture & Equipment (10 years)	1,386,343	$ 1,429,816	$ 43,473
20	1920	Computer Equipment - Hardware	4,502,474	$ 3,388,807	-$ 1,113,668
21	1930	Transportation Equipment	2,212,925	$ 3,129,585	$ 916,660
22	1935	Stores Equipment	22,086	$ 21,420	-$ 667
23	1940	Tools, Shop & Garage Equipment	464,152	$ 462,467	-$ 1,685
24	1945	Measurement & Testing Equipment	362,110	$ 352,291	-$ 9,819
25	1950	Power Operated Equipment	15,143	$ 12,639	-$ 2,503
26	1955	Communications Equipment	116,840	$ 229,434	$ 112,594
27	1960	Miscellaneous Equipment	3,925,366	$ 2,444,695	-$ 1,480,670
28	2005	Property Under Capital Leases	158,669	$ 192,381	$ 33,712
29		**Subtotal**	**35,781,316**	**$ 34,447,403**	**-$ 1,333,913**
30	**Contribution and Grants**				
31	1995	Contributions & Grants	- 11,174,575	-$ 11,951,032	-$ 776,457
32		**Subtotal**	**- 11,174,575**	**-$ 11,951,032**	**-$ 776,457**
32	**Grand Total**		**287,510,899**	**$ 279,715,738**	**-$ 7,795,161**

TABLE 2-4: 2009 Board Approved versus 2009 Actual

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) ($7,428,002)

This variance is due to a timing difference between when the ERP system implementation was spent and when it actually went into service. The capital spend occurred throughout 2009, however the asset went into service in February of 2010.

Distribution Plant

Account 1815 – Transformer Station Equipment >50 kV ($344,147)

The variance is due to a reclassification of Spare Transformers Account 1850.

Account 1830 – Poles, Towers & Fixtures $4,079,785

The 2008 ending balance was $4,558,635 higher than budgeted in the 2009 Board Approved Capital Continuity. During 2009 the City deferred the start of the Tecumseh at Jefferson road widening. This was budgeted at $553,875, however was not capitalized until 2010.

Account 1840 – Underground Conduit ($599,164)

The variance is due to timing differences between when the capital projects were spent and when they went into service and capitalized. Included in these differences include the following projects:

- ($196,510) Subdivision re-cabling projects (Borelli)
- ($209,774) Conversion replacements
- ($128,690) Manhole rebuilds

Account 1850 – Line Transformers ($458,886)

The variance is made up of the following differences:

- ($808,611) Conversion projects that were not completely installed in 2009 and were therefore capitalized in 2010.
- Reclassification of Spare Transformers from Account 1815.

Account 1855 – Services (Overhead & Underground) ($365,870)

The 2007 new services expenditure was down from prior years and at the time of budgeting it was judged that the level of expenditures on services would rebound as 2007 was an all-time low for new services – at 346, down from 1,257 just a few years prior. ENWIN expected that new services would increase from 2007 levels by $1.4 million, however, the economy continued to struggle and new services in 2009 dropped to an all-time low of 200 services.

Account 1860 – Meters ($587,854)

This was the result of a deferral in the Malden TS wholesale metering upgrade. Hydro One identified a problem with the transformers at that station and asked the LDCs to unload the station as much as possible, moving as much load to adjoining stations and feeders as possible. With that operation restriction in place through 2009, it was not possible to further transfer load off any Malden Feeders in order to take the lines completely out of service in order to install the wholesale metering pole top metering units.

General Plant

Account 1920 – Computer Equipment – Hardware ($1,113,668)

This variance is due to a timing difference between when the ERP system implementation was spent and when it actually went into service. The capital spend occurred throughout 2009, however the asset went into service in February of 2010.

Account 1930 – Transportation Equipment $916,660

This variance is due to an allocation difference between Account 1960 and all other General Plant Accounts with the exception of Account 1920.

Account 1960 – Miscellaneous Equipment ($1,480,670)

This variance is due to an allocation difference between all other General Plant Accounts with the exception of Account 1920.

Contributions & Grants

Account 1995 – Contributions & Grants ($776,457)

This variance is a result of receiving larger than expected contributions for the Parkdale relocation.

2009 Actual versus 2010 Actual

ENWIN has an overall increase in gross assets between 2009 Actual and 2010 Actual of $17,025,614 based on GAAP, as can be seen in Table 2-5.

Line No.	USoA	Description	2009 Actual CGAAP	2010 Actual CGAAP	Variance
1		**Intangible Plant**			
2	1611	Computer Software (Formally known as Account 1925)	$ 13,201,788	$ 21,981,690	$ 8,779,902
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 13,232,677**	**$ 22,012,580**	**$ 8,779,902**
5		**Distribution Plant**			
6	1805	Land	$ 100,519	$ 100,519	$ -
7	1808	Buildings	$ 89,273	$ 89,273	$ -
8	1815	Transformer Station Equipment >50 kV	$ 30,317,891	$ 30,317,891	$ -
9	1820	Distribution Station Equipment <50 kV	$ 2,333,532	$ 2,333,532	$ -
10	1830	Poles, Towers & Fixtures	$ 78,436,069	$ 82,508,516	$ 4,072,446
11	1840	Underground Conduit	$ 68,774,086	$ 70,256,667	$ 1,482,581
12	1850	Line Transformers	$ 53,366,473	$ 55,449,007	$ 2,082,534
13	1855	Services (Overhead & Underground)	$ 2,021,827	$ 3,568,053	$ 1,546,225
14	1860	Meters	$ 8,547,019	$ 6,157,855	-$ 2,389,164
15		**Subtotal**	**$ 243,986,689**	**$ 250,781,313**	**$ 6,794,623**
16		**General Plant**			
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 21,461,354	$ 21,746,704	$ 285,350
19	1915	Office Furniture & Equipment (10 years)	$ 1,429,816	$ 1,470,882	$ 41,067
20	1920	Computer Equipment - Hardware	$ 3,388,807	$ 4,402,713	$ 1,013,906
21	1930	Transportation Equipment	$ 3,129,585	$ 3,130,601	$ 1,015
22	1935	Stores Equipment	$ 21,420	$ 36,930	$ 15,511
23	1940	Tools, Shop & Garage Equipment	$ 462,467	$ 462,467	$ -
24	1945	Measurement & Testing Equipment	$ 352,291	$ 382,745	$ 30,454
25	1950	Power Operated Equipment	$ 12,639	$ 12,639	$ -
26	1955	Communications Equipment	$ 229,434	$ 426,304	$ 196,869
27	1960	Miscellaneous Equipment	$ 2,444,695	$ 2,532,820	$ 88,125
28	2005	Property Under Capital Leases	$ 192,381	$ 192,381	$ -
29		**Subtotal**	**$ 34,447,403**	**$ 36,119,700**	**$ 1,672,298**
30		**Contribution and Grants**			
31	1995	Contributions & Grants	-$ 11,951,032	-$ 12,172,241	-$ 221,209
32		**Subtotal**	**-$ 11,951,032**	**-$ 12,172,241**	**-$ 221,209**
33		**Grand Total**	**$ 279,715,738**	**$ 296,741,352**	**$ 17,025,614**

TABLE 2-5: 2009 Actual versus 2010 Actual

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $8,779,902

This variance is due to the capitalization of ERP system SAP along with the disposal of the legacy system PeopleSoft.

Distribution Plant

Account 1830 – Poles, Towers & Fixtures $4,072,446

The variances in this account can be attributed to the following projects:

- City Road Work – Tecumseh Road Widening, Walker Road Widening and Wyandotte Street Extension
- 4 kV Conversion Replacements
- 27.6 kV Pole Replacements

Account 1840 – Underground Conduit $1,482,581

The variance is primarily due to the timing differences of when the capital expenditure took place and when the asset went into service for the following projects:

- Borelli Subdivision
- Manhole Rebuilds

Additional variances were the result of ongoing 4 kV conversion replacements.

Account 1850 – Line Transformers $2,082,534

As referenced in the above variance explanation for Poles, Towers and Fixtures, ENWIN continued significant capital activities in 2010 regarding road work and conversion programs.

Account 1855 – Services (Overhead & Underground) $1,546,225

The variance is the result of 301 new services that were connected in 2010. These services were predominantly small residential and commercial services. Additional variances were the result of conversion work and City road widening projects.

Account 1860 – Meters ($2,389,164)

This was the result of the disposition of conventional meters during the smart meter project. The smart meter additions were capitalized to a deferral and variance account until disposition in 2014.

General Plant

Account 1908 – Building & Fixtures $285,350

The variance was the result of $106k for new boilers, $86k for Ouellette Lobby security upgrades and $53k to upgrade the vehicle garage doors at the Rhodes Drive site.

Account 1920 – Computer Equipment – Hardware $1,013,906

As referenced in the above variance explanation for Computer Software, ENWIN capitalized a new ERP system and disposed of the old legacy system.

2010 Actual versus 2011 Actual

ENWIN has an overall increase in gross assets between 2010 Actual and 2011 Actual of $10,378,061 based on GAAP, as can be seen in Table 2-6.

Line No.	USoA	Description	2010 Actual CGAAP	2011 Actual CGAAP	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 21,981,690	$ 22,740,681	$ 758,990
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 22,012,580**	**$ 22,771,570**	**$ 758,990**
5	**Distribution Plant**				
6	1805	Land	$ 100,519	$ 94,411	-$ 6,108
7	1808	Buildings	$ 89,273	$ 120,372	$ 31,100
8	1815	Transformer Station Equipment >50 kV	$ 30,317,891	$ 30,341,529	$ 23,638
9	1820	Distribution Station Equipment <50 kV	$ 2,333,532	$ 2,333,532	$ -
10	1830	Poles, Towers & Fixtures	$ 82,508,516	$ 88,716,777	$ 6,208,261
11	1840	Underground Conduit	$ 70,256,667	$ 71,584,815	$ 1,328,147
12	1850	Line Transformers	$ 55,449,007	$ 57,038,999	$ 1,589,992
13	1855	Services (Overhead & Underground)	$ 3,568,053	$ 4,772,823	$ 1,204,770
14	1860	Meters	$ 6,157,855	$ 4,800,145	-$ 1,357,709
15		**Subtotal**	**$ 250,781,313**	**$ 259,803,403**	**$ 9,022,091**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 21,746,704	$ 22,075,977	$ 329,274
19	1915	Office Furniture & Equipment (10 years)	$ 1,470,882	$ 1,510,448	$ 39,566
20	1920	Computer Equipment - Hardware	$ 4,402,713	$ 4,612,577	$ 209,864
21	1930	Transportation Equipment	$ 3,130,601	$ 3,032,296	-$ 98,305
22	1935	Stores Equipment	$ 36,930	$ 103,849	$ 66,918
23	1940	Tools, Shop & Garage Equipment	$ 462,467	$ 484,352	$ 21,885
24	1945	Measurement & Testing Equipment	$ 382,745	$ 636,092	$ 253,347
25	1950	Power Operated Equipment	$ 12,639	$ 12,639	$ -
26	1955	Communications Equipment	$ 426,304	$ 455,857	$ 29,554
27	1960	Miscellaneous Equipment	$ 2,532,820	$ 2,604,753	$ 71,932
28	2005	Property Under Capital Leases	$ 192,381	$ 192,381	$ -
29		**Subtotal**	**$ 36,119,700**	**$ 37,043,735**	**$ 924,035**
30	**Contribution and Grants**				
31	1995	Contributions & Grants	-$ 12,172,241	-$ 12,499,296	-$ 327,055
32		**Subtotal**	**-$ 12,172,241**	**-$ 12,499,296**	**-$ 327,055**
33	**Grand Total**		**$ 296,741,352**	**$ 307,119,413**	**$ 10,378,061**

TABLE 2-6: 2010 Actual versus 2011 Actual

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $758,990

The variance is due to enhancements made on the ERP system installed in 2010 in addition to GIS system software required to begin the process to migrate existing CAD drawings and maps to the new GIS system.

Distribution Plant

Account 1830 – Poles, Towers & Fixtures $6,208,261

The conversion work on 4 kV and 27.6 kV continued in 2011 resulting in a significant portion of the variance. Reactive replacements were also a contributing factor in part due to several significant storms in July. The July 4th storm qualified as a major event day.

Account 1840 – Underground Conduit $1,328,147

The variance is due to ongoing 4 kV conversion replacements in addition to reactive cable replacements and manhole rebuilds. An additional planned replacement of a large leaded cable section on Erie Street was partially capitalized in 2011 as well, contributing to the variance.

Account 1850 – Line Transformers $1,589,992

As referenced in the above variance explanation for Poles, Towers and Fixtures, ENWIN continued significant capital activities in 2011 regarding road work and conversion programs as well as replacing transformers due to significant storms that occurred in the month of July.

Account 1855 – Services (Overhead & Underground) $1,204,770

The variance is the result of 305 new services that were connected in 2011. Additional variances were the result of conversion work and reactive replacements.

Account 1860 – Meters ($1,357,709)

This was the result of the disposition of conventional meters during the smart meter project. The smart meter additions were capitalized to a deferral and variance account until disposition in 2014.

General Plant

Account 1908 – Building & Fixtures $329,274

The variance was the result of $106k for new boilers, $86k for Ouellette Lobby security upgrades and $53k to upgrade the vehicle garage doors at the Rhodes Drive site.

Account 1945 – Measurement & Testing Equipment $253,347

The variance results from SCADA investments that includes the following; a new switch, faulted circuit indicators, a second SCADA instance to capture FIT and MicroFit generator data and server and software updates to improve cyber security of the SCADA system.

Contributions & Grants

Account 1995 – Contributions & Grants ($327,055)

This variance is a result of contributions received for City roadwork that was undertaken in 2010.

2011 Actual versus 2012 Actual

ENWIN has an overall increase in gross assets between 2011 Actual and 2012 Actual of $11,592,871 based on MIFRS, as can be seen in Table 2-7.

Line No.	USoA	Description	2011 Actual MIFRS	2012 Actual MIFRS	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 13,242,158	$ 13,708,311	$ 466,153
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 13,273,047**	**$ 13,739,200**	**$ 466,153**
5	**Distribution Plant**				
6	1805	Land	$ 94,411	$ 94,411	$ -
7	1808	Buildings	$ 62,747	$ 62,747	$ -
8	1815	Transformer Station Equipment >50 kV	$ 22,251,600	$ 22,251,600	$ -
9	1820	Distribution Station Equipment <50 kV	$ 1,133,411	$ 1,133,411	$ -
10	1830	Poles, Towers & Fixtures	$ 56,831,975	$ 61,610,388	$ 4,778,413
11	1840	Underground Conduit	$ 38,608,504	$ 40,804,859	$ 2,196,355
12	1850	Line Transformers	$ 34,214,153	$ 36,062,066	$ 1,847,913
13	1855	Services (Overhead & Underground)	$ 4,585,018	$ 6,261,807	$ 1,676,789
14	1860	Meters	$ 2,842,577	$ 3,666,351	$ 823,774
15		**Subtotal**	**$ 160,624,397**	**$ 171,947,641**	**$ 11,323,245**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 17,520,892	$ 18,116,588	$ 595,696
19	1915	Office Furniture & Equipment (10 years)	$ 428,354	$ 489,131	$ 60,777
20	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 2,066,843	$ 2,372,886	$ 306,043
21	1930	Transportation Equipment	$ 1,301,697	$ 1,320,557	$ 18,860
22	1935	Stores Equipment	$ 85,610	$ 114,088	$ 28,478
23	1940	Tools, Shop & Garage Equipment	$ 80,907	$ 139,852	$ 58,945
24	1945	Measurement & Testing Equipment	$ 1,134,092	$ 1,255,639	$ 121,547
25	1950	Power Operated Equipment	$ 175	$ 175	$ -
26	1955	Communications Equipment	$ 391,373	$ 444,806	$ 53,433
27	1960	Miscellaneous Equipment	$ 1,086,294	$ 1,141,711	$ 55,417
28		**Subtotal**	**$ 25,418,749**	**$ 26,717,947**	**$ 1,299,197**
29	**Contribution and Grants**				
30	1995	Contributions & Grants	-$ 9,759,512	-$ 9,426,948	$ 332,564
31	2440	Deferred Revenue	$ -	-$ 1,828,288	-$ 1,828,288
32		**Subtotal**	**-$ 9,759,512**	**-$ 11,255,236**	**-$ 1,495,724**
33	**Grand Total**		**$ 189,556,682**	**$ 201,149,553**	**$ 11,592,871**

TABLE 2-7: 2011 Actual versus 2012 Actual

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $466,153

The variance is due to the purchase of ESRI GIS software, document management software, and software licenses.

Distribution Plant

Account 1830 – Poles, Towers & Fixtures $4,778,413

The conversion work on 4 kV and 27.6 kV continued in 2012 but investment levels dropped. City roadwork increased in 2012 including Walker Road widening and Provincial at Cabana intersection. The Right Honorable Herb Gray Parkway project began and resulted in an increase in overhead capital.

Reactive pole replacements increased in 2012 and continue to reflect an emphasis on catching up on years of pole pulling that had not been done during conversions as Bell and Cogeco had to transfer their plant onto the new poles.

Account 1840 – Underground Conduit $2,196,355

The variances in this account can be attributed to the following projects:

- 4 kV conversion program
- Ongoing efforts to catch-up manhole replacements
- Replacement of a large leaded cable section on Erie Street
- Right Honorable Herb Gray Parkway
- Conductor upgrades

Account 1850 – Line Transformers $1,847,913

As referenced in the above variance explanation for Poles, Towers and Fixtures, ENWIN continued significant capital activities in 2012 regarding road work and conversion programs as well as replacing updating the reactive transformer program to include both a proactive overhead transformer end of life replacement component, as well as a proactive underground padmount transformer end of life replacement component.

Account 1855 – Services (Overhead & Underground) $1,676,789

The variance is the result of 377 new services that were connected in 2012. Additional variances were the result of conversion work, the parkway, City road widening projects and subdivisions.

Account 1860 – Meters $823,774

This was the result wholesale meter installation at Lauzon and Crawford TS.

General Plant

Account 1908 – Building & Fixtures $595,696

The variance was the result of many small capital upgrades. Included in those upgrades was roofing on the Ouellette facility.

Account 1920 - Computer Equipment - Hardware $306,043

The variance is caused by end of life cycle updates to laptops. Other additions include servers and disk drive replacements.

Contributions & Grants

Account 1995 – Contributions & Grants $332,564

This variance is a result of a reclassification of 2011 customer contributions into account 2440 to adhere to IFRS.

Account 2440 – Deferred Revenue ($1,828,288)

This variance is a result of contributions received for work on the Right Honorable Herb Gray Parkway along with new service customer contributions. The remainder was due to the reclassification stated above in Account 1995.

2012 Actual versus 2013 Actual

ENWIN has an overall increase in gross assets between 2012 Actual and 2013 Actual of $9,631,583 based on MIFRS, as can be seen in Table 2-8.

Line No.	USoA	Description	2012 Actual MIFRS	2013 Actual MIFRS	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 13,708,311	$ 14,172,801	$ 464,490
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 13,739,200**	**$ 14,203,690**	**$ 464,490**
5	**Distribution Plant**				
6	1805	Land	$ 94,411	$ 94,411	$ -
7	1808	Buildings	$ 62,747	$ 62,747	$ -
8	1815	Transformer Station Equipment >50 kV	$ 22,251,600	$ 22,251,600	$ -
9	1820	Distribution Station Equipment <50 kV	$ 1,133,411	$ 1,133,411	$ -
10	1830	Poles, Towers & Fixtures	$ 61,610,388	$ 64,998,284	$ 3,387,895
11	1840	Underground Conduit	$ 40,804,859	$ 43,320,444	$ 2,515,585
12	1850	Line Transformers	$ 36,062,066	$ 37,647,015	$ 1,584,949
13	1855	Services (Overhead & Underground)	$ 6,261,807	$ 7,566,052	$ 1,304,245
14	1860	Meters	$ 3,666,351	$ 4,346,109	$ 679,758
15		**Subtotal**	**$ 171,947,641**	**$ 181,420,073**	**$ 9,472,432**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 18,116,588	$ 18,295,770	$ 179,182
19	1915	Office Furniture & Equipment (10 years)	$ 489,131	$ 508,556	$ 19,425
20	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 2,372,886	$ 2,553,969	$ 181,084
21	1930	Transportation Equipment	$ 1,320,557	$ 1,320,559	$ 2
22	1935	Stores Equipment	$ 114,088	$ 155,231	$ 41,143
23	1940	Tools, Shop & Garage Equipment	$ 139,852	$ 220,272	$ 80,420
24	1945	Measurement & Testing Equipment	$ 1,255,639	$ 1,408,330	$ 152,691
25	1950	Power Operated Equipment	$ 175	$ 175	$ -
26	1955	Communications Equipment	$ 444,806	$ 494,186	$ 49,380
27	1960	Miscellaneous Equipment	$ 1,141,711	$ 1,141,711	$ -
28		**Subtotal**	**$ 26,717,947**	**$ 27,421,273**	**$ 703,327**
29	**Contribution and Grants**				
30	1995	Contributions & Grants	-$ 9,426,948	-$ 9,426,948	$ -
31	2440	Deferred Revenue	-$ 1,828,288	-$ 2,836,954	-$ 1,008,666
32		**Subtotal**	**-$ 11,255,236**	**-$ 12,263,902**	**-$ 1,008,666**
33	**Grand Total**		**$ 201,149,553**	**$ 210,781,135**	**$ 9,631,583**

TABLE 2-8: 2012 Actual versus 2013 Actual

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $464,490

The variance is due to the implementation of the following:

- SAP Mobility and Personas
- Docova document management software
- ProjExec licenses and implementation
- Symantec net backup

Distribution Plant

Account 1830 – Poles, Towers & Fixtures $3,387,895

Work on the Parkway continued to contribute to the variance in addition to City projects that were completed in 2013 including Walker Road widening. 25 overhead conductor upgrades occurred throughout the year which also contributed to the variance.

Reactive pole and cable replacements continued in 2013 in addition to the 27.6 kV Pole Replacement project.

Account 1840 – Underground Conduit $2,515,585

During 2013 eleven underground sections of the conductor upgrades took place contributing to the variance. New switches and sectionalizers also increased the variance along with the installation of the Deerbrook switching unit replacement.

ENWIN was also catching up on a backlog of manhole deficiencies identified in earlier inspections that started in 2008.

Externally driven projects also contributed to the variance including the following:

- Right Honorable Herb Gray Parkway
- New subdivisions (2 - Cypress & Ivanhill)
- City Road Widening (Walker)

Account 1850 – Line Transformers $1,584,949

Significant investment in planned and reactive transformer replacements occurred in 2013. This included overhead, submersible and padmount transformer replacements. Similar to other distribution assets, investments were made in the Parkway, subdivisions, road widening projects, and conversion projects.

Account 1855 – Services (Overhead & Underground) $1,304,245

The variance is the result of 364 new services that were connected in 2013. Additional variances were the result of conversion work, the parkway, City road widening projects and subdivisions.

Account 1860 – Meters $679,758

The smart meter program was completed in 2012. In 2013 ENWIN began to replace conventional non-interval large commercial meters with smart meters, which caused the variance.

Contributions & Grants

Account 2440 – Deferred Revenue ($1,008,666)

Similar to 2012, this variance is a result of contributions received for work on the Right Honorable Herb Gray Parkway along with new service customer contributions.

2013 Actual versus 2014 Actual

ENWIN has an overall increase in gross assets between 2013 Actual and 2014 Actual of $33,774,429 based on MIFRS, as can be seen in Table 2-9.

Line No.	USoA	Description	2013 Actual MIFRS	2014 Actual MIFRS	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 14,172,801	$ 24,022,691	$ 9,849,890
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 14,203,690**	**$ 24,053,580**	**$ 9,849,890**
5	**Distribution Plant**				
6	1805	Land	$ 94,411	$ 94,411	$ -
7	1808	Buildings	$ 62,747	$ 71,307	$ 8,560
8	1815	Transformer Station Equipment >50 kV	$ 22,251,600	$ 22,251,600	$ -
9	1820	Distribution Station Equipment <50 kV	$ 1,133,411	$ 1,133,411	$ -
10	1830	Poles, Towers & Fixtures	$ 64,998,284	$ 70,394,522	$ 5,396,238
11	1840	Underground Conduit	$ 43,320,444	$ 49,017,280	$ 5,696,836
12	1850	Line Transformers	$ 37,647,015	$ 39,330,868	$ 1,683,854
13	1855	Services (Overhead & Underground)	$ 7,566,052	$ 9,248,121	$ 1,682,069
14	1860	Meters	$ 4,346,109	$ 13,914,609	$ 9,568,500
15		**Subtotal**	**$ 181,420,073**	**$ 205,456,130**	**$ 24,036,057**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 18,295,770	$ 18,880,089	$ 584,319
19	1915	Office Furniture & Equipment (10 years)	$ 508,556	$ 603,459	$ 94,903
20	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 2,553,969	$ 3,378,771	$ 824,802
21	1930	Transportation Equipment	$ 1,320,559	$ 1,374,207	$ 53,648
22	1935	Stores Equipment	$ 155,231	$ 163,287	$ 8,057
23	1940	Tools, Shop & Garage Equipment	$ 220,272	$ 344,267	$ 123,995
24	1945	Measurement & Testing Equipment	$ 1,408,330	$ 1,635,219	$ 226,890
25	1950	Power Operated Equipment	$ 175	$ 175	$ -
26	1955	Communications Equipment	$ 494,186	$ 501,557	$ 7,371
27	1960	Miscellaneous Equipment	$ 1,141,711	$ 1,668,979	$ 527,268
28		**Subtotal**	**$ 27,421,273**	**$ 29,872,526**	**$ 2,451,252**
29	**Contribution and Grants**				
30	1995	Contributions & Grants	-$ 9,426,948	-$ 9,426,948	$ -
31	2440	Deferred Revenue	-$ 2,836,954	-$ 5,399,724	-$ 2,562,770
32		**Subtotal**	**-$ 12,263,902**	**-$ 14,826,672**	**-$ 2,562,770**
33	**Grand Total**		**$ 210,781,135**	**$ 244,555,564**	**$ 33,774,429**

TABLE 2-9: 2013 Actual versus 2014 Actual

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $9,849,890

The variance is primarily due to the implementation of a new Customer Information System (CIS) NorthStar. In 2014 the purchase of ESRI ArcFM licenses and implementation costs were also capitalized.

Distribution Plant

Account 1830 – Poles, Towers & Fixtures $5,396,238

The Parkway work continued to be the largest project in 2014. In addition to this project work was still completed on the 4 kV and 27.6 kV conversion projects. Ten overhead sectionalizing and feeder tie switches were purchased in 2013 and capitalized in 2014 which contributed to the variance. Conductor upgrades were also ongoing throughout 2014.

Account 1840 – Underground Conduit $5,696,836

The variances in this account can be attributed to the following projects;

- Conductor upgrades

- Right Honorable Herb Gray Parkway
- Underground switching units
- Underground cable ties
- New Services
- Reactive replacements

Account 1850 – Line Transformers $1,683,854

Investments in planned and reactive transformer replacements continued in 2014. This included overhead, submersible and padmount transformer replacements. Similar to other distribution assets, investments continued on the Parkway and in conversion projects.

Account 1855 – Services (Overhead & Underground) $1,682,069

The variance is the result of 407 new services that were connected in 2014. Additional variances were the result of conversion work, the parkway, and subdivisions.

Account 1860 – Meters $9,568,500

Smart meter disposition occurred in 2014; therefore all smart meters purchased and capitalized during the implementation period of 2009-2012 were recognized.

General Plant

Account 1908 – Building & Fixtures $584,319

The variance was the result of many small capital upgrades. Included in those upgrades was roofing on the transformer stations.

Account 1920 - Computer Equipment - Hardware $824,802

The variance is caused by end of life cycle updates to laptops and servers. Tablets were purchased for frontline staff as part of the NorthStar CIS implementation.

Account 1960 - Miscellaneous Equipment $527,268

Due to the disposition of smart meters, the miscellaneous smart meter equipment was recognized into assets in 2014.

Contributions & Grants

Account 2440 – Deferred Revenue ($2,562,770)

This variance is a result of contributions received for work on the Right Honorable Herb Gray Parkway along with new service customer contributions and subdivisions.

2014 Actual versus 2015 Actual

ENWIN has an overall increase in gross assets between 2014 Actual and 2015 Actual of $17,671,696 based on MIFRS, as can be seen in Table 2-10.

Line No.	USoA	Description	2014 Actual MIFRS	2015 Actual MIFRS	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 24,022,691	$ 25,530,808	$ 1,508,117
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 24,053,580**	**$ 25,561,697**	**$ 1,508,117**
5	**Distribution Plant**				
6	1805	Land	$ 94,411	$ 73,127	-$ 21,285
7	1808	Buildings	$ 71,307	$ 67,053	-$ 4,255
8	1815	Transformer Station Equipment >50 kV	$ 22,251,600	$ 22,281,466	$ 29,865
9	1820	Distribution Station Equipment <50 kV	$ 1,133,411	$ 1,163,659	$ 30,248
10	1830	Poles, Towers & Fixtures	$ 70,394,522	$ 79,806,843	$ 9,412,321
11	1840	Underground Conduit	$ 49,017,280	$ 55,309,202	$ 6,291,922
12	1850	Line Transformers	$ 39,330,868	$ 42,266,614	$ 2,935,746
13	1855	Services (Overhead & Underground)	$ 9,248,121	$ 10,551,647	$ 1,303,526
14	1860	Meters	$ 13,914,609	$ 14,128,443	$ 213,835
15		**Subtotal**	**$ 205,456,130**	**$ 225,648,052**	**$ 20,191,922**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 18,880,089	$ 19,007,293	$ 127,204
19	1915	Office Furniture & Equipment (10 years)	$ 603,459	$ 604,854	$ 1,395
20	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 3,378,771	$ 3,568,624	$ 189,853
21	1930	Transportation Equipment	$ 1,374,207	$ 1,383,394	$ 9,187
22	1935	Stores Equipment	$ 163,287	$ 168,034	$ 4,747
23	1940	Tools, Shop & Garage Equipment	$ 344,267	$ 400,031	$ 55,764
24	1945	Measurement & Testing Equipment	$ 1,635,219	$ 2,157,583	$ 522,364
25	1950	Power Operated Equipment	$ 175	$ 175	$ -
26	1955	Communications Equipment	$ 501,557	$ 531,075	$ 29,518
27	1960	Miscellaneous Equipment	$ 1,668,979	$ 1,705,905	$ 36,926
28		**Subtotal**	**$ 29,872,526**	**$ 30,849,482**	**$ 976,956**
29	**Contribution and Grants**				
30	1995	Contributions & Grants	-$ 9,426,948	-$ 9,426,948	$ -
31	2440	Deferred Revenue	-$ 5,399,724	-$ 10,405,023	-$ 5,005,299
32		**Subtotal**	**-$ 14,826,672**	**-$ 19,831,971**	**-$ 5,005,299**
33	**Grand Total**		**$ 244,555,564**	**$ 262,227,260**	**$ 17,671,696**

TABLE 2-10: 2014 Actual versus 2015 Actual

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $1,508,117

The variance is due to multiple software enhancements including; SAP Work Manager, SAP Inventory Manager, SAP Mobility, Success Factors, and post implementation costs relating to NorthStar CIS system.

Distribution Plant

Account 1830 – Poles, Towers & Fixtures $9,412,321

The Parkway work continued to be the largest project in 2015 as the last projects were completed and capitalized. In addition to the Parkway, the conversion program was winding down in 2015 and re-directed to pole replacements. A number of switching units were replaced which contributed to the variance. Conductor upgrades were also ongoing throughout 2014.

Account 1840 – Underground Conduit $6,291,922

The variances in this account can be attributed to the following projects:

- Conductor upgrades

- Right Honorable Herb Gray Parkway
- Underground switching units (Queen Elizabeth, Colborne, Clarence and Adstoll)
- New Services including Subdivisions (Prairie Court, East Riverside, Sixth Concession, Monticello and Babister)
- Reactive replacements (Underground cable and manholes)

Account 1850 – Line Transformers $2,935,746

Investments in planned and reactive transformer replacements continued in 2015 and were also affected by the tornado. This included overhead, submersible and padmount transformer replacements. Similar to other distribution assets, investments continued on the Bridge Plaza, new services, subdivisions and conversion projects.

Account 1855 – Services (Overhead & Underground) $1,303,526

The variance is the result of 463 new services that were connected in 2014. Additional variances were the result of conversion work, the parkway, reactive replacements, and subdivisions.

General Plant

Account 1945 - Measurement & Testing Equipment $522,364

The variance is due to an end of life replacement for the Chrysler MTS PLC Relay so that it could be used to support the distribution system.

Contributions & Grants

Account 2440 – Deferred Revenue ($5,005,299)

This variance is a result of the final invoicing that was completed for the Parkway as the project wrapped up in 2015. New customer connections and subdivisions were also included in this variance.

2015 Actual versus 2016 Actual

ENWIN has an overall increase in gross assets between 2015 Actual and 2016 Actual of $16,334,278 based on MIFRS, as can be seen in Table 2-11.

Line No.	USoA	Description	2015 Actual MIFRS	2016 Actual MIFRS	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 25,530,808	$ 28,326,820	$ 2,796,012
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 25,561,697**	**$ 28,357,709**	**$ 2,796,012**
5	**Distribution Plant**				
6	1805	Land	$ 73,127	$ 65,265	-$ 7,861
7	1808	Buildings	$ 67,053	$ 67,053	$ -
8	1815	Transformer Station Equipment >50 kV	$ 22,281,466	$ 23,377,534	$ 1,096,068
9	1820	Distribution Station Equipment <50 kV	$ 1,163,659	$ 1,163,659	$ -
10	1830	Poles, Towers & Fixtures	$ 79,806,843	$ 84,446,660	$ 4,639,818
11	1840	Underground Conduit	$ 55,309,202	$ 58,539,332	$ 3,230,131
12	1850	Line Transformers	$ 42,266,614	$ 44,497,428	$ 2,230,814
13	1855	Services (Overhead & Underground)	$ 10,551,647	$ 11,858,108	$ 1,306,461
14	1860	Meters	$ 14,128,443	$ 14,626,699	$ 498,256
15		**Subtotal**	**$ 225,648,052**	**$ 238,641,738**	**$ 12,993,685**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 19,007,293	$ 19,252,875	$ 245,582
19	1915	Office Furniture & Equipment (10 years)	$ 604,854	$ 646,537	$ 41,683
20	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 3,568,624	$ 4,186,375	$ 617,751
21	1930	Transportation Equipment	$ 1,383,394	$ 1,397,106	$ 13,712
22	1935	Stores Equipment	$ 168,034	$ 211,585	$ 43,551
23	1940	Tools, Shop & Garage Equipment	$ 400,031	$ 531,472	$ 131,441
24	1945	Measurement & Testing Equipment	$ 2,157,583	$ 2,640,298	$ 482,715
25	1950	Power Operated Equipment	$ 175	$ 175	$ -
26	1955	Communications Equipment	$ 531,075	$ 566,375	$ 35,301
27	1960	Miscellaneous Equipment	$ 1,705,905	$ 1,708,321	$ 2,416
28		**Subtotal**	**$ 30,849,482**	**$ 32,463,634**	**$ 1,614,152**
29	**Contribution and Grants**				
30	1995	Contributions & Grants	-$ 9,426,948	-$ 9,426,948	$ -
31	2440	Deferred Revenue	-$ 10,405,023	-$ 11,474,594	-$ 1,069,571
32		**Subtotal**	**-$ 19,831,971**	**-$ 20,901,542**	**-$ 1,069,571**
33	**Grand Total**		**$ 262,227,260**	**$ 278,561,538**	**$ 16,334,278**

TABLE 2-11: 2015 Actual versus 2016 Actual

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $2,796,012

The variance is due to the implementation of a new Outage Management System and the integration of ENWIN's GIS (ESRI) with the CIS (NorthStar).

Distribution Plant

Account 1815 - Transformer Station Equipment >50 kV $1,096,068

The variance is due to the completion of the installation of a grounding transformer at the GM MTS in order to convert that station to a distribution station as well as some remotely monitored faulted circuit indicators on feeders.

Account 1830 – Poles, Towers & Fixtures $4,639,818

The 27.6 kV pole replacement conversion project continued into 2016. Reactive replacements were up due to a tornado that hit the Rhodes Industrial park and destroyed a significant section of line. As well, pole pulling was increased due to a number of poles identified during the pole inspection project that had been missed in prior years. Construction for the Bridge Plaza also began in 2016.

Account 1840 – Underground Conduit $3,230,131

The variances in this account can be attributed to the following projects;

- Conductor upgrades
- Underground switching units (McDougall, College Ave, and Art Gallery)
- New Services including Subdivisions
- Reactive replacements (Underground cable and manholes)

Account 1850 – Line Transformers $2,230,814

Investments in planned and reactive transformer replacements continued in 2016. This included overhead, submersible and padmount transformer replacements. Similar to other distribution assets, investments continued on the Parkway, new services, subdivisions and conversion projects.

Account 1855 – Services (Overhead & Underground) $1,306,461

The variance is the result of 670 new services that were connected in 2016. Additional variances were the result of conversion work, the bridge plaza, reactive replacements, and subdivisions.

Account 1860 - Meters $498,256

The variance is due to the increase in customer connections. The City of Windsor experienced a surge in subdivision developments in 2016.

General Plant

Account 1920 - Computer Equipment - Hardware $617,751

The variance is due to expenditures on hardware for the Outage Management System, a network switch upgrade, Dell server replacement, and regular end of life computer hardware replacements.

Account 1945 - Measurement & Testing Equipment $482,715

The variance is due to SCADA communications equipment and end of life software replacements.

Contributions & Grants

Account 2440 – Deferred Revenue ($1,069,571)

This variance is a result of an increase in the number of subdivisions capitalized within 2016 including the following:

- North Neighbourhood
- Sixth Concession
- Cypress
- Royal Timbers
- Babister

The remaining differences result from the capitalization of new services.

2016 Actual versus 2017 Actual

ENWIN has an overall increase in gross assets between 2016 Actual and 2017 Actual of $13,213,068 based on MIFRS, as can be seen in Table 2-12.

Line No.	USoA	Description	2016 Actual MIFRS	2017 Actual MIFRS	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 28,326,820	$ 29,478,752	$ 1,151,932
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 28,357,709**	**$ 29,509,642**	**$ 1,151,932**
5	**Distribution Plant**				
6	1805	Land	$ 65,265	$ 43,534	-$ 21,731
7	1808	Buildings	$ 67,053	$ 160,388	$ 93,336
8	1815	Transformer Station Equipment >50 kV	$ 23,377,534	$ 23,979,429	$ 601,896
9	1820	Distribution Station Equipment <50 kV	$ 1,163,659	$ 1,163,659	$ -
10	1830	Poles, Towers & Fixtures	$ 84,446,660	$ 90,438,504	$ 5,991,843
11	1840	Underground Conduit	$ 58,539,332	$ 61,283,848	$ 2,744,516
12	1850	Line Transformers	$ 44,497,428	$ 46,608,121	$ 2,110,694
13	1855	Services (Overhead & Underground)	$ 11,858,108	$ 12,620,785	$ 762,676
14	1860	Meters	$ 14,626,699	$ 14,924,233	$ 297,533
15		**Subtotal**	**$ 238,641,738**	**$ 251,222,500**	**$ 12,580,763**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 19,252,875	$ 19,523,409	$ 270,534
19	1915	Office Furniture & Equipment (10 years)	$ 646,537	$ 680,660	$ 34,123
20	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 4,186,375	$ 4,832,116	$ 645,741
21	1930	Transportation Equipment	$ 1,397,106	$ 1,440,171	$ 43,065
22	1935	Stores Equipment	$ 211,585	$ 222,713	$ 11,128
23	1940	Tools, Shop & Garage Equipment	$ 531,472	$ 599,932	$ 68,460
24	1945	Measurement & Testing Equipment	$ 2,640,298	$ 3,136,515	$ 496,217
25	1950	Power Operated Equipment	$ 175	$ 175	$ -
26	1955	Communications Equipment	$ 566,375	$ 566,375	$ -
27	1960	Miscellaneous Equipment	$ 1,708,321	$ 1,808,129	$ 99,808
28		**Subtotal**	**$ 32,463,634**	**$ 34,132,710**	**$ 1,669,076**
29	**Contribution and Grants**				
30	1995	Contributions & Grants	-$ 9,426,948	-$ 9,426,948	$ -
31	2440	Deferred Revenue	-$ 11,474,594	-$ 13,663,298	-$ 2,188,703
32		**Subtotal**	**-$ 20,901,542**	**-$ 23,090,246**	**-$ 2,188,703**
33	**Grand Total**		**$ 278,561,538**	**$ 291,774,606**	**$ 13,213,068**

TABLE 2-12: 2016 Actual versus 2017 Actual

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $1,151,932

The variance is due to an SAP upgrade to a HANA database. In 2017 additional GIS upgrade costs were also capitalized.

Distribution Plant

Account 1815 - Transformer Station Equipment >50 kV $601,896

The variance is caused by the expenditure to replace gaskets on one of the Walker 2 transformers. While this replacement was planned, the prices for the work came in much higher than a similar replacement in 2015 on the other transformer at Walker 2.

Account 1830 – Poles, Towers & Fixtures $5,991,843

The 27.6 kV pole replacement conversion project continued into 2017. Other large projects that were capitalized in 2017 include:

- Bridge Plaza

- City Roadworks projects (Walker Road Widening, Cabana Road Corridor & Riverside Vista)
- Reactive Replacements (March included a large windstorm)

Account 1840 – Underground Conduit $2,744,516

The variances in this account can be attributed to the following projects:

- Conductor upgrades
- 55M3 & 24M3 Feeder ties
- Underground switching units (University of Windsor, South Cameron, Crawford)
- New Services including Subdivisions
- Reactive replacements (Underground cable and manholes)

Account 1850 – Line Transformers $2,110,694

Investments in planned and reactive transformer replacements continued in 2017, however many planned replacements for 2016 were deferred to 2017 which resulted in an increase to transformer additions. These replacements included overhead, submersible and padmount transformers. Similar to other distribution assets, investments continued on the Bridge Plaza, new services, subdivisions, city roadwork, and conversion projects.

Account 1855 – Services (Overhead & Underground) $762,676

The variance is the result of 597 new services that were connected in 2017. Additional variances were the result of conversion work, the bridge plaza, reactive replacements, and subdivisions.

Account 1860 - Meters $297,533

The variance is due to sampling that was required for seal extension for the smart meters. The lot sizes require a sample size of 250 meters and 250 meters had to be purchased to form a base from which selected sample meters could be exchanged.

General Plant

Account 1908 - Building & Fixtures $270,534

In 2017 multiple smaller building improvements were capitalized including lighting upgrades, furniture purchases and training hut improvements.

Account 1920 - Computer Equipment - Hardware $645,741

The variance is due to expenditures on hardware required for the SAP database upgrade to HANA in addition to a Dell Disk Systems replacement.

Account 1945 - Measurement & Testing Equipment $496,217

The variance is due to SCADA communications equipment including Horstmann Smart Reporter and Navigator equipment.

Contributions & Grants

Account 2440 – Deferred Revenue ($2,188,703)

This variance is a result of work being completed and invoiced on the new Bridge Plaza. Additional variances include new services, subdivisions, and a switching unit that was provided to ENWIN by

the manufacturer in compensation for ENWIN's cost of labour to replace two defective switching units.

2017 Actual versus 2018 Forecast

ENWIN has an overall increase in gross assets between 2017 Actual and 2018 Forecast of $14,524,357 based on MIFRS, as can be seen in Table 2-13.

Line No.	USoA	Description	2017 Actual MIFRS	2018 Forecast MIFRS	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 29,478,752	$ 30,653,752	$ 1,175,000
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 29,509,642**	**$ 30,684,642**	**$ 1,175,000**
5	**Distribution Plant**				
6	1805	Land	$ 43,534	$ 43,534	$ -
7	1808	Buildings	$ 160,388	$ 190,388	$ 30,000
8	1815	Transformer Station Equipment >50 kV	$ 23,979,429	$ 24,507,429	$ 528,000
9	1820	Distribution Station Equipment <50 kV	$ 1,163,659	$ 1,163,659	$ -
10	1830	Poles, Towers & Fixtures	$ 90,438,504	$ 96,332,800	$ 5,894,296
11	1840	Underground Conduit	$ 61,283,848	$ 62,451,098	$ 1,167,250
12	1850	Line Transformers	$ 46,608,121	$ 48,628,141	$ 2,020,020
13	1855	Services (Overhead & Underground)	$ 12,620,785	$ 14,689,261	$ 2,068,476
14	1860	Meters	$ 14,924,233	$ 15,917,717	$ 993,484
15		**Subtotal**	**$ 251,222,500**	**$ 263,924,026**	**$ 12,701,526**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 19,523,409	$ 19,678,909	$ 155,500
19	1915	Office Furniture & Equipment (10 years)	$ 680,660	$ 845,660	$ 165,000
20	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 4,832,116	$ 5,405,116	$ 573,000
21	1930	Transportation Equipment	$ 1,440,171	$ 2,264,088	$ 823,917
22	1935	Stores Equipment	$ 222,713	$ 295,213	$ 72,500
23	1940	Tools, Shop & Garage Equipment	$ 599,932	$ 693,432	$ 93,500
24	1945	Measurement & Testing Equipment	$ 3,136,515	$ 3,376,515	$ 240,000
25	1950	Power Operated Equipment	$ 175	$ 175	$ -
26	1955	Communications Equipment	$ 566,375	$ 566,375	$ -
27	1960	Miscellaneous Equipment	$ 1,808,129	$ 2,221,129	$ 413,000
28		**Subtotal**	**$ 34,132,710**	**$ 36,669,127**	**$ 2,536,417**
29	**Contribution and Grants**				
30	1995	Contributions & Grants	-$ 9,426,948	-$ 9,426,948	$ -
31	2440	Deferred Revenue	-$ 13,663,298	-$ 15,551,884	-$ 1,888,586
32		**Subtotal**	**-$ 23,090,246**	**-$ 24,978,832**	**-$ 1,888,586**
33	**Grand Total**		**$ 291,774,606**	**$ 306,298,963**	**$ 14,524,357**

TABLE 2-13: 2017 Actual versus 2018 Forecast

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $1,175,000

The forecasted variance is due to regular upgrades to the application software to keep it at the version that is at one version lower than the current vendor released version. This enables ENWIN to be more agile, take advantage of enhanced features, and minimize the need and risk of large project upgrades.

Distribution Plant

Account 1815 - Transformer Station Equipment >50 kV $528,000

The variance is caused by the forecasted replacement of the GM PLC/Relay end of life equipment replacement as well as redundant station battery banks.

Account 1830 – Poles, Towers & Fixtures $5,894,296

The largest forecasted expenditure in 2018 includes the Pole Sustaining program. Other projects that are forecasted to be completed in 2018 include the following:

- Bridge Plaza
- City Roadworks projects
- Reactive Replacements
- Conductor Upgrades

Account 1840 – Underground Conduit $1,167,250

The variances in this account can be attributed to the following projects:

- Underground cable sustainment
- Feeder ties
- Underground switching units
- New Services including Subdivisions
- Reactive replacements

Account 1850 – Line Transformers $2,020,020

Planned replacements were forecasted for overhead, submersible and padmount transformers. Similar to other distribution assets, investments continued on the Bridge Plaza, new services, subdivisions, city roadwork, and conversion projects.

Account 1855 – Services (Overhead & Underground) $2,068,476

The variance is the result of the forecasted new services that were anticipated to be similar in total to 2017 actuals. Additional variances were the result of conversion work, the bridge plaza, reactive replacements, and subdivisions.

Account 1860 - Meters $993,484

The variance is due to the forecasted replacement of MIST meters. It also includes the consistency of new services that were experienced in 2017 as well as retest smart meters and meter tank replacements.

General Plant

Account 1920 - Computer Equipment - Hardware $573,000

The forecasted variance is due to expenditures on life cycle upgrades including servers, network switches and routers, firewall devices, personal computers, laptops, tablets, printers, disk drives and miscellaneous devices. Also included in the forecast are hardware infrastructure updates for cyber security.

Account 1930 - Transportation Equipment $823,917

In 2018 ENWIN decided to move from leasing vehicles, to purchasing them based on a lease versus

buy analysis. In 2018 the forecasted vehicles to replace include the following:

- Class 5 - Light Duty Trucks - 5153, 5169, 5176, 5180, 5195
- Class 6 - Mid Duty Trucks - 6197
- Class 7 - Heavy Duty Trucks - 7159
- Class 9 - Trailers - 9052

Account 1960 - Miscellaneous Equipment $413,000

The 2018 forecast includes radial branch backups.

Contributions & Grants

Account 2440 – Deferred Revenue ($1,888,586)

This variance is a result of work being forecasted for the Riverside Vista City project, new customer connections, and the Bridge Plaza relocation.

2018 Forecast versus 2019 Bridge Year

ENWIN has an overall increase in gross assets between 2018 Forecast and 2019 Bridge Year of $21,081,038 based on MIFRS, as can be seen in Table 2-14.

Line No.	USoA	Description	2018 Forecast MIFRS	2019 Bridge Year MIFRS	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 30,653,752	$ 32,107,652	$ 1,453,900
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 30,684,642**	**$ 32,138,542**	**$ 1,453,900**
5	**Distribution Plant**				
6	1805	Land	$ 43,534	$ 43,534	$ -
7	1808	Buildings	$ 190,388	$ 190,388	$ -
8	1815	Transformer Station Equipment >50 kV	$ 24,507,429	$ 24,982,429	$ 475,000
9	1820	Distribution Station Equipment <50 kV	$ 1,163,659	$ 1,163,659	$ -
10	1830	Poles, Towers & Fixtures	$ 96,332,800	$ 104,814,240	$ 8,481,440
11	1840	Underground Conduit	$ 62,451,098	$ 64,207,118	$ 1,756,020
12	1850	Line Transformers	$ 48,628,141	$ 52,354,621	$ 3,726,480
13	1855	Services (Overhead & Underground)	$ 14,689,261	$ 16,747,321	$ 2,058,060
14	1860	Meters	$ 15,917,717	$ 17,102,717	$ 1,185,000
15		**Subtotal**	**$ 263,924,026**	**$ 281,606,026**	**$ 17,682,000**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 1,322,514	$ -
18	1908	Buildings & Fixtures	$ 19,678,909	$ 21,652,409	$ 1,973,500
19	1910	Leasehold Improvements	$ -	$ 365,330	$ 365,330
20	1915	Office Furniture & Equipment (10 years)	$ 845,660	$ 1,095,660	$ 250,000
21	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 5,405,116	$ 5,956,616	$ 551,500
22	1930	Transportation Equipment	$ 2,264,088	$ 4,610,896	$ 2,346,808
23	1935	Stores Equipment	$ 295,213	$ 365,713	$ 70,500
24	1940	Tools, Shop & Garage Equipment	$ 693,432	$ 883,932	$ 190,500
25	1945	Measurement & Testing Equipment	$ 3,376,515	$ 3,971,515	$ 595,000
26	1950	Power Operated Equipment	$ 175	$ 175	$ -
27	1955	Communications Equipment	$ 566,375	$ 566,375	$ -
28	1960	Miscellaneous Equipment	$ 2,221,129	$ 2,721,129	$ 500,000
29		**Subtotal**	**$ 36,669,127**	**$ 43,512,265**	**$ 6,843,138**
30	**Contribution and Grants**				
31	1995	Contributions & Grants	-$ 9,426,948	-$ 9,426,948	$ -
32	2440	Deferred Revenue	-$ 15,551,884	-$ 20,449,884	-$ 4,898,000
33		**Subtotal**	**-$ 24,978,832**	**-$ 29,876,832**	**-$ 4,898,000**
34	**Grand Total**		**$ 306,298,963**	**$ 327,380,001**	**$ 21,081,038**

TABLE 2-14: 2018 Forecast versus 2019 Bridge Year

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $1,453,900

The forecasted variance is due to regular upgrades to the application software to keep it at the version that is at one version lower than the current vendor released version. This enables ENWIN to be more agile, take advantage of enhanced features, and minimize the need and risk of large project upgrades.

One large upgrade has been budgeted for 2019 which includes the upgrade to NorthStar CIS. Included in this upgrade is a change in customer portals.

Distribution Plant

Account 1815 - Transformer Station Equipment >50 kV $475,000

The variance is caused by the budgeted replacement of NSD 70 with NSD 570 TT Equipment at the Windsor Assembly Plant and GM.

Account 1830 – Poles, Towers & Fixtures $8,481,440

The largest budgeted expenditure in 2019 includes the Pole Sustaining program. Other projects that are forecasted to be completed in 2019 include the following:

- Bridge Plaza & Ambassador Bridge Twin Span
- City Roadworks projects
- Reactive Replacements
- Conductor Upgrades

Account 1840 – Underground Conduit $1,756,020

The variances in this account can be attributed to the following projects:

- Underground cable sustainment
- Feeder ties
- Underground switching units
- New Services including Subdivisions
- Reactive replacements

Account 1850 – Line Transformers $3,726,480

Planned replacements were forecasted for overhead, submersible and padmount transformers. Similar to other distribution assets, investments continued on the Bridge Plaza, new services, subdivisions, city roadwork, and conversion projects.

Account 1855 – Services (Overhead & Underground) $2,058,060

The variance is the result of conversion work, the bridge plaza, reactive replacements, and subdivisions partially offset by a decrease in budgeted new services.

Account 1860 - Meters $1,185,000

The variance is due to the forecasted replacement of MIST meters. It also includes the decrease of new services that were budgeted above in Account 1855 as well as retest smart meters and meter tank replacements.

General Plant

Account 1908 - Building & Fixtures $1,973,500

The variance in 2019 is primarily due to the renovation of ENWIN's Rhodes Drive Operating Centre so that it can accommodate the employees from its Ouellette Avenue Head Office location which is to be sold.

Account 1910 - Leasehold Improvements $365,330

The addition of a leasehold improvement is due to the site consolidation as mentioned above in Account 1908. The improvement is required for a redundant and back-up server room. The space will be leased from the Windsor Utilities Commissions Water Treatment Plant. In addition, modifications are required to a building used as a fibre hub.

Account 1920 - Computer Equipment - Hardware $551,500

The forecasted variance is due to expenditures on life cycle upgrades including servers, network switches and routers, firewall devices, personal computers, laptops, tablets, printers, disk drives and miscellaneous devices. Also included in the forecast are hardware infrastructure updates for cyber security.

Account 1930 - Transportation Equipment $2,346,808

The variance results from the forecasted 2019 vehicles to be purchased including the following:

- Class 5 - Light Duty Trucks - 5147, 5151, 5500, 5993, 5994
- Class 6 - Mid Duty Trucks - 6135, 6171, 6215, 6114, 6173
- Class 7 - Heavy Duty Trucks - 7160, 7183, 7211
- Class 8 - Forklifts/Backhoes - 8018, 8019

Account 1945 - Measurement & Testing Equipment $595,000

The 2019 variance is due to the budgeted SCADA communications evolution design and equipment. Upgrades to SCADA FCI's are also budgeted for 2019.

Account 1960 - Miscellaneous Equipment $500,000

The 2019 budget also includes radial branch backups, similar to the 2018 Forecast.

Contributions & Grants

Account 2440 – Deferred Revenue ($4,898,000)

This variance is a result of work being forecasted for the Bridge Plaza relocation and the Ambassador Bridge Twin Span, Walker Road and Cabana Road City projects, and new customer connections.

2019 Bridge Year versus 2020 Test Year

ENWIN has an overall increase in gross assets between 2019 Bridge and 2020 Test Year of

$18,746,499 based on MIFRS, as can be seen in Table 2-15.

Line No.	USoA	Description	2019 Bridge Year MIFRS	2020 Test Year MIFRS	Variance
1	**Intangible Plant**				
2	1611	Computer Software (Formally known as Account 1925)	$ 32,107,652	$ 33,224,152	$ 1,116,500
3	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ 30,889	$ -
4		**Subtotal**	**$ 32,138,542**	**$ 33,255,042**	**$ 1,116,500**
5	**Distribution Plant**				
6	1805	Land	$ 43,534	$ 43,534	$ -
7	1808	Buildings	$ 190,388	$ 190,388	$ -
8	1815	Transformer Station Equipment >50 kV	$ 24,982,429	$ 25,257,429	$ 275,000
9	1820	Distribution Station Equipment <50 kV	$ 1,163,659	$ 1,163,659	$ -
10	1830	Poles, Towers & Fixtures	$ 104,814,240	$ 112,518,380	$ 7,704,140
11	1840	Underground Conduit	$ 64,207,118	$ 66,514,118	$ 2,307,000
12	1850	Line Transformers	$ 52,354,621	$ 55,899,661	$ 3,545,040
13	1855	Services (Overhead & Underground)	$ 16,747,321	$ 18,626,141	$ 1,878,820
14	1860	Meters	$ 17,102,717	$ 18,809,717	$ 1,707,000
15		**Subtotal**	**$ 281,606,026**	**$ 299,023,026**	**$ 17,417,000**
16	**General Plant**				
17	1905	Land	$ 1,322,514	$ 991,286	-$ 331,228
18	1908	Buildings & Fixtures	$ 21,652,409	$ 21,896,528	$ 244,119
19	1910	Leasehold Improvements	$ 365,330	$ 365,330	$ -
20	1915	Office Furniture & Equipment (10 years)	$ 1,095,660	$ 1,345,660	$ 250,000
21	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 5,956,616	$ 6,559,116	$ 602,500
22	1930	Transportation Equipment	$ 4,610,896	$ 6,425,472	$ 1,814,576
23	1935	Stores Equipment	$ 365,713	$ 440,213	$ 74,500
24	1940	Tools, Shop & Garage Equipment	$ 883,932	$ 989,432	$ 105,500
25	1945	Measurement & Testing Equipment	$ 3,971,515	$ 4,236,515	$ 265,000
26	1950	Power Operated Equipment	$ 175	$ 175	$ -
27	1955	Communications Equipment	$ 566,375	$ 566,375	$ -
28	1960	Miscellaneous Equipment	$ 2,721,129	$ 3,161,161	$ 440,032
29		**Subtotal**	**$ 43,512,265**	**$ 46,977,264**	**$ 3,464,999**
30	**Contribution and Grants**				
31	1995	Contributions & Grants	-$ 9,426,948	-$ 9,426,948	$ -
32	2440	Deferred Revenue	-$ 20,449,884	-$ 23,701,884	-$ 3,252,000
33		**Subtotal**	**-$ 29,876,832**	**-$ 33,128,832**	**-$ 3,252,000**
34	**Grand Total**		**$ 327,380,001**	**$ 346,126,500**	**$ 18,746,499**

TABLE 2-15: 2019 Bridge Year versus 2020 Test Year

Intangible Plant

Account 1611 – Computer Software (Formally known as Account 1925) $1,116,500

The forecasted variance is due to regular upgrades to the application software to keep it at the version that is at one version lower than the current vendor released version. This enables ENWIN to be more agile, take advantage of enhanced features, and minimize the need and risk of large project upgrades.

One large upgrade has been budgeted for 2020 which includes investments to the Records Management System.

Distribution Plant

Account 1815 - Transformer Station Equipment >50 kV $275,000

The variance is caused by the budgeted investment in the Green Energy Plan/Remote Trip Pilot which is a project to asses point to multi-point transfer trip systems.

Account 1830 – Poles, Towers & Fixtures $7,704,140

The largest budgeted expenditure in 2020 includes the Pole Sustaining program. Other projects that are forecasted to be completed in 2020 include the following:

- Bridge Plaza & Ambassador Bridge Twin Span
- City Roadworks projects
- Reactive Replacements
- Conductor Upgrades

Account 1840 – Underground Conduit $2,307,000

The variances in this account can be attributed to the following projects:

- Underground cable sustainment
- Feeder ties
- Underground switching units
- New Services including Subdivisions
- Reactive replacements

Account 1850 – Line Transformers $3,545,040

Planned replacements were forecasted for overhead, submersible and padmount transformers. Similar to other distribution assets, investments continued on the Bridge Plaza, new services, subdivisions, city roadwork, and conversion projects.

Account 1855 – Services (Overhead & Underground) $1,878,820

The variance is the result of the decrease in budgeted new services. Additional variances were the result of conversion work, the bridge plaza, reactive replacements, and subdivisions.

Account 1860 - Meters $1,707,000

The variance is due to the budgeted replacement of MIST meters. It also includes the decrease of new services that were budgeted above in Account 1855 as well as retest smart meters and meter tank replacements. The replacement of the Keith TS wholesale meter is also budgeted to occur in 2020.

General Plant

Account 1905 - Land ($331,228)

The variance in 2020 is sale of ENWIN's Ouellette Avenue Head Office.

Account 1915 - Office Furniture & Equipment $250,000

The additional investment in office equipment is due to the site consolidation. New furniture and equipment will be purchased as the Rhodes Drive facility is renovated.

Account 1920 - Computer Equipment - Hardware $602,500

The forecasted variance is due to expenditures on life cycle upgrades including servers, network switches and routers, firewall devices, personal computers, laptops, tablets, printers, disk drives and miscellaneous devices. Also included in the forecast are hardware infrastructure updates for cyber

security.

Account 1930 - Transportation Equipment $1,814,576

The variance results from the forecasted 2020 vehicles to be purchased including the following:

- Class 4 - Cars - 4001
- Class 5 - Light Duty Trucks - 5124, 5129, 5167, 5170, 5190, 5203, 5212, 5174, 5230, 5231
- Class 7 - Heavy Duty Trucks - 7121, 7161, 7165

Account 1945 - Measurement & Testing Equipment $265,000

The 2020 variance is due to the budgeted SCADA communications equipment. Upgrades to SCADA FCI's are also budgeted for 2020 along with miscellaneous sustainment costs.

Account 1960 - Miscellaneous Equipment $440,032

The 2020 budget also includes radial branch backups, similar to the 2019 Bridge Year.

Contributions & Grants

Account 2440 – Deferred Revenue ($3,252,000)

This variance is a result of work being forecasted for the second phase of the Riverside Vista City project, Keith TS Wholesale metering, new customer connections, Bridge Plaza relocation and the Ambassador Bridge Twin Span.

2.2.3 Incremental Capital Module Adjustments

ENWIN Utilities Ltd. confirms that it has not applied for nor received any Incremental Capital Module ("ICM") adjustments as part of a previous IRM application.

2.3 Allowance for Working Capital

2.3.1 Allowance Factor Overview

The Filing Requirements permit applicants to take one of two approaches for calculation of the Allowance for Working Capital:

a) The 7.5% Allowance Approach as indicated by the Board; or

b) The filing of a lead/lag study.

ENWIN has used the rate of 7.5% for calculating the Working Capital Allowance as per the letter issued by the Board on June 3, 2015, “Allowance for Working Capital for Electricity Distribution Rate Applications”. The Working Capital Allowance is the sum of Cost of Power and controllable expenses (i.e. Operations, Maintenance, Billing and Collecting, Community Relations, Administration and General) multiplied by the default value of 7.5%. ENWIN is proposing a working capital allowance of $21,499,345 as shown in Table 2-16 below.

Expenses for Working Capital	2009 Last Board Approved	2009	2010	2011	2012	2013	2014
	CGAAP	CGAAP	CGAAP	CGAAP	MIFRS	MIFRS	MIFRS
Eligible Distribution Expenses							
Operations	2,437,390	2,428,126	2,179,670	2,168,958	2,215,696	2,241,488	2,446,148
Maintenance	2,871,452	2,527,893	2,574,239	2,083,371	1,941,200	1,987,679	2,014,312
Billing and Collecting	1,279,189	1,265,826	648,427	1,277,901	1,382,908	1,215,699	1,559,075
Community Relations	53,366	39,117	53,370	106,603	39,925	48,192	61,327
Administrative and General	14,982,471	13,687,876	16,002,774	17,142,682	20,836,210	17,520,813	18,998,119
Taxes other than Income Taxes	502,272	895,247	565,692	423,534	389,408	378,985	347,673
Donations	16,510	7,113	3,624	5,320	66,244	61,623	110,754
Total Eligible Distribution Expenses	**22,142,650**	**20,851,199**	**22,027,795**	**23,208,370**	**26,871,591**	**23,454,479**	**25,537,409**
Power Suply Expenses	165,703,327	160,940,319	190,839,507	191,152,342	213,533,589	220,352,271	237,532,111
Total Expenses for Working Capital	**187,845,977**	**181,791,517**	**212,867,302**	**214,360,712**	**240,405,180**	**243,806,751**	**263,069,519**
Working Capital factor	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%	15.0%
Total Working Capital	**28,176,897**	**27,268,728**	**31,930,095**	**32,154,107**	**36,060,777**	**36,571,013**	**39,460,428**

TABLE 2-16: Summary of Working Capital Allowance

Expenses for Working Capital	2015	2016	2017	2018 Forecast	2019 Bridge	2020 Test
	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS
Eligible Distribution Expenses						
Operations	2,648,198	2,602,508	7,269,859	6,882,531	7,698,671	7,729,065
Maintenance	1,750,044	2,028,985	2,487,236	2,942,835	3,243,162	3,174,613
Billing and Collecting	1,347,818	1,618,089	2,472,105	2,829,545	3,049,494	3,122,687
Community Relations	48,725	55,286	132,385	175,829	182,709	147,723
Administrative and General	19,598,340	19,931,438	14,839,679	14,775,628	15,209,199	14,936,539
Taxes other than Income Taxes	339,420	320,579	329,940	326,186	330,853	331,505
Donations	68,523	60,246	72,635	68,174	58,259	69,800
Total Eligible Distribution Expenses	**25,801,069**	**26,617,132**	**27,603,839**	**28,000,727**	**29,772,347**	**29,511,932**
Power Suply Expenses	245,977,671	281,993,088	250,390,291	248,629,222	262,620,628	257,146,004
Total Expenses for Working Capital	**271,778,739**	**308,610,220**	**277,994,129**	**276,629,949**	**292,392,975**	**286,657,937**
Working Capital factor	15.0%	15.0%	15.0%	15.0%	15.0%	7.5%
Total Working Capital	**40,766,811**	**46,291,533**	**41,699,119**	**41,494,492**	**43,858,946**	**21,499,345**

TABLE 2-16 (Continued): Summary of Working Capital Allowance

2.3.2 Lead/Lag Study

ENWIN is not proposing to use a lead/lag study in order to determine its Working Capital Allowance. As indicated previously ENWIN has chosen to follow the first of the options in the Board's June 3, 2015 letter providing two approaches for the calculation of the allowance for working capital:

a) The 7.5% Allowance Approach as indicated by the Board; or

b) The filing of a lead/lag study.

ENWIN has not previously been directed by the Board to undertake a lead/lag study.

2.3.3 Cost of Power Forecast

ENWIN confirms that the Cost of Power (CoP) is determined by a split between the Regulated Price Plan (RPP) and non-RPP customers based on actual data, use of most current RPP prices established for the May 1, 2018 to April 30, 2019 period, and use of the most recent approved Uniform Transmission Rates (UTRs), Smart Metering Entity charge and regulatory charges. ENWIN has calculated the CoP for the 2020 Test Year based upon the 2020 Load Forecast adjusted for the impact of Conservation and Demand Management (CDM) activities. A summary of the Total CoP expenses is shown in Table 2-17 below.

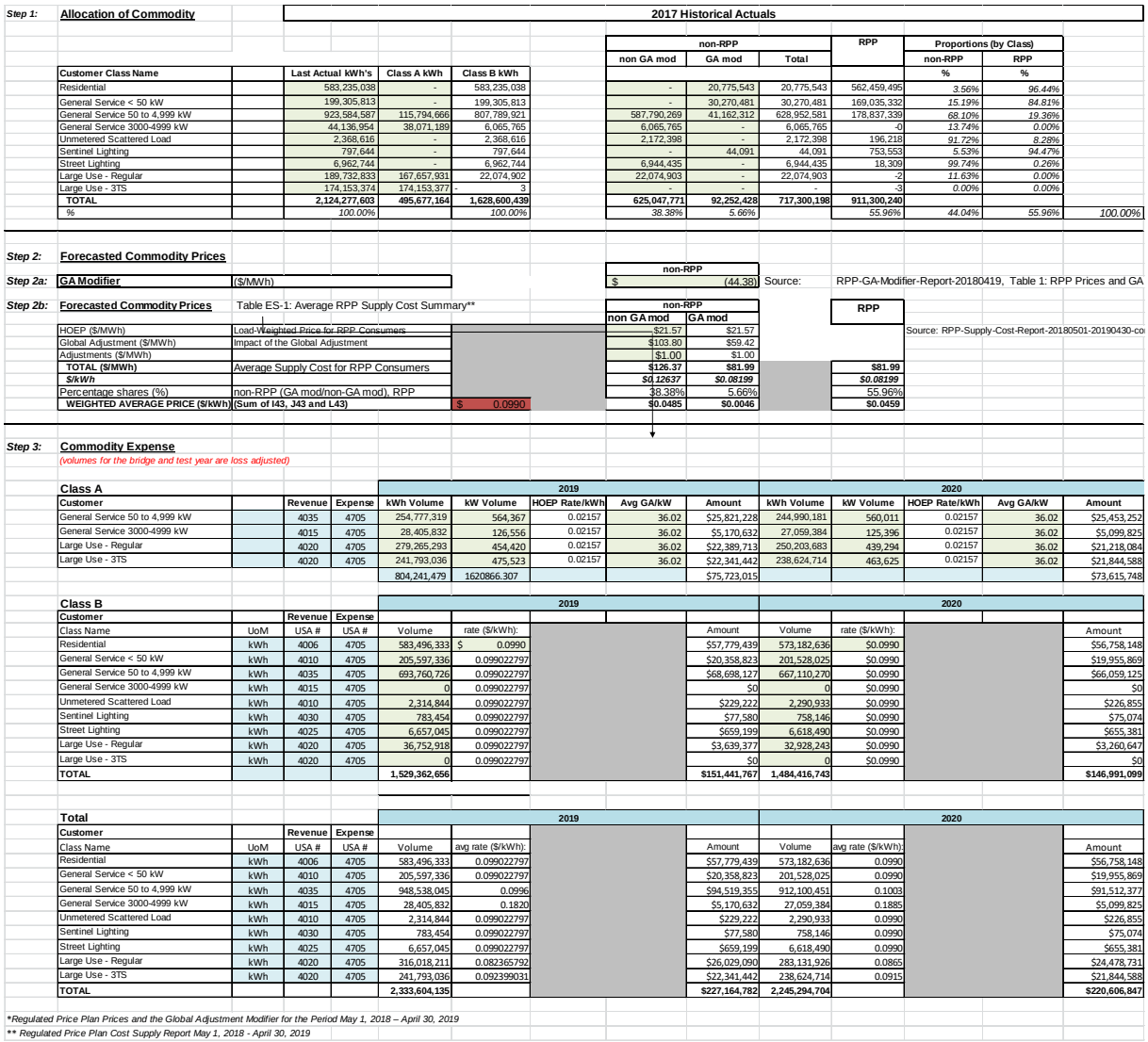
	2009 Last Board Approved	2009	2010	2011	2012	2013	2014
	CGAAP	CGAAP	CGAAP	CGAAP	MIFRS	MIFRS	MIFRS
4705 - Power Purchased	129,421,180	128,580,883	154,200,003	153,532,565	111,768,625	114,784,838	134,551,706
4707 - Global Adjustment	-	-	-	-	59,781,294	66,745,541	62,884,055
4708 - Charges - WMS	14,723,143	10,916,849	11,667,563	11,516,549	14,878,149	11,823,394	12,592,931
4712 - Charges - One Time	-	-	-	-	-	-	-
4714 - Charges, NW	13,159,711	11,447,225	13,868,926	14,746,924	17,466,161	17,244,491	17,334,736
4716 - Charges, CN	8,399,293	7,525,915	8,240,048	8,564,283	9,639,361	9,286,188	9,370,351
4730- Rural Rate Assistance Expense	-	2,469,446	2,862,966	2,792,022	-	-	-
4751 - Smart Metering Entity Charge	-	-	-	-	-	467,818	798,332
Total	**165,703,327**	**160,940,319**	**190,839,507**	**191,152,342**	**213,533,589**	**220,352,271**	**237,532,111**

TABLE 2-17: Summary of Cost of Power Expenses

	2015	2016	2017	2018 Forecast	2019 Bridge	2020 Test
	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS	MIFRS
4705 - Power Purchased	124,127,026	130,422,810	107,796,309	117,427,017	118,375,149	110,729,318
4707 - Global Adjustment	86,507,353	112,340,077	106,656,503	95,050,228	108,789,633	109,877,530
4708 - Charges - WMS	8,466,397	11,579,535	8,911,438	7,477,855	6,922,463	6,692,627
4712 - Charges - One Time	-	-	-	-	-	-
4714 - Charges, NW	16,794,858	17,034,086	16,194,986	16,920,575	16,811,773	17,791,870
4716 - Charges, CN	9,280,036	9,808,602	10,018,199	11,045,780	11,125,893	11,456,680
4730- Rural Rate Assistance Expense	-	-	-	-	-	-
4751 - Smart Metering Entity Charge	802,001	807,977	812,857	707,767	595,716	597,980
Total	**245,977,671**	**281,993,088**	**250,390,291**	**248,629,222**	**262,620,628**	**257,146,004**

TABLE 2-17 (Continued): Summary of Cost of Power Expenses

In accordance with the Filing Requirements, the commodity price estimate used to calculate CoP was determined using a split between RPP and non-RPP Class A and Class B customers based on 2017 actual data and uses the most current RPP price. Non-RPP consumption data has been further split between customers eligible for the Global Adjustment (GA) modifier vs. non-eligible. The RPP and non-RPP prices were obtained from the "Regulated Price Plan Prices and the Global Adjustment Modifier for the Period May 1, 2018 to April 30, 2019" and the "Regulated Price Plan Cost Supply Report May 1, 2018 – April 30, 2019". The GA modifier was applied to eligible customers and a weighted average commodity price was determined using the 2017 actual split between RPP, eligible non-RPP and non-eligible non-RPP customers. Table 2-18 below shows the calculation of the RPP and non-RPP forecast supply costs for 2019 and 2020 (Appendix 2-Z).



Step 1: **Allocation of Commodity** — **2017 Historical Actuals**

Customer Class Name	Last Actual kWh's	Class A kWh	Class B kWh	non-RPP non GA mod	non-RPP GA mod	non-RPP Total	RPP	Proportions (by Class) non-RPP %	Proportions (by Class) RPP %	
Residential	583,235,038	-	583,235,038	-	20,775,543	20,775,543	562,459,495	*3.56%*	*96.44%*	
General Service < 50 kW	199,305,813	-	199,305,813	-	30,270,481	30,270,481	169,035,332	*15.19%*	*84.81%*	
General Service 50 to 4,999 kW	923,584,587	115,794,666	807,789,921	587,790,269	41,162,312	628,952,581	178,837,339	*68.10%*	*19.36%*	
General Service 3000-4999 kW	44,136,954	38,071,189	6,065,765	6,065,765	-	6,065,765	-0	*13.74%*	*0.00%*	
Unmetered Scattered Load	2,368,616	-	2,368,616	2,172,398	-	2,172,398	196,218	*91.72%*	*8.28%*	
Sentinel Lighting	797,644	-	797,644	-	44,091	44,091	753,553	*5.53%*	*94.47%*	
Street Lighting	6,962,744	-	6,962,744	6,944,435	-	6,944,435	18,309	*99.74%*	*0.26%*	
Large Use - Regular	189,732,833	167,657,931	22,074,902	22,074,903	-	22,074,903	-2	*11.63%*	*0.00%*	
Large Use - 3TS	174,153,374	174,153,377	-3	-	-	-	-3	*0.00%*	*0.00%*	
TOTAL	**2,124,277,603**	**495,677,164**	**1,628,600,439**	**625,047,771**	**92,252,428**	**717,300,198**	**911,300,240**			
%	*100.00%*		*100.00%*	*38.38%*	*5.66%*		*55.96%*	*44.04%*	*55.96%*	*100.00%*

Step 2: **Forecasted Commodity Prices**

Step 2a: **GA Modifier** ($/MWh) — non-RPP: $ (44.38) — Source: RPP-GA-Modifier-Report-20180419, Table 1: RPP Prices and GA

Step 2b: **Forecasted Commodity Prices** — Table ES-1: Average RPP Supply Cost Summary**

		non-RPP non GA mod	non-RPP GA mod	RPP
HOEP ($/MWh)	Load-Weighted Price for RPP Consumers	$21.57	$21.57	
Global Adjustment ($/MWh)	Impact of the Global Adjustment	$103.80	$59.42	
Adjustments ($/MWh)		$1.00	$1.00	
TOTAL ($/MWh)	Average Supply Cost for RPP Consumers	**$126.37**	**$81.99**	**$81.99**
$/kWh		***$0.12637***	***$0.08199***	***$0.08199***
Percentage shares (%)	non-RPP (GA mod/non-GA mod), RPP	38.38%	5.66%	55.96%
WEIGHTED AVERAGE PRICE ($/kWh)	**(Sum of I43, J43 and L43)**	**$0.0485**	**$0.0046**	**$0.0459**

Source: RPP-Supply-Cost-Report-20180501-20190430-co

Step 3: **Commodity Expense**

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

Class A

Customer	Revenue	Expense	2019 kWh Volume	2019 kW Volume	2019 HOEP Rate/kWh	2019 Avg GA/kW	2019 Amount	2020 kWh Volume	2020 kW Volume	2020 HOEP Rate/kWh	2020 Avg GA/kW	2020 Amount
General Service 50 to 4,999 kW	4035	4705	254,777,319	564,367	0.02157	36.02	$25,821,228	244,990,181	560,011	0.02157	36.02	$25,453,252
General Service 3000-4999 kW	4015	4705	28,405,832	126,556	0.02157	36.02	$5,170,632	27,059,384	125,396	0.02157	36.02	$5,099,825
Large Use - Regular	4020	4705	279,265,293	454,420	0.02157	36.02	$22,389,713	250,203,683	439,294	0.02157	36.02	$21,218,084
Large Use - 3TS	4020	4705	241,793,036	475,523	0.02157	36.02	$22,341,442	238,624,714	463,625	0.02157	36.02	$21,844,588
			804,241,479	1620866.307			$75,723,015					$73,615,748

Class B

Customer	UoM	Revenue	Expense	2019 Volume	2019 rate ($/kWh):	2019 Amount	2020 Volume	2020 rate ($/kWh):	2020 Amount
Class Name		USA #	USA #						
Residential	kWh	4006	4705	583,496,333	$ 0.0990	$57,779,439	573,182,636	$0.0990	$56,758,148
General Service < 50 kW	kWh	4010	4705	205,597,336	0.099022797	$20,358,823	201,528,025	$0.0990	$19,955,869
General Service 50 to 4,999 kW	kWh	4035	4705	693,760,726	0.099022797	$68,698,127	667,110,270	$0.0990	$66,059,125
General Service 3000-4999 kW	kWh	4015	4705	0	0.099022797	$0	0	$0.0990	$0
Unmetered Scattered Load	kWh	4010	4705	2,314,844	0.099022797	$229,222	2,290,933	$0.0990	$226,855
Sentinel Lighting	kWh	4030	4705	783,454	0.099022797	$77,580	758,146	$0.0990	$75,074
Street Lighting	kWh	4025	4705	6,657,045	0.099022797	$659,199	6,618,490	$0.0990	$655,381
Large Use - Regular	kWh	4020	4705	36,752,918	0.099022797	$3,639,377	32,928,243	$0.0990	$3,260,647
Large Use - 3TS	kWh	4020	4705	0	0.099022797	$0	0	$0.0990	$0
TOTAL				**1,529,362,656**		**$151,441,767**	**1,484,416,743**		**$146,991,099**

Total

Customer	UoM	Revenue	Expense	2019 Volume	2019 avg rate ($/kWh):	2019 Amount	2020 Volume	2020 avg rate ($/kWh):	2020 Amount
Class Name		USA #	USA #						
Residential	kWh	4006	4705	583,496,333	0.099022797	$57,779,439	573,182,636	0.0990	$56,758,148
General Service < 50 kW	kWh	4010	4705	205,597,336	0.099022797	$20,358,823	201,528,025	0.0990	$19,955,869
General Service 50 to 4,999 kW	kWh	4035	4705	948,538,045	0.0996	$94,519,355	912,100,451	0.1003	$91,512,377
General Service 3000-4999 kW	kWh	4015	4705	28,405,832	0.1820	$5,170,632	27,059,384	0.1885	$5,099,825
Unmetered Scattered Load	kWh	4010	4705	2,314,844	0.099022797	$229,222	2,290,933	0.0990	$226,855
Sentinel Lighting	kWh	4030	4705	783,454	0.099022797	$77,580	758,146	0.0990	$75,074
Street Lighting	kWh	4025	4705	6,657,045	0.099022797	$659,199	6,618,490	0.0990	$655,381
Large Use - Regular	kWh	4020	4705	316,018,211	0.082365792	$26,029,090	283,131,926	0.0865	$24,478,731
Large Use - 3TS	kWh	4020	4705	241,793,036	0.092399031	$22,341,442	238,624,714	0.0915	$21,844,588
TOTAL				**2,333,604,135**		**$227,164,782**	**2,245,294,704**		**$220,606,847**

**Regulated Price Plan Prices and the Global Adjustment Modifier for the Period May 1, 2018 – April 30, 2019*

*** Regulated Price Plan Cost Supply Report May 1, 2018 - April 30, 2019*

Table 2-18 Forecast of Commodity Expense

ENWIN applied the weighted average price to all customer classes in both 2019 and 2020 in order to determine an estimated cost of supply.

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

Wholesale Market Service Charge:

On December 20, 2018 the Board issued a Decision with Reasons and Rate Order (EB-2018-0294) establishing that the Wholesale Market Service rate ("WMS rate") used by rate regulated distributors to bill their customers shall be $0.0030 per kilowatt hour effective January 1, 2019. The unit rate is applied to a customer's metered energy consumption adjusted by the distributor's Board-approved Total Loss Factor. ENWIN has excluded the Rural or Remote Electricity Protection (RRRP) charge of $0.0005 per kilowatt hour and the Capacity Based Recovery (CBR) component of $0.0004 per kilowatt hour for Class B customers effective January 1, 2019. As shown in Table 2-19, below, ENWIN used 0.0030 per kilowatt hour for the WMS charge in its 2020 Test Year CoP calculations.

		2019			2020		
Customer	**4708**						
Class Name	UoM	Volume	rate ($/kWh):	Amount	Volume	rate ($/kWh):	Amount
Residential	kWh	562,297,710	0.0030	$1,686,893	555,916,913	0.0030	$1,667,751
General Service < 50 kW	kWh	198,127,913	0.0030	$594,384	195,457,487	0.0030	$586,372
General Service 50 to 4,999 kW	kWh	914,077,329	0.0030	$2,742,232	884,625,659	0.0030	$2,653,877
General Service 3000-4999 kW	kWh	27,373,838	0.0030	$82,122	26,244,286	0.0030	$78,733
Unmetered Scattered Load	kWh	2,230,745	0.0030	$6,692	2,221,924	0.0030	$6,666
Sentinel Lighting	kWh	754,991	0.0030	$2,265	735,308	0.0030	$2,206
Street Lighting	kWh	6,415,192	0.0030	$19,246	6,419,124	0.0030	$19,257
Large Use - Regular	kWh	314,602,500	0.0030	$943,807	281,863,540	0.0030	$845,591
Large Use - 3TS	kWh	281,607,579	0.0030	$844,823	277,391,364	0.0030	$832,174
TOTAL		**2,307,487,797**		**$6,922,463**	**2,230,875,607**		**$6,692,627**

Table 2-19: Forecast Wholesale Market Service Costs

Network and Connection Charges:

Electricity distributors are charged for transmission costs at the wholesale level and subsequently pass these charges on to their distribution customers through the Retail Transmission Service Rates (RTSRs). For each distribution rate class there are two RTSRs:

- RTSR Network Charge – recovers the Uniform Transmission Rates (UTR) wholesale network service charge
- RTSR Connection Charge – recovers the UTR wholesale line and transformation connection charges

ENWIN pays Network and Connection charges to the IESO as a connected wholesale customer.

ENWIN used its actual 2019 and 2020 forecast Network and Connection charges as the best proxy for the charges in 2019 and 2020 to estimate this portion of its cost of power. As shown in Table 2-20 below, ENWIN's Network and Connection charges have not changed significantly from year to year. Table 2-21 shows a comparison of the 2019 and 2020 RTSRs.

Customer Class	Transmission Charge		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Proposed 2020
Residential	Network	Per kWh	0.0057	0.0066	0.0067	0.0078	0.0079	0.0080	0.0079	0.0078	0.0078	0.0078	0.0082	0.0089
	Connection	Per kWh	0.0041	0.0043	0.0044	0.0046	0.0045	0.0047	0.0047	0.0049	0.0053	0.0057	0.0058	0.0061
General Service < 50 kW	Network	Per kWh	0.0052	0.0060	0.0061	0.0071	0.0072	0.0073	0.0072	0.0072	0.0072	0.0072	0.0076	0.0082
	Connection	Per kWh	0.0038	0.0040	0.0041	0.0043	0.0042	0.0043	0.0043	0.0045	0.0049	0.0053	0.0054	0.0057
General Service 50 to 4,999 kW	Network	Per kW	1.8005	2.0814	2.1246	2.4616	2.5062	2.5323	2.4913	2.4619	2.4568	2.4428	2.5629	2.7675
	Connection	Per kW	1.3332	1.4025	1.4389	1.4965	1.4579	1.5090	1.5019	1.5683	1.6958	1.8204	1.8611	1.9560
General Service 3000-4999 kW	Network	Per kW	2.4402	2.8209	2.8794	3.3362	3.3967	3.4321	3.3766	3.3368	3.3299	3.3109	3.4737	2.7675
	Connection	Per kW	1.8069	1.9009	1.9502	2.0282	1.9759	2.0451	2.0355	2.1255	2.2983	2.4672	2.5223	1.9560
Unmetered Scattered Load	Network	Per kWh	0.0052	0.0060	0.0061	0.0071	0.0072	0.0073	0.0072	0.0072	0.0072	0.0072	0.0076	0.0082
	Connection	Per kWh	0.0038	0.0040	0.0041	0.0043	0.0042	0.0043	0.0043	0.0045	0.0049	0.0053	0.0054	0.0057
Sentinel Lighting	Network	Per kW	1.6474	1.9044	1.9439	2.2523	2.2931	2.3170	2.2795	2.2526	2.2479	2.2351	2.3450	2.5322
	Connection	Per kW	1.2198	1.2832	1.3165	1.3692	1.3339	1.3806	1.3741	1.4349	1.5516	1.6656	1.7028	1.7896
Street Lighting	Network	Per kW	1.6453	1.9020	1.9415	2.2495	2.2903	2.3142	2.2768	2.2499	2.2452	2.2324	2.3421	2.5291
	Connection	Per kW	1.2184	1.2818	1.3151	1.3677	1.3325	1.3792	1.3727	1.4334	1.5500	1.6639	1.7011	1.7878
Large Use - Regular	Network	Per kW	2.4778	2.8643	2.9237	3.3875	3.4489	3.4849	3.4285	3.3880	3.3810	3.3617	3.5270	3.8085
	Connection	Per kW	1.3196	1.3935	1.4297	1.4869	1.4486	1.4994	1.4923	1.5584	1.6851	1.8089	2.5919	2.7241
Large Use - 3TS	Network	Per kW	2.4778	2.8643	2.9237	3.3875	3.4489	3.4849	3.4285	3.3880	3.3810	3.3617	3.5270	3.8085
	Connection	Per kW	0.5365	0.5596	0.5741	0.5971	0.5817	0.6021	0.5993	0.6258	0.6767	0.7264	0.7426	0.7805
Large Use - Ford Annex	Network	Per kW	2.4778	2.8643	2.9237	3.3875	3.4489	3.4849	3.4285	3.3880	3.3810	3.3617	3.5270	3.8085
	Connection	Per kW	0.5365	0.5596	0.5741	0.5971	0.5817	0.6021	0.5993	0.6258	0.6767	0.7264	0.7426	0.7805

Table 2-20: Historical ENWIN Hydro Transmission Charges

Transmission – Network

(volumes for the bridge and test years are loss adjusted)

		2019			2020		
Customer	**4714**						
Class Name	UoM	Volume	$/kWh or $/kW	Amount	Volume	$/kWh or $/kW	Amount
Residential	kWh	562,297,710	0.0082	$4,610,841	555,916,913	0.0089	$4,947,661
General Service < 50 kW	kWh	198,127,913	0.0076	$1,505,772	195,457,487	0.0082	$1,602,751
General Service 50 to 4,999 kW	kW	2,455,904	2.5629	$6,294,236	2,436,951	2.7675	$6,744,262
General Service 3000-4999 kW	kW	126,556	3.4737	$439,618	125,396	2.7675	$347,033
Unmetered Scattered Load	kWh	2,230,745	0.0076	$16,954	2,221,924	0.0082	$18,220
Sentinel Lighting	kW	2,092	2.3450	$4,906	2,038	2.5322	$5,161
Street Lighting	kW	18,420	2.3421	$43,141	18,431	2.5291	$46,614
Large Use - Regular	kW	561,013	3.5270	$1,978,693	542,339	3.8085	$2,065,498
Large Use - 3TS	kW	543,695	3.5270	$1,917,612	528,993	3.8085	$2,014,670
TOTAL		**766,364,048**		**$16,811,773**	**757,250,473**		**$17,791,870**

Transmission – Connection

(volumes for the bridge and test years are loss adjusted)

		2019			2020		
Customer	**4716**						
Class Name	UoM	Volume	$/kWh or $/kW	Amount	Volume	$/kWh or $/kW	Amount
Residential	kWh	562,297,710	0.0058	$3,261,327	555,916,913	0.0061	$3,391,093
General Service < 50 kW	kWh	198,127,913	0.0054	$1,069,891	195,457,487	0.0057	$1,114,108
General Service 50 to 4,999 kW	kW	2,455,904	1.8611	$4,570,683	2,436,951	1.9560	$4,766,676
General Service 3000-4999 kW	kW	126,556	2.5223	$319,212	125,396	1.9560	$245,275
Unmetered Scattered Load	kWh	2,230,745	0.0054	$12,046	2,221,924	0.0057	$12,665
Sentinel Lighting	kW	2,092	1.7028	$3,562	2,038	1.7896	$3,647
Street Lighting	kW	18,420	1.7011	$31,334	18,431	1.7878	$32,951
Large Use - Regular	kW	561,013	2.5919	$1,454,090	542,339	2.7241	$1,477,386
Large Use - 3TS	kW	543,695	0.7426	$403,748	528,993	0.7805	$412,879
TOTAL		**766,364,048**		**$11,125,893**	**757,250,473**		**$11,456,680**

Table 2-21: Forecast Transmission Costs

ENWIN acknowledges that the transmission costs will be updated to reflect any new rates that may become available prior to the approval of its application.

Smart Meter Entity Charges:

On March 28, 2018 the Board issued a Decision and Order (EB-2017-0290) that effective January 1, 2018, the Smart Metering Entity charge to be levied and collected by Distributors identified in the Board's annual Yearbook of Electricity Distributors from Residential and General Service<50kW customers shall be $0.57 per month. ENWIN used $0.57 per month for the Smart Meter Entity charge in its 2020 Test Year CoP calculations as shown below in Table 2-22.

		2019			2020		
Customer	**4751**						
Class Name	UoM	Volume	rate ($/kWh):	Amount	Volume	rate ($/kWh):	Amount
Residential	Customer	79,969	0.57	$546,988	80,293	0.57	$549,204
General Service < 50 kW	Customer	7,124	0.57	$48,728	7,131	0.57	$48,776
TOTAL		**88,646**		**$595,716**	**88,981**		**$597,980**

Table 2-22: Forecast Smart Meter Entity Costs

2.4 Treatment of Stranded Meter Assets

2.4.1 History

On March 13, 2014, ENWIN received its rate order from the Board in regards to its Smart Meter Disposal and Cost Recovery application EB-2013-0348. Smart meters had been 100% installed for Residential and General Service <50 KW customers and costs incurred up to December 31, 2012 and the incremental revenue requirement for Operational, Maintenance and Administrative ("OM&A") costs in 2012 were approved by the Board.

ENWIN received approval to dispose of its estimated net book value of stranded assets as at December 31, 2012 in its Application for Recovery of Stranded Meter Costs and Recovery of the Incremental Requirement for Smart Meter Implementation application EB-2017-0132. The Board approved recovery of stranded meter costs through applicable rate riders over a 26 month period starting November 1, 2017.

2.4.2 Stranded Meter Treatment

As discussed above, ENWIN was approved for recovery of its net book value of stranded assets in its Application for Recovery of Stranded Meter Costs and Recovery of the Incremental Requirement for Smart Meter Implementation application. Accordingly, ENWIN is not required to complete the Board's Smart Meter Model and the Board Appendix 2-S.

2.5 Capital Expenditures

2.5.1 Planning

ENWIN has prepared its Distribution System Plan ("DSP"), in accordance with Chapter 5 of the Board's Filing Requirements for Electricity Distribution and Transmission Applications, dated March 2013 ("Chapter 5 Filing Requirements") in support of its 2020 forward test-year cost of service rate application.

The planning objectives that are considered relate to ENWIN's values of Safety, Reliability, Sufficiency, Capital and Operating Efficiency, Risk Minimization and Sustainability. As well, capital investment decisions must ensure that appropriate resources are available to complete mandatory system access projects such as new customer connections, road widenings and other OEB mandates such as smart meters. These are balanced against expenditures for system renewal, system service and general plant. Expenditure requirements are considered against inputs from customer engagement activities and the desire to minimize and smooth rate increases while satisfying the stated needs and preferences of the customers.

Capital spending information is provided for the 2009-2017 Historical Years, 2018 Forecast Year, 2019 Bridge Year and the 2020 Test Year. The DSP also contains forecasted capital expenditures beyond the 2020 Test Year, for 2020-2024, representing the total planning horizon of the instructed five years.

The DSP contains four sections including an introductory section as Section 1. Section 2 provides an overview of the DSP, including coordinated planning with third parties, performance measurement for continuous improvement and realized efficiencies due to smart meters. Section 3 provides an overview of ENWIN's asset management process including an overview of assets managed, asset lifecycle optimization policies and procedures and system capability assessment for renewable energy generation. Section 4 provides a summary of ENWIN's capital expenditure plan, including an overview of the capital expenditure planning process, a capital expenditure summary and a justification of capital expenditures.

Information related to the Regional Planning process is found in Section 5.2.2 of the DSP.

2.5.2 Capital Expenditure Summary

Appendix 2-AB provides the annual capital expenditure for the 2009-2017 Historical Years, 2018 Forecast Year, 2019 Bridge Year, and the 2020 Test Year. It also includes forecasted capital expenditures beyond the 2020 Test Year, for 2020-2024, representing the total planning horizon of the instructed five years. It is provided in the table below, and included in Attachment 2-X of this Exhibit.

First year of Forecast Period:												
2020												
CATEGORY	**Historical Period** (previous plan[1] & actual)											
	2009			**2010**			**2011**			**2012**		
	Plan	**Actual**	**Var**	**Plan**	**Actual**	**Var**	**Plan**	**Actual**	**Var**	**Plan**	**Actual**	**Var**
	$ '000		%	*$ '000*		%	*$ '000*		%	*$ '000*		%
System Access	2,876	1,608	-44.1%	15,061	8,443	-43.9%	5,187	5,099	-1.7%	5,097	5,870	15.2%
System Renewal	6,789	7,848	15.6%	6,380	6,921	8.5%	8,874	8,133	-8.4%	9,483	7,569	-20.2%
System Service	604	253	-58.1%	173	26	-85.1%	910	727	-20.2%	904	983	8.7%
General Plant	8,965	8,067	-10.0%	12,635	9,453	-25.2%	17,123	3,725	-78.2%	3,698	2,660	-28.1%
TOTAL EXPENDITURE	19,234	17,776	-7.6%	34,249	24,844	-27.5%	32,094	17,683	-44.9%	19,182	17,083	-10.9%
Capital Contributions	-	- 520	--	-	- 224	--	-	- 321	--	-	- 1,496	--
Net Capital Expenditures	19,234	17,255	-10.3%	34,249	24,619	-28.1%	32,094	17,362	-45.9%	19,182	15,587	-18.7%
System O&M	$ 5,309	$ 4,956	-6.6%	$ 5,515	$ 4,754	-13.8%	$ 5,134	$ 4,252	-17.2%	$ 4,434	$ 4,157	-6.2%

CATEGORY	**Historical Period** (previous plan[1] & actual)											
	2013			**2014**			**2015**			**2016**		
	Plan	**Actual**	**Var**	**Plan**	**Actual**	**Var**	**Plan**	**Actual**	**Var**	**Plan**	**Actual**	**Var**
	$ '000		%	*$ '000*		%	*$ '000*		%	*$ '000*		%
System Access	3,079	4,903	59.2%	6,638	4,363	-34.3%	6,258	2,762	-55.9%	3,638	3,946	8.5%
System Renewal	10,766	8,126	-24.5%	8,109	6,952	-14.3%	6,719	8,221	22.4%	5,501	5,475	-0.5%
System Service	1,645	1,304	-20.7%	2,643	2,594	-1.8%	6,363	6,433	1.1%	5,196	2,931	-43.6%
General Plant	8,985	4,680	-47.9%	6,387	4,885	-23.5%	3,273	3,499	6.9%	5,369	2,253	-58.0%
TOTAL EXPENDITURE	24,475	19,014	-22.3%	23,777	18,794	-21.0%	22,613	20,915	-7.5%	19,704	14,605	-25.9%
Capital Contributions	-	- 757	--	- 3,131	- 2,403	-23.2%	- 3,485	- 4,322	24.0%	- 1,874	- 412	-78.0%
Net Capital Expenditures	24,475	18,257	-25.4%	20,646	16,391	-20.6%	19,128	16,592	-13.3%	17,830	14,194	-20.4%
System O&M	$ 4,729	$ 4,229	-10.6%	$ 4,332	$ 4,460	3.0%	$ 4,518	$ 4,398	-2.7%	$ 4,764	$ 4,631	-2.8%

Table 2-23: Historical and Future Capital Expenditures (Appendix 2-AB)

CATEGORY	Historical Period (previous plan[1] & actual)									Forecast Period (planned)				
	2017			2018			2019			2020	2021	2022	2023	2024
	Plan	Actual	Var	Plan	Forecast	Var	Plan	Actual[2]	Var					
	$ '000		%	$ '000		%	$ '000		%	$ '000				
System Access	3,325	3,963	19.2%	5,269	3,310	-37.2%	7,267		-100.0%	6,205	3,476	3,526	3,577	3,628
System Renewal	6,883	5,456	-20.7%	6,482	5,586	-13.8%	7,289		-100.0%	8,440	8,009	7,605	7,850	7,366
System Service	5,979	3,976	-33.5%	6,135	4,427	-27.8%	4,221		-100.0%	3,537	3,622	3,610	3,986	3,623
General Plant	4,652	2,058	-55.8%	2,399	3,098	29.1%	7,507		-100.0%	5,021	4,283	3,856	4,174	4,213
TOTAL EXPENDITURE	20,839	15,452	-25.8%	20,285	16,421	-19.0%	26,284	-	-100.0%	23,203	19,390	18,597	19,587	18,830
Capital Contributions	- 1,234	- 2,217	79.6%	- 2,921	- 1,889	-35.3%	- 4,898		-100.0%	- 3,252	- 813	- 823	- 834	- 844
Net Capital Expenditures	19,605	13,236	-32.5%	17,364	14,533	-16.3%	21,386		-100.0%	19,951	18,577	17,774	18,753	17,986
System O&M	$ 8,813	$ 9,757	10.7%	$ 9,488	$ 9,825	3.6%	$ 10,942		-100.0%	$ 10,904	$ 11,049	$ 11,068	$ 11,102	$ 11,096

Notes to the Table:

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

2. Indicate the number of months of 'actual' data included in the last year of the Historical Period (normally a 'bridge' year): - 0

Table 2-23 (Continued): Historical and Future Capital Expenditures (Appendix 2-AB)

2.5.3 Capital Expenditures by Project

The table below provides a summary of all capital projects for the years 2009 through to the 2019 Bridge Year and the 2020 Test year, which is consistent with Board Appendix 2-AA and is included in Attachment 2-D of this Exhibit.

Projects	2009	2010	2011	2011	2012	2013	2014
Reporting Basis	**CGAAP**	**CGAAP**	**CGAAP**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**
System Access							
Overhead customer connections	517,019	536,232	475,238	475,238	358,751	561,507	738,242
Underground customer connections	317,524	219,646	318,004	318,004	543,922	943,511	322,463
Bridge Plaza	-	-	-	-	-	-	-
Windsor-Essex Parkway	-	-	599,974	599,974	1,307,485	2,252,949	2,504,867
City driven road work	532,355	867,290	86,393	86,393	2,318,762	214,793	1,338
Wholesale metering: Keith TS feeders	-	-	-	-	-	-	-
Meter work - new customers	118,560	236,541	206,121	206,121	588,110	743,474	795,630
Smart meters	96,704	6,199,730	3,211,161	3,211,161	192,910	-	-
Wholesale meters	25,458	383,717	201,840	201,840	560,208	187,071	-
Sub-Total	1,607,620	8,443,156	5,098,731	5,098,731	5,870,148	4,903,306	4,362,540
System Renewal							
4 kV Conversion	5,239,546	5,283,768	5,453,919	4,973,310	3,920,134	3,612,272	2,258,878
27.6 kV Pole replacements	556,477	660,866	1,218,716	1,111,321	1,389,392	1,435,487	2,548,352
Planned cable replacements	912,191	5,711	328,115	299,201	743,404	691,288	91,439
Planned & reactive transformers	372,857	208,109	342,797	312,589	280,604	769,849	788,478
Reactive pole replacements	89,524	222,613	131,549	119,957	294,596	192,482	295,675
Reactive equipment replacements	13,233	4,057	78,565	71,642	33,982	46,978	97,628
Reactive conductor replacements	24,039	98,699	326,584	297,805	67,733	112,051	5,943
Manhole rebuilds	262,874	318,772	252,696	230,428	678,724	819,375	29,912
Switching units	37,824	118,712	-	-	160,639	338,501	622,781
Station equipment	251,015	-	-	-	-	-	-
Other renewal	88,732	-	-	-	-	108,065	212,907
	-	-	-	-	-	-	-
Sub-Total	7,848,312	6,921,307	8,132,941	7,416,253	7,569,208	8,126,349	6,951,993
System Service							
Conductor upgrades	-	-	-	-	225,054	554,407	1,308,605
Feeder reliability improvement	-	-	43,372	39,550	-	-	13,763
New switches and sectionalizers	40,423	-	-	-	2,620	467,266	783,537
New tie connections	-	-	231,106	210,741	2,213	125,765	163,316
Padmounted SU automation	191,058	-	-	-	269,623	43,971	-
Radial branch back-ups	-	-	-	-	-	-	250,583
SCADA improvements	112,704	25,783	452,155	412,310	210,970	79,363	74,411
Transformer station upgrades	-	-	-	-	-	7,870	-
Other	- 91,182	-	-	-	272,458	25,621	-
Sub-Total	253,003	25,783	726,633	662,601	982,938	1,304,262	2,594,215
General Plant							
Building	515,522	581,138	470,405	470,405	504,553	194,885	574,788
Information Technology	786,130	659,743	326,625	326,625	741,602	650,970	2,434,000
Vehicles	-	-	-	-	-	-	-
Fleet & Welding	213,097	25,900	41,157	41,157	56,098	32,204	40,909
Tools	202,244	105,287	150,221	150,221	141,802	242,892	144,424
GIS	-	479,432	196,492	196,492	23,880	-	-
ERP	6,349,583	7,601,892	2,539,787	2,539,787	- 4,203	-	-
CIS	-	-	-	-	1,196,656	3,558,982	1,691,004
Sub-Total	8,066,576	9,453,392	3,724,687	3,724,687	2,660,388	4,679,933	4,885,125
Miscellaneous							
Total	**17,775,511**	**24,843,638**	**17,682,992**	**16,902,271**	**17,082,682**	**19,013,849**	**18,793,873**
Less Renewable Generation Facility Assets and Other Non-Rate-Regulated Utility Assets (input as negative)	-	-	-	-	-	-	-
Customer Contributions	- 520,301	- 224,159	- 321,196	- 321,196	- 1,495,683	- 757,276	- 2,403,163
Total	**17,255,209**	**24,619,479**	**17,361,796**	**16,581,075**	**15,586,999**	**18,256,573**	**16,390,710**

Table 2-24: Capital Projects Table

Projects	2015	2016	2017	2018	2019 Bridge Year	2020 Test Year
Reporting Basis	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**
System Access						
Overhead customer connections	859,451	881,637	464,048	515,000	525,000	535,500
Underground customer connections	682,178	1,107,193	1,269,433	1,100,000	750,000	525,000
Bridge Plaza	128,336	1,067,769	1,050,168	550,000	1,700,000	1,000,000
Windsor-Essex Parkway	706,675	- 9,320	-	-	-	-
City driven road work	7,098	438,733	598,995	675,000	3,886,000	3,250,000
Wholesale metering: Keith TS feeders	-	-	-	-	-	477,000
Meter work - new customers	337,035	459,611	580,797	470,000	406,000	417,000
Smart meters	-	-	-	-	-	-
Wholesale meters	41,343	-	-	-	-	-
Sub-Total	2,762,116	3,945,623	3,963,441	3,310,000	7,267,000	6,204,500
System Renewal						
4 kV Conversion	210,618	25,896	-	-	-	-
27.6 kV Pole replacements	3,740,967	2,659,646	2,350,615	2,200,000	2,950,000	3,300,000
Planned cable replacements	-	-	41,908	215,077	120,000	512,000
Planned & reactive transformers	815,514	701,444	1,104,211	1,265,000	1,350,000	1,325,000
Reactive pole replacements	276,518	394,601	315,268	150,000	100,000	100,000
Reactive equipment replacements	597,796	282,855	194,262	115,218	280,000	280,000
Reactive conductor replacements	11,247	69,635	190,110	30,000	90,000	90,000
Manhole rebuilds	138,412	25,448	100,103	160,000	150,000	150,000
Switching units	666,285	498,466	271,844	340,000	825,000	1,025,000
Station equipment	782,628	1,573	463,166	2,658	-	-
Other renewal	981,119	815,322	424,201	1,108,250	1,424,000	1,658,000
	-					
Sub-Total	8,221,104	5,474,883	5,455,688	5,586,203	7,289,000	8,440,000
System Service						
Conductor upgrades	1,382,704	147,390	713,201	741,000	712,000	200,000
Feeder reliability improvement	3,105,249	209,817	864,033	1,600,000	1,250,000	1,224,000
New switches and sectionalizers	701,799	658,423	478,149	594,517	504,000	144,000
New tie connections	611,084	218,062	254,112	92,316	155,000	169,000
Padmounted SU automation	-	1,060,073	524,898	703,167	550,000	550,000
Radial branch back-ups	6,745	12,293	467,674	355,715	400,000	400,000
SCADA improvements	207,683	194,254	446,853	240,000	595,000	265,000
Transformer station upgrades	409,733	380,335	177,558	100,000	50,000	200,000
Other	7,892	50,524	49,089	180	5,000	385,000
Sub-Total	6,432,888	2,931,171	3,975,568	4,426,895	4,221,000	3,537,000
General Plant						
Building	357,412	191,140	351,588	354,000	2,592,330	1,521,000
Information Technology	1,055,463	704,337	888,462	-	-	-
Vehicles	-	-	-	833,547	2,652,178	1,604,576
Fleet & Welding	30,102	81,999	87,479	87,500	70,500	74,500
Tools	119,993	135,286	231,272	90,000	187,000	102,000
GIS	1,935,870	774,857	-	1,733,000	2,005,400	1,719,000
ERP	-	365,793	498,746	-	-	-
CIS	-	-	-	-	-	-
Sub-Total	3,498,840	2,253,412	2,057,547	3,098,047	7,507,408	5,021,076
Miscellaneous						
Total	**20,914,948**	**14,605,089**	**15,452,244**	**16,421,145**	**26,284,408**	**23,202,576**
Less Renewable Generation Facility Assets and Other Non-Rate-Regulated Utility Assets (input as negative)	-	-	-	-	-	-
Customer Contributions	- 4,322,469	- 411,579	- 2,216,539	- 1,888,586	- 4,898,000	- 3,251,860
Total	**16,592,479**	**14,193,510**	**13,235,705**	**14,532,559**	**21,386,408**	**19,950,716**

Table 2-24 (Continued): Capital Projects Table

2.5.4 Capital Expenditures Variance Analysis

The following analysis has been prepared in $000's (rounded) and is consistent with the presentation in Appendix 2-AB Capital Expenditure Summary (also provided as Table 2-23).

2009 Board Approved versus 2009 Actual

ENWIN experienced an overall decrease in capital expenditures of $1,978,671 from 2009 Board Approved budget to 2009 Actual results summarized in Table 2-25 below.

CATEGORY	2009 Board Approved	2009 Actual	Variance	Variance
	$ '000			%
System Access	2,877	1,608	- 1,269	-44.1%
System Renewal	6,789	7,848	1,060	15.6%
System Service	604	253	- 351	-58.1%
General Plant	8,965	8,067	- 898	-10.0%
TOTAL EXPENDITURE	**19,234**	**17,776**	**- 1,458**	**-7.6%**
Capital Contributions	-	- 520	- 520	--
Net Capital Expenditures	**19,234**	**17,255**	**- 1,979**	**-10.3%**

Table 2-25: 2009 Board Approved versus 2009 Actual Capital Expenditure Variances

System Access

The variance in System Access was primarily related to a decrease in new services and relocations. The economy struggled in 2009 and new services dropped to an all-time low of 200 services. ENWIN also planned to replace the wholesale meters at Malden TS in 2009; however the upgrade was deferred when Hydro One identified a problem with the transformers at that station and asked the LDCs to unload the station as much as possible, moving as much load to adjoining stations and feeders as possible. With that operation restriction in place through 2009, it was not possible to further transfer load off any Malden feeders in order to take the lines completely out of service in order to install the wholesale metering pole top metering units.

System Renewal

System Renewal expenditures in 2009 were $1,059,664 greater than originally filed in the 2009 Cost of Service. Additional 4 kV projects (22F1 and 22F9) were undertaken resulting in an expenditure increase of $300,898. Several other areas exceeded budget estimates, such as subdivisions, cable replacements and manhole rebuild expenditures.

System Service

The decrease in System Service expenditure of $350,672 between Board approved and 2009 actual was primarily due to SCADA improvements that were not undertaken and the monthly spare transformer adjustment that allowed for the capitalization of spare transformers in inventory.

General Plant

In 2009 the SAP comprehensive ERP system was initiated, however approvals were somewhat delayed resulting in a variance decrease over the Board Approved amount by $900,862. This was the primary cause of the variance in 2009.

Capital Contributions

The contributed capital amount for 2009 was larger than expected as the contributed capital for the Parkdale relocation in 2008 landed in 2009 capital totals.

2009 Actual versus 2010 Actual

ENWIN experienced an overall increase in capital expenditures of $7,364,270 from 2009 Actual results to 2010 Actual results summarized in Table 2-26 below.

CATEGORY	2009 Actual	2010 Actual	Variance	Variance
	$ '000			%
System Access	1,608	8,443	6,836	425.2%
System Renewal	7,848	6,921	- 927	-11.8%
System Service	253	26	- 227	-89.8%
General Plant	8,067	9,453	1,387	17.2%
TOTAL EXPENDITURE	**17,776**	**24,844**	**7,068**	**39.8%**
Capital Contributions	- 520	- 224	296	-56.9%
Net Capital Expenditures	**17,255**	**24,619**	**7,364**	**42.7%**

Table 2-26: 2009 Actual versus 2010 Actual Capital Expenditure Variances

System Access

The variance was primarily due to the increase in expenditures for smart meters, which increased by $6,103,026. The majority of residential meters were changed out in 2010. Small commercial customers also received smart meters, however conversion to smart meters for many commercial customers continued into 2011.

System Renewal

In 2010, ENWIN experienced a variance decrease of $927,005 in System Renewal capital expenditures which is the result of no major subdivision cable replacement projects identified during the year. Additionally, there were no expenditures on MTS stations and transformer replacements were down generally in conjunction with less cable work.

System Service

System Service expenditures in 2010 were $227,220 less than in 2009. This was primarily due to no remote operated padmount switching units installed as a pilot as was done in 2009 to provide a system improvement. No pole top reclosers were installed and the only pilot was a faulted circuit indicator pilot for $5,716.

General Plant

ENWIN experienced an increase in General Plant capital expenditures of $1,386,816. This was primarily due to the continued work on implementing the SAP ERP software which went live during 2010.

Capital Contributions

Capital contributions decreased due to a decrease in new customer connections in 2010 compared

to 2009.

2010 Actual versus 2011 Actual

ENWIN experienced an overall decrease in capital expenditures of $7,257,683 from 2010 Actual results to 2011 Actual results summarized in Table 2-27 below.

CATEGORY	2010 Actual	2011 Actual	Variance	Variance
	$ '000			%
System Access	8,443	5,099	- 3,344	-39.6%
System Renewal	6,921	8,133	1,212	17.5%
System Service	26	727	701	2718.3%
General Plant	9,453	3,725	- 5,729	-60.6%
TOTAL EXPENDITURE	**24,844**	**17,683**	**- 7,161**	**-28.8%**
Capital Contributions	- 224	- 321	- 97	43.3%
Net Capital Expenditures	**24,619**	**17,362**	**- 7,258**	**-29.5%**

Table 2-27: 2010 Actual versus 2011 Actual Capital Expenditure Variances

System Access

The decrease in System Access spending between 2011 and 2010 is the result of the completion of smart meter installations for residential customers in 2010 and the focus shifting to small commercial customers in 2011. City roadwork was also reduced in 2011.

System Renewal

System Renewal expenditures increased from 2010 to 2011. This is primarily due to increased investments into the 27.6 kV pole replacements and reactive replacements caused by significant storms experienced in July.

System Service

System Service expenditures significantly increase in 2011 due to extensions to the 55M24 feeder and the 25M7 feeder. Investments in SCADA were also made in 2011 including an additional instance to capture FIT and MicroFit generator data along with cyber security software updates.

General Plant

ENWIN experienced a decrease in general plant expenditures in 2011 due to the completion of the SAP ERP system in 2010.

Capital Contributions

The increase in capital contributions is due to an increase in customer connections as well as timing differences of prior year contributions for road widening projects.

2011 Actual versus 2012 Actual

ENWIN experienced an overall decrease in capital expenditures of $1,774,797 from 2011 Actual results to 2012 Actual results summarized in Table 2-28 below.

CATEGORY	2011 Actual	2012 Actual	Variance	Variance
	$ '000			%
System Access	5,099	5,870	771	15.1%
System Renewal	7,416	7,569	153	2.1%
System Service	663	983	320	48.3%
General Plant	3,725	2,660	- 1,064	-28.6%
TOTAL EXPENDITURE	**17,683**	**17,083**	**- 600**	**-3.4%**
Capital Contributions	- 321	- 1,496	- 1,174	365.7%
Net Capital Expenditures	**17,362**	**15,587**	**- 1,775**	**-10.2%**

Table 2-28: 2011 Actual versus 2012 Actual Capital Expenditure Variances

System Access

There are three significant changes in capital expenditures in 2012 that cause the increase. They include the following:

- Increased work on the Windsor-Essex Parkway;
- Two large City projects were completed during the year;
- Completion of the smart meter project

System Renewal

The increase in System Renewal expenditures in 2012 is primarily due to an increase in the 27.6 kV pole replacements, planned cable replacements and manhole rebuilds. Reactive pole replacements have increased in 2012 but continue to reflect an emphasis on catching up on years of pole pulling that had not been done during conversions as Bell and Cogeco had to transfer their plant onto new poles.

System Service

Conductor upgrades accounted for the majority of the variance in System Service in 2012. Two switching units and SCADA investments were also made during the year.

General Plant

General Plant investments decreased compared to the prior year due to the fact that there were no significant ERP costs as in previous years.

Capital Contributions

Capital contributions increased over 2011 due to work completed on the Windsor-Essex Parkway along with the two large City projects.

2012 Actual versus 2013 Actual

ENWIN experienced an overall increase in capital expenditures of $2,669,575 from 2012 Actual results to 2013 Actual results summarized in Table 2-29 below.

CATEGORY	2012 Actual	2013 Actual	Variance	Variance
	$ '000			%
System Access	5,870	4,903	- 967	-16.5%
System Renewal	7,569	8,126	557	7.4%
System Service	983	1,304	321	32.7%
General Plant	2,660	4,680	2,020	75.9%
TOTAL EXPENDITURE	**17,083**	**19,014**	**1,931**	**11.3%**
Capital Contributions	- 1,496	- 757	738	-49.4%
Net Capital Expenditures	**15,587**	**18,257**	**2,670**	**17.1%**

Table 2-29: 2012 Actual versus 2013 Actual Capital Expenditure Variances

System Access

The City of Windsor had significantly less roadwork done in 2013 as compared to 2012. ENWIN completed the work for one project that begun at the end of 2011 and carried through 2012. This significantly contributed to the decrease in capital expenditures.

System Renewal

ENWIN increased investments in planned and reactive transformer replacements in 2013. This, along with manhole repairs and switching unit replacements resulted in an increase in System Renewal expenditures.

System Service

System Service expenditures increased by $321,325 in 2013. The primary cause of this increase was due to conductor upgrades along with the introduction of new switches and sectionalizers.

General Plant

Significant work was completed on the new Customer Information System ("CIS") and Operational Data Store ("ODS") in 2013. NorthStar CIS and MeterSense ODS were selected and implementation was underway in 2013 with a go-live date set for first quarter 2014. This resulted in a large increase to the General Plant expenditures.

Capital Contributions

Windsor-Essex Parkway contributions decreased compared to 2012 due to timing differences on the completion of projects and the invoicing to the customer. This was the primary cause of the decrease in Capital Contributions between 2012 and 2013.

2013 Actual versus 2014 Actual

ENWIN experienced an overall decrease in capital expenditures of $1,865,863 from 2013 Actual results to 2014 Actual results summarized in Table 2-30 below.

CATEGORY	2013 Actual	2014 Actual	Variance	Variance
	$ '000			%
System Access	4,903	4,363	- 541	-11.0%
System Renewal	8,126	6,952	- 1,174	-14.5%
System Service	1,304	2,594	1,290	98.9%
General Plant	4,680	4,885	205	4.4%
TOTAL EXPENDITURE	**19,014**	**18,794**	- **220**	**-1.2%**
Capital Contributions	- 757	- 2,403	- 1,646	217.3%
Net Capital Expenditures	**18,257**	**16,391**	- **1,866**	**-10.2%**

Table 2-30: 2013 Actual versus 2014 Actual Capital Expenditure Variances

System Access

The decrease in System Access is due to a reduction in underground connections resulting from fewer subdivisions starts in 2014 compared to 2013.

System Renewal

System Renewal investments were reduced due to decreases in planned cable replacements since much of the oldest lead and non-tree retardant poly cables reached end of life and have been replaced.

System Service

In 2014, ENWIN continued to invest in conductor upgrades and sectionalizing and feeder tie switches. This resulted in an increase in System Service costs compared to 2013.

General Plant

General Plant expenditures in 2014 included increases in IT for hardware and software replacements, while decreases were made in CIS expenditures due to the completion of the NorthStar CIS project.

Capital Contributions

Capital contributions increased as the invoicing was completed on the 2013 work on the Windsor-Essex Parkway as well as the 2014 expenditures.

2014 Actual versus 2015 Actual

ENWIN experienced an overall increase in capital expenditures of $201,769 from 2014 Actual results to 2015 Actual results summarized in Table 2-31 below.

CATEGORY	2014 Actual	2015 Actual	Variance	Variance
	$ '000			%
System Access	4,363	2,762	- 1,600	-36.7%
System Renewal	6,952	8,221	1,269	18.3%
System Service	2,594	6,433	3,839	148.0%
General Plant	4,885	3,499	- 1,386	-28.4%
TOTAL EXPENDITURE	**18,794**	**20,915**	**2,121**	**11.3%**
Capital Contributions	- 2,403	- 4,322	- 1,919	79.9%
Net Capital Expenditures	**16,391**	**16,592**	**202**	**1.2%**

Table 2-31: 2014 Actual versus 2015 Actual Capital Expenditure Variances

System Access

System Access investments decreased in 2015 due to the mostly complete work on the Windsor-Essex Parkway. Meter work capital also decreased during the year contributing to the variance.

System Renewal

Significant expenditures were made in the 27.6 kV systems during 2015. As well, a one-time update of pole inspection database was undertaken as that database was in poor condition and adversely affecting ENWIN's ability to efficiently manage that asset type. These expenditures assisted in the increase in the investment category in 2015.

System Service

An increase in System Service expenditures was experienced in 2015 primarily caused by an upgrade to the 15M11 feeder and the second upgrade to the 15M8 feeder. A large expenditure was also made for new connections.

General Plant

One-time capital expenditures in IT in 2014 caused the decrease in capital expenditures in 2015, along with the completion of the NorthStar CIS system in 2014.

Capital Contributions

The Windsor-Essex Parkway relocation work was mostly complete in 2015 and therefore caused an increase in capital contributions compared to the prior year as invoicing was caught up and completed.

2015 Actual versus 2016 Actual

ENWIN experienced an overall decrease in capital expenditures of $2,398,969 from 2015 Actual results to 2016 Actual results summarized in Table 2-32 below.

CATEGORY	2015 Actual	2016 Actual	Variance	Variance
	$ '000			%
System Access	2,762	3,946	1,184	42.8%
System Renewal	8,221	5,475	- 2,746	-33.4%
System Service	6,433	2,931	- 3,502	-54.4%
General Plant	3,499	2,253	- 1,245	-35.6%
TOTAL EXPENDITURE	**20,915**	**14,605**	**- 6,310**	**-30.2%**
Capital Contributions	- 4,322	- 412	3,911	-90.5%
Net Capital Expenditures	**16,592**	**14,194**	**- 2,399**	**-14.5%**

Table 2-32: 2015 Actual versus 2016 Actual Capital Expenditure Variances

System Access

2016 saw another increase in customer connections which is consistent with a very active real estate market in Windsor. The relative increase in underground customer connections is consistent with a surge in subdivision developments that the City experienced in 2016.

System Renewal

The decrease in System Renewal expenditures was due to a reduced investment in the planned pole replacements for 2016. Station equipment investments were also reduced during the year.

System Service

System Service decreased between 2016 and 2015 due to the reduction in new connection work from lack of significant projects. Additionally conduction upgrades were lower than 2015 in part due to tow specific jobs that were planned and could not proceed due to land acquisition issues.

General Plant

General Plant expenditures decreased as GIS expenditures were lower than 2015 and while the OMS project continued, the large expenditure for licensing and development by the vendor were over and costs were largely staff costs for refinement.

Capital Contributions

The completion of the Windsor-Essex Parkway in 2015 caused the significant decrease in capital contributions in 2016.

2016 Actual versus 2017 Actual

ENWIN experienced an overall decrease in capital expenditures of $957,805 from 2016 Actual results to 2017 Actual results summarized in Table 2-33 below.

CATEGORY	2016 Actual	2017 Actual	Variance	Variance
	$ '000			%
System Access	3,946	3,963	18	0.5%
System Renewal	5,475	5,456	- 19	-0.4%
System Service	2,931	3,976	1,044	35.6%
General Plant	2,253	2,058	- 196	-8.7%
TOTAL EXPENDITURE	**14,605**	**15,452**	**847**	**5.8%**
Capital Contributions	- 412	- 2,217	- 1,805	438.5%
Net Capital Expenditures	**14,194**	**13,236**	**- 958**	**-6.7%**

Table 2-33: 2016 Actual versus 2017 Actual Capital Expenditure Variances

System Access

No significant variances occurred in 2017 for System Access expenditures.

System Renewal

System Renewal expenditures were consistent with 2016.

System Service

System Service expenditures were increased due to additional work completed on the conductor upgrade. Feeder reliability improvement projects were increased in 2017 as the engineering was completed in 2016.

General Plant

The decrease in General Plant was not significant in 2017 and largely due to the fact that the effort to implement GIS and to scrub data was ending and that area was moving to more of a maintenance mode, save for specific project implementations such as the CYME network analysis model project which, although started in 2016 was largely delivered in 2017.

Capital Contributions

Capital contributions in 2017 were higher than in 2016. This is in part due to Windsor Detroit Bridge Authority (WDBA) capital contributions that were capitalized in 2017 but were for 2016 work. This had the effect of overstating the 2016 costs while understating the 2017 costs. As well, a credit from vendor Thomas and Betts was received in 2017 in compensation for ENWIN's cost of labour to replace two defective switching units.

2017 Actual versus 2018 Forecast

ENWIN anticipates an overall increase in capital expenditures of $1,296,854 from 2017 Actual results to 2018 Forecast summarized in Table 2-34 below.

CATEGORY	2017 Actual	2018 Forecast	Variance	Variance
	$ '000			%
System Access	3,963	3,310	- 653	-16.5%
System Renewal	5,456	5,586	131	2.4%
System Service	3,976	4,427	451	11.4%
General Plant	2,058	3,098	1,041	50.6%
TOTAL EXPENDITURE	**15,452**	**16,421**	**969**	**6.3%**
Capital Contributions	- 2,217	- 1,889	328	-14.8%
Net Capital Expenditures	**13,236**	**14,533**	**1,297**	**9.8%**

Table 2-34: 2017 Actual versus 2018 Forecast Capital Expenditure Variances

System Access

The planned expenditures in 2018 System Access are expected to decrease from 2017. This variance is generally due to a reduction in Bridge Plaza new services and relocations as required by the Windsor-Detroit Bridge Authority.

System Renewal

The anticipated increase in System Renewal is primarily due to increased investment in the underground transformer sustainment program as well as the underground cable sustainment program for subdivisions.

System Service

In 2018, ENWIN plans to continue investments into feeder reliability improvements. This increased investment results in a variance over 2017 actual spend.

General Plant

The main cost driver for the variance in General Plant capital expenditures is the cost of vehicle purchases. In addition, the planned investment in a new Records Management System and integration between the ERP system SAP and the GIS system are contributing to this variance.

Capital Contributions

The forecasted decrease in Capital Contributions corresponds to the decrease in Bridge Plaza new services and relocations.

2018 Forecast versus 2019 Bridge Year

ENWIN anticipates an overall increase in capital expenditures of $6,853,849 from 2018 Forecast to 2019 Bridge Year summarized in Table 2-35 below.

CATEGORY	2018 Forecast	2019 Bridge Year	Variance	Variance
	$ '000			%
System Access	3,310	7,267	3,957	119.5%
System Renewal	5,586	7,289	1,703	30.5%
System Service	4,427	4,221	- 206	-4.7%
General Plant	3,098	7,507	4,409	142.3%
TOTAL EXPENDITURE	**16,421**	**26,284**	**9,863**	**60.1%**
Capital Contributions	- 1,889	- 4,898	- 3,009	159.3%
Net Capital Expenditures	**14,533**	**21,386**	**6,854**	**47.2%**

Table 2-35: 2018 Forecast versus 2019 Bridge Year Capital Expenditure Variances

System Access

The planned expenditures in 2019 System Access are expected to increase from 2018. This variance is largely due to the Ambassador Bridge Twin Span and the Bridge Plaza for new services and relocations as required by the Windsor-Detroit Bridge Authority and various roadworks projects specified by the City of Windsor.

System Renewal

The anticipated increase in System Renewal is primarily due to increased investment in the Pole Sustaining program, specifically 27.6kV pole replacements, and the underground Switching Unit Vault Sustainment Program.

System Service

In 2019, ENWIN plans to reduce investment on feeder reliability improvements, but increase investment in Supervisory Control and Data Acquisition (SCADA) communications. The total investment in system service is not expected to be materially different from 2018 forecast spend.

General Plant

The main reason for the budgeted increase in General Plant capital expenditure is the cost related to the planned consolidation of facilities, requiring renovations to the Rhodes Drive Operations Centre. Also contributing to this increase is the planned replacement of vehicles, including three heavy duty trucks. In addition, the planned investment in a new Records Management System and NorthStar Evolution are also contributing to this variance.

Capital Contributions

The budgeted increase in Capital Contributions corresponds to the increased spend budgeted for Ambassador Bridge Twin Span and the Bridge Plaza.

2019 Bridge Year versus 2020 Test Year

ENWIN anticipates an overall decrease in capital expenditures of $1,435,692 from 2019 Bridge Year to 2020 Test Year summarized in Table 2-36 below.

CATEGORY	2019 Bridge Year	2020 Test Year	Variance	Variance
	$ '000			%
System Access	7,267	6,205	- 1,063	-14.6%
System Renewal	7,289	8,440	1,151	15.8%
System Service	4,221	3,537	- 684	-16.2%
General Plant	7,507	5,021	- 2,486	-33.1%
TOTAL EXPENDITURE	**26,284**	**23,203**	**- 3,082**	**-11.7%**
Capital Contributions	- 4,898	- 3,252	1,646	-33.6%
Net Capital Expenditures	**21,386**	**19,951**	**- 1,436**	**-6.7%**

Table 2-36: 2019 Bridge Year versus 2020 Test Year Capital Expenditure Variances

System Access

The budgeted expenditures in 2020 System Access are expected to decrease from 2019. This variance is due to an expected reduction in the Ambassador Bridge Twin Span and the Bridge Plaza as well as roadworks projects specified by the City of Windsor.

System Renewal

The anticipated increase in System Renewal is primarily due to increased investment required for the Walker Rd. - Foster to Airport Rd. – Feeder Connection project.

System Service

The decrease in ENWIN's budgeted expenditures for System Service is related to reductions in planned spending on conductor upgrades, switches and sectionalizers and SCADA. However, this is partially offset by ENWIN's plan to upgrade the Keith Transformer Station ('TS') wholesale meter in order to comply with the Provincial and Federal Government mandate that all meter market participants conform to the IESO Wholesale Market regulatory requirements, which require installation of Measurement Canada approved metering equipment at bulk transformer stations. The associated cost is expected to be partially offset by capital contributions.

General Plant

The main reason for the budgeted decrease in General Plant capital expenditure is the cost related to the planned consolidation of facilities, since the majority of renovations to the Rhodes Drive Operations Centre are expected to be complete in 2019. Also contributing to this decrease is a reduction in planned vehicle replacements, specifically mid duty trucks. In addition, the NorthStar Evolution project is expected to be complete in 2019.

Capital Contributions

The budgeted decrease in Capital Contributions corresponds to the decreased spend budgeted for Ambassador Bridge Twin Span and the Bridge Plaza as well as roadworks projects specified by the City of Windsor.

Reconciliation of DSP to Fixed Asset Additions

A detailed year over year capital expenditure variance analysis can be found in the DSP under section 5-4-2(a). The total capital expenditures represent new spending in the year and the reconciliation to the amounts capitalized can be found in Table 2-37 below.

Line No.	Reconciliation	2009 Actual	2010 Actual	2011 Actual	2012 Actual	2013 Actual	2014 Actual
1	Total Additions per DSP	$17,775,511	$24,843,638	$17,682,992	$17,082,682	$19,013,849	$18,793,873
2	Contributions in Kind	(520,301)	(224,159)	(321,196)	(1,510,636)	(998,221)	(2,403,163)
3	Spare Transformer Adjustment	-	-	-	(276,563)	3,225	(96,348)
4	Vehicle Additions	-	-	-	-	-	-
5	**Net DSP Additions**	**$17,255,209**	**$24,619,479**	**$17,361,796**	**$15,295,483**	**$18,018,854**	**$16,294,362**
6	Additions per Fixed Asset Continuity	$10,156,939	$25,417,381	$13,049,669	$11,913,591	$ 9,901,515	$34,238,456
7	Less Work in Progress Disposals	7,092,908	(7,096,508)	896,068	3,221,275	8,117,338	(8,140,395)
8	Smart Meter Additions (Disposition)	5,362	6,298,606	3,416,060	160,617	-	(9,803,699)
9	**Net Fixed Asset Additions**	**$17,255,209**	**$24,619,479**	**$17,361,796**	**$15,295,483**	**$18,018,854**	**$16,294,362**

Line No.	Reconciliation	2015 Actual	2016 Actual	2017 Actual	2018 Forecast	2019 Bridge Year	2020 Test Year
1	Total Additions per DSP	$20,914,948	$14,605,089	$15,452,244	$15,587,598	$23,632,230	$21,598,360
2	Contributions in Kind	(4,322,469)	(411,579)	(2,216,539)	(1,888,586)	(4,898,000)	(3,251,860)
3	Spare Transformer Adjustment	192,283	43,322	199,942	9,761	-	-
4	Vehicle Additions	-	-	-	823,917	2,346,808	1,814,576
5	**Net DSP Additions**	**$16,784,762**	**$14,236,832**	**$13,435,647**	**$14,532,690**	**$21,081,038**	**$20,161,076**
6	Additions per Fixed Asset Continuity	$18,276,316	$16,831,839	$13,709,114	$14,524,357	$21,081,038	$20,161,076
7	Less Work in Progress Disposals	(1,491,554)	(2,595,007)	(313,349)	8,333	-	-
8	MIST Meter Additions	-	-	39,882	-	-	-
9	**Net Fixed Asset Additions**	**$16,784,762**	**$14,236,832**	**$13,435,647**	**$14,532,690**	**$21,081,038**	**$20,161,076**

Table 2-37: Reconciliation of DSP Additions to Total Fixed Asset Additions

2.5.5 Accounting Treatment for Capital Projects Greater than One Year

ENWIN's accounting policy is to include projects in Fixed Assets when they are completed and put into service. Capital projects which are not yet completed are included in Work in Progress ("WIP"). Capital projects with a life cycle greater than one year will be carried over from one year to the next in WIP. Once completed expenditures are removed from WIP and capitalized to fixed assets, they begin depreciating.

2.5.6 Efficiencies due to Smart Meters

The implementation of smart meters has resulted in significant change for ENWIN's billing and distribution operations. Some of the key smart meter efficiencies and benefits leveraged by ENWIN include the following:

- Reduced meter reading costs;
- Faster power outage detection;
- Improved outage statistics;
- Power verification that results in faster determination of and resolution to on-going problems at a customer's premises;
- Peak loading for premises assists in planning infrastructure for similar type of customers;

- Rate class determinations can be made without having to install a more expensive demand meter;
- Coincident peak load is determined exactly allowing for proper sizing of transformers so that transformer life expectancy is not shortened;
- Enables a more exact modeling of the network and a more precise determination of requirements for network constructions;
- Ability to send high and low voltage alarms;
- Customers can subscribe to see their hourly consumption which allows them to make better decisions regarding their energy use;
- Hot socket alarms improve the safety of supply for customers;
- Tamper detection helps ensure that power losses are minimized and that rates are not increased to account for losses due to theft;
- Meter damage protection minimizes the time for unmetered load and minimizes bill estimates;
- Midnight readings have eliminated end-of-period consumption estimation as part of the variability in loss determination;
- Barcoded meters results in improved inventory control;
- Reduced meter types and seal extensions have resulted in reduced costs to manage various types of meters;
- Improved billing accuracy;
- Faulted circuit indicators detect faults on the distribution feeders and relay the information to the ENWIN SCADA system;
- Reduction of meter shop costs.

Additional information related to the each of the smart meter efficiencies and benefits can be found in Section 5.2.4 of the DSP.

2.5.7 Rate Funded Activities to Defer Distribution Infrastructure

In general, ENWIN has not used rate-funded CDM programs or other activities to defer capital investment for specific distribution infrastructure. As yet, there have been no opportunities where a non-wires solution would be the most economic or otherwise most attractive alternative. This is in part due to the fact that ENWIN's distribution territory is not as congested and difficult to work in as other larger metropolitan areas and partly because ENWIN's overall system load has decreased over 23% due to a variety of factors, which are discussed in the following sections.

2.5.8 Capitalization Policy

ENWIN's current capitalization policy is based on International Financial Reporting Standards ("IFRS"). ENWIN converted to Modified International Financial Reporting Standards ("MIFRS") for

financial reporting purposes on January 1, 2012 and, as such, the capitalization policy in effect from 2012 through the 2020 Test Year is compliant with MIFRS.

ENWIN engaged KPMG to assist with determining the level of Property, Plant & Equipment ("PP&E") componentization required under IFRS and identifying whether any changes to overhead capitalization were required. The OEB contracted with Kinectrics for a useful life study ("The Kinectrics Report"). ENWIN adopted the results of that study to establish updated useful lives to be used under IFRS.

ENWIN revised its capitalization policy effective December 12, 2009 to align with guidance under IFRS. ENWIN further revised its capitalization policy effective March 1, 2019 to increase the threshold amount for capitalization from $1,000 to $2,000 and provide additional guidance. ENWIN 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 on Transition to International Financial Reporting Standards (EB-2008-0408) ("the Board Report"), the Kinectrics Report, and the Board's Accounting Procedures Handbook ("APH").

A copy of ENWIN's capitalization policy is attached in Attachment 2-E.

IFRS prescribes which costs can be included as part of the cost of an asset and indicates that only costs that are directly attributable to bringing as asset to the location and to a condition necessary for it to operate in a manner intended by management can be capitalized. Indirect overhead costs, such as general and administrative costs that are not directly attributable to an asset, cannot be capitalized under IFRS. ENWIN capitalizes three types of overhead expenses: labour, material and trucking. This is explained in more detail in 2.5.9 Capitalization of Overhead.

2.5.9 Capitalization of Overhead

International Accounting Standard ("IAS") 16 – Property Plant & Equipment ("PP&E") states that the cost of an item of PP&E includes:

- Its purchase price;
- Any costs directly attributable to bringing the asset to the location and condition necessary for it to be capable of operating in the manner intended by management; and
- The estimated costs of dismantling and removing the item and restoring the site on which it is located.

IAS 16 does not define the term "directly attributable". The specific facts and circumstances surrounding the nature of the costs and the associated activities must be considered to determine if it is directly attributable to an item of PP&E. Where CGAAP allowed for the capitalization of general and administrative overhead, IFRS does not. As a result, ENWIN reviews the charges in each of its "overhead/burden" calculations to determine which costs would be directly attributable and therefore eligible to be capitalized. As a result, overhead rates expensed in operating and maintenance (O&M or OM&A) accounts are higher than those allocated to capital.

ENWIN engaged KPMG to assist in performing an analysis of all overhead costs that were being capitalized under CGAAP in order to determine whether these costs were eligible for capitalization under MIFRS. ENWIN capitalizes three types of overhead expenses: labour, material, and trucking. The analysis conducted by ENWIN relating to the capitalization of overhead is summarized below.

Labour Burden

The labour burden calculated under CGAAP included employee benefits (WSIB, CPP, EHT EI, life insurance, long-term disability, benefit and pension costs, non-productive time, and clothing allowance), management and engineering time. Most payroll and company benefit costs are required by law or in accordance with the respective collective agreements. The costs viewed to be unavoidable and not at the option of the company were included in the burden calculation. ENWIN adds labour burden as a percentage to each hour of regular time allocated to a capital or recoverable project. The burden rate is adjusted annually based on the actual benefit and labour dollars.

Safety, training and education expenses are indirect expenses and cannot be capitalized under MIFRS. Therefore, the following benefit costs have been removed:

- Professional and technical fees
- Training expenditures (external and internal)
- Tuition reimbursements

The management and engineering expenditures imbedded in the CGAAP labour burden calculation included salaries which may be viewed as indirect to the capital project and, as such, have been removed for MIFRS calculations as follows:

- Health and Safety Manager
- Administration Manager
- Senior Directors of Operations

The costs deemed to be directly attributable in the management and engineering burdens were only those employees who primarily and directly worked on capital projects in the departments of the organization.

Material Burden

The material burden included costs related to the Stores Department including the wages, benefits, and warehousing costs attributable to the issuance of capital work. The following costs were deemed to be indirect and, as such, have been removed for MIFRS calculations as follows:

- Wages and benefits related to the Purchasing Department
- Imputed inventory carrying charges
- Miscellaneous costs
- Property and building maintenance

The costs related to the Stores Department are deemed to be directly attributable given that they would typically receive and distribute materials required for the asset to be placed in the location and operate in the manner intended by management.

Burden rates are determined on an annual basis and applied as a percentage to the materials issued by the Stores Department to a specific capital or recoverable project.

The costs related to the smart meter installation did not include a material burden. Since the installation of the smart meters was contracted to a third party, and the contractors had an option

to store the meters themselves or use ENWIN's warehouse, and the meters were in and out of inventory within the year of installation, it was determined that the project should not include the material burden.

Trucking Burden

The trucking burden calculated under CGAAP included all costs associated with maintaining trucks, equipment and trailers etc. These costs included mechanics' wages, leases, depreciation, fuel, repairs, insurance and other costs related to vehicle operations. Trucking burdens are applied at an hourly rate per vehicle class as used on capital and recoverable projects as well as O&M.

Wages and benefits of the mechanics and other miscellaneous and property expenses were considered general and administrative under MIFRS and, therefore, not considered eligible for capitalization. Only departmental expenses such as depreciation, fuel, and other operating expenses directly attributable to maintaining and operating the vehicles and equipment are considered directly attributable to capital. Given the nature of the work performed on capital projects, trucking costs are a critical element in the completion of work.

Burden rates are determined on an annual basis for each class of vehicle and equipment (e.g., bucket truck, pick-up truck, trailer etc.) by dividing the directly attributable annual costs for each class by the annual usage in hours. When vehicles are used for capital projects, the vehicle cost is capitalized based on the vehicles' respective burden rate multiplied by the hours of usage.

Burden Rates

ENWIN has completed Table 2-38, which provides a summary of the capital overhead rates used in the last Cost of Service Rate Application in 2009 and the calculated overhead rates for 2020.

Burden Type	2009 Rates	2020 Rates
Labour	117.70%	66.20%
Material	16.00%	5.81%
Trucking		
Class 4 Vehicles – Cars	$ 8.36	$ 4.53
Class 5 Vehicles – Vans & Pick-up Trucks	$ 8.44	$ 5.07
Class 6 Vehicles – Dump & Utility Trucks	$ 16.11	$ 8.35
Class 7 Vehicles – Bucket Trucks	$ 44.85	$ 25.06
Class 8 Vehicles – Specialty Vehicles	$ 14.20	$ 11.97
Class 9 Vehicles – Trailers	$ 14.97	$ 2.42

Table 2-38: Overhead Expense

Burden rates are calculated and reviewed on an annual basis to reflect actual costs or changed circumstances. The fluctuation in rates since the last cost of service is due to the changes between CGAAP and IFRS as outlined above.

ENWIN has completed the Board's appendix 2-D, which is also included as Attachment 2-F of this Exhibit.

2.6 Eligible Investments for Connecting Qualifying Generation

Section 2.2.2.5 of the Board's 2018 Filing Requirements states: "For any costs incurred to make investments that are eligible for rate protection as described in section 79.1 of the *Ontario Energy Board Act, 1998* (OEB Act) and O.Reg. 330/09 under the OEB Act, including any facilities forecast to enter service beyond the test year, the distributor may seek approval to recover the rate protection component of the costs."

ENWIN has not identified any material eligible investments for which rate protection is required. As such ENWIN has not completed Appendices 2-FA through 2-FC.

2.7 New Policy Options for the Funding of Capital

On September 18, 2014, the Board released the "*Report of the Board on New Policy Options for the Funding of Capital Investments: The Advanced Capital Module"* and in it the Board has established the following mechanism to assist distributors in aligning capital expenditure timing and prioritization with rate predictability and smoothing:

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

At this time, ENWIN does not have certainty on any discrete capital projects within the five-year horizon that it believes would require the new policy option. The capital investment required by ENWIN from 2020 through 2024 is relatively flat and ENWIN believes it can be managed through the rates proposed in this Application.

2.8 Additions of ICM Assets to Rate Base

ENWIN has not applied for nor received approval of any ICM assets and therefore has no such asset added to its rate base. Accordingly, ENWIN has not completed the Board's Capital Model applicable to ACM and ICM.

2.9 Service Quality and Reliability Performance

ENWIN follows the Board's Reporting and Record Keeping Requirements Guideline to report its service quality indicators annually. In accordance with the Filing Requirements, Table 2-39 is provided below and is consistent with Board Appendix 2-G, Service Quality Indicators. The table provides the performance measurements for the last five historical years - 2014 through 2018.

Appendix 2-G
Service Reliability and Quality Indicators
2013 - 2017

Service Reliability

Index	Including outages caused by loss of supply					Excluding outages caused by loss of supply					Excluding Major Event Days				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
SAIDI	1.019	0.813	1.066	0.968	0.730	0.942	0.808	1.061	0.645	0.724	0.881	0.813	1.066	0.802	0.730
SAIFI	2.428	1.911	1.996	2.119	1.751	2.292	1.849	1.878	1.470	1.697	2.198	1.911	1.996	1.882	1.751

5 Year Historical Average

SAIDI				0.919					0.836						0.858
SAIFI				2.041					1.837						1.948

SAIDI = System Average Interruption Duration Index
SAIFI = System Average Interruption Frequency Index

Service Quality

Indicator	OEB Minimum	2013	2014	2015	2016	2017
Low Voltage Connections	90.0%	99.7%	100.0%	99.1%	100.0%	100.0%
High Voltage Connections	90.0%	N/A	100.0%	N/A	N/A	N/A
Telephone Accessibility	65.0%	82.2%	86.8%	75.5%	70.7%	78.2%
Appointments Met	90.0%	100.0%	100.0%	100.0%	100.0%	99.8%
Written Response to Enquires	80.0%	99.9%	99.2%	100.0%	100.0%	100.0%
Emergency Urban Response	80.0%	98.0%	98.0%	100.0%	100.0%	100.0%
Emergency Rural Response	80.0%	N/A	N/A	N/A	N/A	N/A
Telephone Call Abandon Rate	10.0%	2.1%	1.3%	2.8%	3.8%	3.9%
Appointment Scheduling	90.0%	100.0%	100.0%	100.0%	100.0%	98.5%
Rescheduling a Missed Appointment	100.0%	100.0%	N/A	100.0%	N/A	100.0%
Reconnection Performance Standard	85.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 2-39: Service Quality Indicators (Appendix 2-G)

Please refer to Attachment 2-B, Distribution System Plan Section 5.2.3(c) for a detailed discussion with respect to System Reliability.

ENWIN's performance results over the 2013 to 2017 period meet or exceed the Board's approved standards. ENWIN's performance is within the range of acceptable performance over the previous five years and no corrective action is required.

ATTACHMENT 2 – A

ENWIN Utilities Ltd. Distribution System Plan

5.2 DISTRIBUTION SYSTEM PLAN

Distributors are encouraged to organize the required information using the section and subsection headings indicated from here onwards. If a distributor's application uses alternative section headings and/or arranges the information in a different order, the distributor shall provide a table that clearly cross-references the headings/subheadings used in the application to the section headings/subheadings indicated in these filing requirements. Distributors are also encouraged to structure the application so that all DSP appendices and supporting materials are included after the main DSP body text, to facilitate review.
The DSP's duration is a minimum of ten years in total, comprising of an historical period and a forecast period. The historical period is the first five years of the DSP duration, consisting of five historical years, ending with the Bridge year. The forecast period is the last five years of the DSP duration, consisting of five forecast years, beginning with the Test year.

5.2.1 Distribution System Plan overview

The distributor must provide a high-level overview of the information filed in the DSP, including but not limited to:

a) Key elements of the DSP that affect its rate proposal, especially prospective business conditions driving the size and mix of capital investments needed to achieve planning objectives

b) An overview of how projects or initiatives address customers' preferences and expectations

c) The sources of cost savings expected to be achieved over the forecast period through good planning and DSP execution

d) The period covered by the DSP (historical and forecast years)

e) The vintage of the information on investment drivers used to justify investments identified in the application (i.e. the information is considered current as of what date?)

f) Where applicable, a summary of any important changes to the distributor's asset management process (e.g. enhanced asset data quality or scope, improved analytic tools, process refinements, etc.) since the last DSP filing

g) Aspects of the DSP that relate to or are contingent upon the outcome of ongoing activities or future events, the nature of the activity (e.g. Regional Planning Process'') or event (OEB decision on Long Term Load Transfers) and the expected dates by which such outcomes are expected or will be known

h) Identification of projects related to cost-effective grid modernization, distributed energy resources, and climate change adaptation and how these projects address the goals of the

Long-Term Energy Plan

Prior to filing, care must be taken to ensure that summary information is consistent with the detailed information filed in the following sections and elsewhere in the application.

5.2.1 Distribution System Plan Overview

This section provides the Ontario Energy Board (the "OEB") and stakeholders with a high-level overview of the information filed in this Distribution System Plan (the "DSP"), including key elements of the DSP, how customer preferences are addressed, sources of expected cost efficiencies, the period covered by the DSP, the vintage of the information, a summary of changes to ENWIN Utilities Limited's ("ENWIN") asset management processes, aspects of the DSP that are contingent on the outcome of ongoing activities or future events and identification of projects related to grid modernization, distributed energy resources ("DER") and how these projects address the goals of the Long-Term Energy Plan ("LTEP").

ENWIN filed its first Distribution System Plan with the OEB in May of 2014 (the "2014 DSP") and has provided progress updates on the 2014 DSP annually thereafter. ENWIN last filed for a Cost of Service Rate Application ("CoS") in 2008 for 2009 rates.

5.2.1 (a) Key Elements of the DSP

This section describes the key elements of the DSP that affect ENWIN's rate proposal. The size and mix of ENWIN's capital investment is driven by ENWIN's core business and planning objectives, which are developed through internal and external stakeholder engagement. ENWIN continuously monitors its performance to ensure that these objectives are being met. ENWIN's planning objectives are summarized below, and further defined in section 5.3.1.

Core Planning Objectives

Safety – ENWIN's customers place a high value on that safety, and they have come to expect that the electrical distribution system that serves their energy needs is safe. ENWIN has utmost regard for the safety of the public and its employees and will design, build, operate and maintain its assets to ensure that the risk of harm to individuals, property or the environment is minimized in accordance with good utility practise.

Reliability – ENWIN's customers—particularly those who operate in the manufacturing sector—greatly value the reliability of their electrical supply. ENWIN operates in the highest isokeraunic (frequency of thunderstorms) area in Canada, but, nevertheless, strives to provide its customers with electrical system reliability commensurate with that enjoyed by electricity consumers in other parts of Ontario, which are served by similar (e.g. overhead vs. underground) distribution systems. ENWIN designs and operates its distribution system in

conformance with established standards for reliability and power quality. ENWIN's goal is to maintain its current and expected level of reliability, but will also strive to improve reliability levels as appropriate and cost-effective opportunities to do so arise.
Additionally, ENWIN's customers value communication during outages. Hence, in addition to maintaining and improving the reliability of its distribution system, ENWIN strives to continually improve its ability to provide its customers with information regarding the extent and likely duration of extended outages.

Sufficiency – ENWIN's customers expect receive power where and when they need it. Hence, ENWIN's customers value the sufficiency of the electrical distribution system. The availability of reliable power at a just and reasonable cost is an engine of economic growth and prosperity for the community which ENWIN serves. ENWIN, therefore, designs and operates its distribution system to ensure that its distribution system has sufficient capacity to serve reasonably expected near-term growth.

Efficiency (Capital and O&M) – ENWIN's customers expect to pay just and reasonable rates for their power. ENWIN believes that where customers enjoy reasonable rates for power, those reasonable rates will be a driver for the economy and for greater utilization, which in turn will maximize return for the shareholder. ENWIN understands the realities of the local economy in which it operates. ENWIN recognizes that its customers value economy and efficiency built into the capital structure of its assets. Hence, ENWIN designs, builds, operates and maintains its distribution system in a manner that provides optimum value to the ratepayers and shareholders over the full life-cycle of the assets.

Risk Minimization – ENWIN designs, builds, operates and maintains its distribution system with the goal of minimizing risk, which would adversely affect the safety and reliability of the distribution system, in a cost effective manner. In the context of ENWIN's electrical distribution system, risk can refer to consequences (taking into account likelihood of occurrence) arising from:

1. Physical asset failures within the distribution system.
2. Operational deficiencies which may result in ENWIN's failure to meet safety, reliability (e.g. frequency and duration of outages), and sustainability performance targets; financial costs to customers or to ENWIN; or damage to ENWIN's reputation.

Risk management is considered as part of the planning, building, operating and maintaining of ENWIN's distribution system. Risks are mitigated through the inspections, maintenance, operations, the replacement of assets, and other system modifications.

Sustainability – ENWIN recognizes the value its customers place on predictability of rates and strives to manage its distribution system assets in a manner that will, where possible, minimize peaks and valleys of expenditures. ENWIN's customers are environmentally conscious. Accordingly, ENWIN strives to be a good steward of the environment, and will minimize the environmental footprint of its operations in accordance with good utility practice.

Furthermore, ENWIN's regulators, who act as a proxy for customer choice, expect ENWIN to manage its assets and deliver services in compliance with all applicable rules and regulations. ENWIN aims to comply with these rules and regulations at all times.
ENWIN values its reputation with its customers, its regulators, and within the electricity distribution industry. ENWIN believes that engaging in good practises in maintaining and operating its distribution system at just and reasonable costs, and in conformance to regulatory requirements, enhances ENWIN's reputation, while also providing value to its customers, regulators, and other stakeholders.

The Planning Process

The output of this integrated planning process is a levelized plan which addresses ENWIN's short and mid-term priorities. This process is also critical in assessing future demands on the system, and is crucial in establishing a long-term strategy for ENWIN's continued success in achieving its objectives. A summary of the proposed capital investments by OEB categories is provided in Table 1 below, which presents the capital expenditures by investment category and the system operations and maintenance ("O&M") costs for both the historical and forecasted periods.

Table 1 Historical and forecast capital expenditures and system O&M

Category	Historical ($ '000)					Forecast ($ '000)				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
System Access	$ 2,762	$ 3,946	$ 3,963	$ 3,310	$ 7,267	$ 6,205	$ 3,476	$ 3,526	$ 3,577	$ 3,628
System Renewal	$ 8,221	$ 5,475	$ 5,456	$ 5,586	$ 7,289	$ 8,440	$ 8,009	$ 7,605	$ 7,850	$ 7,366
System Service	$ 6,433	$ 2,931	$ 3,976	$ 4,427	$ 4,221	$ 3,537	$ 3,622	$ 3,610	$ 3,986	$ 3,623
General Plant	$ 3,499	$ 2,253	$ 2,058	$ 3,098	$ 7,507	$ 5,021	$ 4,283	$ 3,856	$ 4,174	$ 4,213
Total (Gross)	$ 20,915	$ 14,605	$ 15,452	$ 16,421	$ 26,284	$ 23,203	$ 19,390	$ 18,597	$ 19,587	$ 18,830
Contributed Capital	$ 4,322	$ 412	$ 2,217	$ 1,889	$ 4,898	$ 3,252	$ 813	$ 823	$ 834	$ 844
Total (Net)	$ 16,592	$ 14,194	$ 13,236	$ 14,532	$ 21,386	$ 19,951	$ 18,577	$ 17,774	$ 18,753	$ 17,986
System O&M	$ 4,398	$ 4,631	$ 9,757	$ 9,825	$ 10,942	$ 10,904	$ 11,049	$ 11,068	$ 11,102	$ 11,096

Table 2 below summarizes the average total gross and average total net capital expenditure amounts over both the Historical Period and Forecast Period (both as defined in Section 5.2.1(d) of the DSP, below). Note that, on average, the total gross expenditures in the Forecast Period are roughly 4.6% higher than the Historical Period while the net expenditures in the Forecast Period are 14.4% higher.

Table 2 Historical and forecast average capital expenditures

Period	Average ($'000)	% Change (Forecast x Historical)*	% Change (Year over Year, Forecast x Historical)**
Gross, Historical (2015-2019)	$18,735		
Gross, Forecast (2020 – 2024)	$19,921	6.3%	1.2%/yr
Net, Historical (2015 – 2019)	$15,988		
Net, Forecast (2020-2024)	$18,608	16.4%	3.1%/yr

* % change is the total percentage change between the historical and forecast period
** % change is the annual average percentage change needed to obtain the total percentage change over a 5-year period (i.e. from mid-historical period to mid-forecast period)

In 2018, ENWIN changed its fleet practice to purchase rather than lease vehicles (as further explained in Section 5.4.3.1 (a) of the DSP). This change is reflected in the expenditures for years 2018 and 2019 in the Historical Period, as well as all five years of the Forecast Period, and this, as well as cost inflation, has contributed toward increasing the percent change between the two periods.

Business Conditions Driving Capital Investments

This section provides a brief description of the prospective business conditions driving the size and mix of capital investments across each investment category over the Forecast Period.

System Access

Over the Forecast Period, System Access investments are planned primarily in response to customer services requests (e.g. new services, system expansions such as new subdivisions, and relocations due to road widenings and bridge projects). These investments are initiated by customer and third parties. The projects are completed to fulfill ENWIN's service obligations. These investments typically include the following:

1. New Customer Connections
2. Road Widenings
3. Plant Relocations
4. Metering

System Access forecasts are based on data from previous years, along with consultations with third parties to determine what projects will proceed in the current planning cycle.
System Access spending is forecasted to be higher, in aggregate, in 2019 and 2020, relative to other years in the Forecast Period, due to the GHIB and Ambassador Bridge projects and consequent plant relocations required. It is relatively stable over the remainder of the Forecast Period due to a steady customer growth predicted.

System Access Capital Contributions

Over the Historical Period, the level of capital contributions was impacted by the construction of the Windsor-Essex Parkway (the "Parkway"), and the GHIB project. The Parkway was constructed first and the GHIB construction is on-going with an expected opening date in 2024. ENWIN successfully argued with the Government of Canada that the GHIB benefits the Province of Ontario (the "Province") and country as a whole, and Windsor residents should not be expected to pay for the utility relocations required to accommodate the GHIB. Consequently, the Government of Canada will reimburse ENWIN for 100% of any costs incurred in carrying out relocation works associated with GHIB.

Similarly, the construction of the second span of Ambassador Bridge is expected to start in 2019 and ENWIN's position is that project is privately driven and Windsor residents should not be expected to pay for utility relocations. Hence, the Ambassador Bridge Company will reimburse ENWIN for 100% of any costs incurred in carrying out relocation works associated with the Ambassador Bridge project.

As a result, the amounts of capital contributions are higher in years 2019 and 2020 mainly due to the GHIB and Ambassador Bridge projects.

City roadwork projects tend to vary depending on the City of Windsor's (the "City") budget for such projects in any given year. Some roadwork projects were accomplished over the historic period when grant money was made available to the City. However, the City has not increased taxes for approximately the last 10 years. This has limited the amount of funding available for roadworks projects, and has led to increased scrutiny by the City over ENWIN's investments in roadwork relocation projects.

The current City council has conceded that a 0% tax increase is untenable in the long term, as a lot of infrastructure across the city needs to be upgraded or refurbished. The City plans to complete several projects (some of which are ongoing) over the Forecast Period. The City has provided ENWIN with a list of known projects through 2023, some of which are ongoing and in various stages of execution.

ENWIN is able to budget, with reasonable accuracy, expenditures in 2019 and 2020 for investments pertaining to City roadworks, since preliminary engineering work has gone into these estimates. The City has identified projects beyond 2021, but has not yet completed their engineering work. Hence, ENWIN's expenditures for roadworks projects in 2021 and beyond are based on an average value, which was derived using 2016, 2017, and 2018 (to date) actual expenditures, and 2019 projected expenditures. The projects for 2019 Bridge Year and 2020 Test Year are shown in Table 3 below.

Table 3 Capital contribution for major projects – Bridge Year and Test Year

Project Name	2019 Bridge Year ($ '000)		2020 Test Year ($ '000)	
	Capital	Contributed	Capital	Contributed
Road Widening	$ 1,886	$ 705	$ 2,250	$ 631
O/H Customer Connections	$ 525	$ 163	$ 536	$ 166
U/G Customer Connections	$ 1,250	$ 330	$ 1,275	$ 337
GHIB Bridge Plaza Relocations	$ 1,700	$ 1,700	$ 1,000	$ 1,000
Ambassador Bridge Relocations	$ 2,000	$ 2,000	$ 1,000	$ 1,000
Metering	$ 1,185	$ -	$ 1,707	$ 118

System Renewal

System Renewal expenditures include renewals for poles, transformers, switches, meters, manholes, cables, and TS equipment. The size and mix of capital investments in the System Renewal category is primarily driven by the results of ENWIN's Asset Management Plan ("AMP"), which was informed by the Asset Condition Assessment ("ACA") (attached herein as *Appendix A - Kinectrics Asset Condition Assessment*).

The ACA was completed by Kinectrics Inc., a category leader in providing life cycle management solutions for the electricity industry. The ACA recommends a "Flagged for Action" ("FFA") plan of assets expected to require attention over the Forecast Period. System Renewal spending is allocated to assets with the greatest need for replacement. ENWIN has balanced the recommended FFA plan with prudence in order to achieve the desired pace of capital investment over the Forecast Period.

The FFA plan determined that in the short term power transformers—mainly due to the condition of load tap changers ("LTC")—had the highest percentages of units flagged for action. Hence, the refurbishment of the load tap changer assets was completed in 2018.

With respect to other asset categories of concern, distribution transformers (submersible) had the highest percentages of units in "poor" to "very poor" condition. As a result, ENWIN increased spending for these assets in 2018 to help smooth-out the timing of expenditures in future years, since a number of large spikes were present on the EOL graph. Additionally, a significant number of in-service failures of these assets have occurred over the last 5 years, which further helps justify the increased budget for this category over the Forecast Period.

Overall, ENWIN's investment in System Renewal has been relatively consistent year over year and is projected to remain so through the DSP prospective.

System Service

System Service capital investments include expansions or upgrades to existing systems to support the growth of existing customers or improve operational efficiencies and flexibilities. This category also includes improvements to the existing system with regards to reliability, power quality, and performance and functionality. Projects are planned to meet customers' expectations with respect to reliability of the system (as further detailed in section 5.4.3 of this DSP). ENWIN is focusing its investments in the following areas:

1. Conductor Upgrades
2. Automated Switch Installations
3. Feeder Reliability Improvements
4. SCADA Improvements

System Service spending was comparatively higher during the Historical Period compared to the Forecast Period mainly due to the completion of a substantial portion of ENWIN's grid automation program.

General Plant

General Plant investments include those that are made to maintain assets that are part of ENWIN's day-to-day operational and business infrastructure activities, but are not directly part of the distribution system. These typically include the following categories:

1. tools and equipment;
2. vehicle fleet;
3. land and buildings; and
4. technology, including information systems hardware and software.

ENWIN will continue to invest in fleet and non-distribution infrastructure renewal as required to optimize and sustain business operations.

ENWIN's technology investment decisions continue to be based on three basic considerations:

1. Enhancing service to our customers;
2. Creating efficiencies that will increase our cost effectiveness; and
3. Improving agility and resilience in the face of industry disruption.

In addition to routine IT asset renewal investments, ENWIN has identified several additional capital projects that are required during the Forecast Period.

1. Implement and enhance a new records management system;
2. Improve security systems to comply with OEB's cyber security guidelines;
3. Upgrade customer-facing CIS systems through self-service and mobile applications;

4. Continue investing in employee mobile field applications and process improvement projects; and
5. Further develop the outage management system ("OMS") to improve communication with customers during storm events.

5.2.1 (b) How projects and initiatives address customer's preferences and expectations

ENWIN engaged Innovative Research Group Inc. ("IRG") to help ENWIN design, collect feedback, and document its customer engagement and consultation process as part of the development of the DSP, and to aid in ENWIN's assessment of capital investments and operational plans (see *Appendix B –Customer Engagement*).

During the consultation process, customers were given the opportunity to provide suggestions regarding how ENWIN can improve service to them. The top priority, consistent across all customer groups, was the need to deliver electricity at a reasonable price. Maintaining reliability was ranked second. Finally, customers ranked safety as a third priority (see *Appendix B – Customer Engagement, Customer Priorities, at p. 9*).

Additionally, customer telephone surveys reveal that a majority of low-volume customers would like ENWIN to spend what is needed to either maintain or improve system reliability, with respect to fewer and shorter outages. Technologies, such as automated switches, which can improve reliability and manage outages more efficiently, are believed to provide the most value relative to other investment. Approximately 70% of telephone survey respondents feel that it is important to invest now in modernizing the grid. With respect to replacing aging infrastructure, respondents are divided, with a slight preference in favour of prioritizing investments to maintain system reliability—even if this increases customer monthly bills.

ENWIN has done much to deliver safe, reliable and cost-effective electricity to address customers' top priorities. In this DSP, investments are prioritized based on benefits achieved, risks mitigated, and cost effectiveness.

For instance, given that so many of ENWIN's customers have experienced basement flooding in recent times, ENWIN has improved the resilience of its distribution grid by deploying line sensors, line sectionalizers, and cross ties. This has allowed ENWIN to improve its reliability stats and reduce its Customer Average Interruption Duration Index ("CAIDI", the average length of time of a given outage) numbers even in years in which System Average Interruption Frequency Index ("SAIFI", the frequency of outages) was increasing. Investments in ENWIN's Supervisory Control and Data Acquisition ("SCADA") system and OMS allows ENWIN to provide customers with a consistent level of service, despite increased weather impactors and degrading infrastructure, at a reasonable cost.

ENWIN's commercial and industrial customer is comprised of a high proportion of manufacturers. ENWIN has engaged these customers and is aware that reliability of service and

power quality are extremely important to these customers, since these customers increasingly rely on sophisticated and sensitive machinery that does not tolerate even sub-second voltage sags. While there is little that ENWIN can do to actually eliminate these issues, ENWIN has increased its tree trimming efforts in order to try to eliminate as many causes of interruption as possible. In 2018, ENWIN increased it tree trimming radius around primary conductors from 8 to 10 feet to reduce incidents of tree contact to live lines, and thereby improve reliability to customers. As ENWIN is on a three-year tree trimming cycle, the full effect of the change will not be discernible until 2020 or later.

Safety has always been a top priority for ENWIN, and ENWIN assigns safety the highest weighting factor in the PROSORT ® tool (which is a tool utilized to rank projects, as detailed in section 5.4.1(b) of the DSP). This is despite the fact that ENWIN's customers identified safety as the third-most important deliverable that they expect from ENWIN. ENWIN believes that safety was only ranked third on customers' priority list, because there is an expectation and a belief that safety is a "given". In other words, customers believe that ENWIN will ensure that the electrical distribution system is safe for the public and for ENWIN's workers. A more detailed explanation for why ENWIN places safety as its top priority is provided in section 5.3.1 (a) of the DSP.

ENWIN has also increased its public awareness campaign, which is aimed at educating the public on the dangers of electricity and the electrical distribution system.

ENWIN also spends a large portion of its annual capital investment funds on System Renewal. System Renewal is aimed at ensuring that ENWIN's electrical distribution assets will continue to perform and deliver value to customers in a safe manner. When planning and prioritizing System Renewal investments, ENWIN considers the risks associated with operating it assets and seeks to ensure that investments maximize risk reduction in a cost effective manner.

ENWIN understands the challenges associated with providing its customers with value for money and in meeting their expectations above. The DSP demonstrates ENWIN's considered approach to balancing financial performance (cost), operational performance, risk, and sustainability. The DSP outlines ENWIN's approach to maximizing the value delivered by its assets and to ensuring that ENWIN's distribution system will provide sustainable value to its customers in the future.

5.2.1 (c) Sources of Cost Savings Expected

This section describes initiatives that ENWIN has implement to achieve cost savings and efficiencies over the Forecast Period and Historical Period. The efficiency measures described below have been implemented slowly in order to minimize implementation problems, and achieve cost-savings over time.

Building Consolidation

ENWIN is planning a building consolidation to reduce operating costs. ENWIN currently operates out of two locations: a downtown head office, which houses ENWIN's Finance, Regulatory, Call Centre, Human Resources, Information Technology and Public Relations departments; and an operations centre, which houses ENWIN's Engineering, Operations, Project Management, Metering, and Meter Reading groups, as well as the Fleet/Site/Warehouse. ENWIN plans to relocate staff from the downtown office to the operations centre, which will result in cost savings for customers. The payback period for the consolidation is less than 3 years. Capital replacement and operating costs for the downtown office have been removed from the budgets following the expected date of the move. This will result in operating savings of approximately $400k annually, and an avoided annual capital investment of approximately $80k. A complete discussion of the plan is included in *Appendix C – Building Consolidation*, attached herein.

Asset Management Process

ENWIN continues to implement a number of initiatives to facilitate better planning and execution of its capital and operating expenditures. The implementation of a formal Asset Management Process ("AMPRO") has allowed ENWIN to determine the most appropriate pace and level of investment for renewal of its assets. ENWIN expects to realize cost efficiencies through the reduction in unexpected replacement of equipment on premium time. ENWIN's AMPRO also balances the performance of the distribution system and customers' demand for service and reliability in determining renewal, maintenance, and improvement requirements. The DSP incorporates best practises with regard to asset management from the AMPRO.

Formal Project Management Process

ENWIN has also adopted a formal project management approach to planning and executing its project deliverables. This includes business case development and review for large projects, as well as reporting key performance indicators ("KPIs") to ensure projects are delivered on-time, on-budget, and with the requisite level of quality. Project managers are assigned to the largest projects and those with the greatest potential impact, while other ENWIN staff have been trained and supplied with project management tools to manage smaller projects.

Project progress is regularly measured and reported to senior management to ensure outcomes are appropriate. KPIs are selected to ensure they match the expectations and requirements of ENWIN's board of directors (the "Board of Directors"). Although this approach was previously only applied at the project execution phase, it has recently been expanded such that it is applied throughout the entire project lifecycle, starting from project conception and design. ENWIN believes that a formal project management approach to planning and executing its system investments is a good utility practise. As such, ENWIN has been improving upon this process since its inception in 2010. Since the formal project management approach has been part of ENWIN's operational culture for several years, and has produced cost efficiencies over this timeframe, no incremental savings are expected through this CoS period.

Distribution Automation

Distribution automation has the potential to positively impact reliability statistics and increase labour efficiencies. The continuation of the grid modernization with the installation of automated overhead and underground switches, as well as the installation of faulted circuit indicators ("FCIs"), incorporation of smart meters into the OMS, outage maps, etc. is expected to automate operations and minimize truck dispatches, while minimizing outages and reducing restoration times. To date, ENWIN's implementation of such automation has facilitated workforce reduction without compromising reliability. Section 5.4.3.1 (b) of the DSP illustrates that, despite drivers that would be expected increase system O&M, during the period from 2009 through 2016, system O&M decreased from $4,956k to $4,631k (accounting changes in 2017 made further comparisons incongruous).

Collaborative Efforts

ENWIN strives for improved efficiency by working collaboratively with other utilities and agencies. For instance, ENWIN is a member of the GridSmartCity Cooperative (the "Cooperative"). The objective of the Cooperative is to achieve greater economies of scale, efficiency and effectiveness through collaboration and greater purchasing power to provide the best services to their customers through reduced operating costs. Additionally, the Cooperative provides members with opportunity to collaborate and share knowledge, skills and expertise to improve the quality of services, provide access to better products and services, and generally enhance the effectiveness of service delivery and operational activities.

While ENWIN has undertaken joint purchasing with other members of the Cooperative, ENWIN is not able quantify the level of savings achieved because:

1. pricing in general has increased since the last tender; and
2. since ENWIN never tendered on its own, it cannot determine the prices that would have been tendered had it not jointly purchased with other members of the Cooperative.

ENWIN is also a member of the Utilities Standards Forum ("USF"), an organization formed in 2005 by many of Ontario's small to medium sized electricity local distribution companies ("LDC"). The group is devoted to the sharing of information and standards improvement. As part of this group, ENWIN often solicits information from the membership as well as provides information, solutions, answers, or assistance to membership questions and requests.

ENWIN expects its involvement with these initiatives will provide real tangible improvements to the organization's compliance with the most up-to-date standards, improved system reliability, and lower life cycle and overall process costs.

Additionally, ENWIN works with the Electricity Distributors Association ("EDA"), the Centre for Energy Advancement through Technological Innovation ("CEATI"), the University of Windsor,

and St. Clair College's Line Trade program, in association with their National Powerline Training Centre in Chatham.

Operationally, ENWIN shares the Lauzon, Malden and Keith TSs, which are owned by Hydro One Networks Inc. ("HONI"), thereby allowing ENWIN to reroute the flow of power should supply issues arise at any given TS. This provides flexibility in supplying power to customers during adverse events. In contrast, county utilities have much less flexibility than ENWIN, and when problems develop, ENWIN will often reconfigure its distribution system so that loss of supply to county feeders does not occur. This saves all utilities money and provides improved service for people living in the areas adjacent to ENWIN's service territory.

Technology

ENWIN is deploying devices, such as portable tablets and using web-based applications, which will replace paper-based data collection. These technologies are expected to improve operational efficiency, reduce the possibility of data translation errors, and provide labour savings in data entry. Since the cost of the work associated with the use of portable tablets is not separately tracked, it is not possible to determine with any reasonable certainty, the quantum of savings resulting from this initiative. The clerical pool has, however, been reduced from eight individuals, to five currently. However that pool also serves ENWIN's sister company, the Windsor Utilities Commission ("WUC").

ENWIN's geographical information system ("GIS") has matured to a level where data availability and quality enable the creation of reports, reliable maps, and plans. This helps reduce costs by minimizing the need to send resources to site to field-verify existing conditions.

The new OMS and outage map that is published on ENWIN's website has provided customers with more information about outages and reduced the level of calls received during major storm events. This has enabled ENWIN to manage after-hours storm events with fewer call center staff (who are paid overtime premiums).

Smart meters have also allowed certain efficiencies to be effected; these are discussed in detail in Section 5.2.4 of the DSP.

Tree Trimming

ENWIN has increased tree trimming clearances which should both reduce momentary and sustained outages, and thereby provide customers with improved reliability and reduce storm related costs.

5.2.1 (d) Period Covered by DSP

The DSP covers the Historical Period of 2015 through 2018, with the bridge year being 2019 (the "Historical Period"). The Forecast Period is 2020 through 2024, where 2020 is the Test Year

(the "Forecast Period"). This DSP was written throughout 2018 and, consequently, the period 2018 to 2024 is considered the prospective period which includes the Forecast Period (2020 – 2024) plus 2018-2019.

5.2.1 (e) Vintage of Information

The majority of the historical financial and operating information contained in this DSP can be considered current as of December 31, 2018. The Kinectrics Asset Condition Assessment was completed on April 4, 2018.

5.2.1 (f) Important Changes to the Asset Management Processes

Since the 2014 DSP filing, ENWIN has made important changes to its AMPRO, which are discussed below, and further detailed in Section 5.3.1 of the DSP.

The ACA

As discussed in Section 5.2.1(a), above, asset condition and replacement rates are informed through an ACA, which identifies an FFA plan of assets expected to require attention over ten (10) years. In planning the System Renewal investments for the capital expenditure plan, ENWIN considers the FFA plan in light of observed asset failure rates and consumer rate impacts. The FFA informs ENWIN's AMP regarding the degree of intervention required to maintain the level of reliability enjoyed by ENWIN's customers, and also identifies additional health index information to direct future efforts to collect asset health data.

Kinectrics PROSORT

ENWIN began using the Kinectrics PROSORT tool for prioritization of investment across asset categories and investment portfolios based on ENWIN's business values and their attributes. Projects are ranked based on the ratio of the risks that are mitigated and the associated benefits resulting from the cost incurred. The tool provides a means of evaluating the cost/benefit relationship of dissimilar projects so that the most cost-effective risk minimization for customers is prioritized for action. It also serves as a guideline for providing a consistent approach to decision making, and for optimizing the overall risk to the investment portfolio. This analysis will be performed annually.

Esri® GIS

In 2014, ENWIN implemented an Esri® GIS system, and has taken steps to capture and add asset data into the GIS. This initiative resulted in the following benefits:

1. improved underground cable segment distinction and better identification of cable age;
2. visual display of asset condition, leading to more effective group replacement of poles;
3. visual display of feeder performance , resulting in more effective project selection; and

4. visual display of project areas, leading to better coordination of projects with the City and other utilities.

Pole Inspections

ENWIN re-established its pole inspection database in 2015/16 and retained a contractor to inspect all poles in its distribution system. Concurrently, ENWIN moved data from an old Microsoft Access database to the corporate ERP database which allowed data sharing between applications such as GIS and Work Manager. There were problems identified in the old database that resulted in unreliable project identification, which required additional manual effort to field-verify pole conditions. These issues were minimized through this initiative. Additionally, during a system wide inspection, ENWIN implemented a pre-emptive pole-drilling process to determine baselines for internal rot, and to apply pole preservative before internal rot takes hold rather than after it has started.

Other Technological Changes

ENWIN deployed mobile inspection devices to collect and retain asset condition information in SAP's Work Manager field data capture program, and established refined inspection criteria to provide more consistent and objective results.

Additionally, in 2016, ENWIN implemented an OMS that leveraged its earlier investment in the GIS. Built atop the validated complex interconnections of distribution equipment, the OMS contributes not only to efficient dispatch of restoration resources, but also provides valuable asset management information. The OMS implementation and its accompanying public-facing outage map ensure that customers have access to outage information in a timely manner. It also improves ENWIN's understanding and recording of the root cause of power interruptions, thereby improving planning capabilities. A thorough understanding of the causes and locations of outages and feeder performance contributes to more informed decision making regarding the appropriate targets for capital investment.

Finally, the full implementation of CYME (power engineering software) in 2017 enabled a clearer understanding of network power flow, and identified constrained areas for remediation. It also allowed for better decision making regarding feeders that may require reinforcement.

5.2.1 (g) DSP Contingencies

Most of the investments in the System Access category are contingent on upon the outcome of ongoing activities or future events, since these investments are initiated by parties external to ENWIN. For instance, expenditures related to customer service requests for new services or modifications to existing services depend on the volume of work requested during the year, and the project timelines are dictated by the OEB's Distribution System Code ("DSC").

Moreover, system expansions request are contingent upon the expected development—predominantly new residential subdivisions, or industrial or commercial developments—actually materializing. Although ENWIN participates in regional development meetings to improve planning quality (as further detailed Sections 5.2.2 of the DSP), long-term forecasts are contingent on the evolving needs of many external stakeholders.

Similarly, ENWIN's expenditures to accommodate third-party infrastructure developments, such as road widenings, are contingent on the scopes and timelines of these developments, which are driven by external parties. While ENWIN participates in the planning of these third-party developments (as further detailed Sections 5.2.2 of the DSP), these initiative may be deferred, cancelled, or modified by the external parties responsible for these developments.

For instance, work is currently underway for the new Bridge Plaza at the GHIB (the "Plaza"). Although the Government of Canada is constructing the Plaza, both ENWIN and HONI are required to relocate many of their electrical facilities to accommodate this development. The pace of ENWIN's work will depend upon the pace and scope of the Plaza work. The expected in-service date for this bridge is 2024.

The Government of Canada will reimburse ENWIN for 100% of its costs incurred to accommodate the Plaza. Hence, although ENWIN is allocating resources to the Plaza project, the budget and rate-impact of this investment is zero. Since ENWIN is dedicating many resources to the Plaza project, independent contractors will be hired to complete other work, on an as-needed basis.

Additionally, the privately-owned Ambassador Bridge is planning to twin its span and expand its footprint in Windsor. This work will progress at the pace established by the bridge owner. Costs incurred by ENWIN will be fully recoverable from the bridge owner, and will, therefore, not impact on ENWIN's budget or ratepayers.

5.2.1 (h) Grid Modernization, DER, LTEP

ENWIN has identified challenges associated with the provincial energy management strategies under the LTEP, which include:

1. the introduction of new concepts for household energy usage such as new energy storage systems (a type of DER);
2. the expected proliferation of electric vehicles ("EV"); and
3. the customer requirement for supply reliability.

Through its customer engagement, ENWIN has identified future expectations for the distribution grid, and has created plans to achieve cost-effective grid modernization and DER projects to address the objectives of the LTEP. These initiatives are discussed below.

Cost-effective grid modernization

Distribution system equipment typically has a long lifespan. Hence, ENWIN takes a long-term view with regard to distribution grid upgrades. Across its long-term planning horizon, ENWIN seeks opportunities to bundle investments to achieve efficiencies. For instance, non-critical asset upgrades will be planned to coincide with other initiatives such as end-of-life ("EOL") asset replacement, or third-party driven development projects. In this manner, the costs to modernize or upgrade the grid are limited to the incremental cost for the upgraded materials. ENWIN's approach to cost-effective grid modernization planning, DER and climate change adaptation follow the principle objectives below:

1. Manage contingencies and short-term, high load requirements through:

    a. cost effective conductor capacity increases;
    b. eliminating capacity reservations and allowing loading of transformers to 100% (e.g. to facilitate the connection of EV loads); and
    c. utilizing communication-based distribution feeder control devices to manage load on a real-time basis.

2. Develop remote operability by enabling feeder re-configurability, through cost-effective infrastructure for both human-directed and self-healing networks.

3. Develop high capacity feeder connections to manage loss of feeder and loss of station contingencies, as well as sudden load increases or transfers in feeder sections.

4. Implement a reliable, cost-effective communication infrastructure.

5. Accept more DERs while maintaining distribution system reliability.

6. Maintain distribution grid reliability performance in the face of more frequent and more severe storms.

All grid modernization projects fall into one of the following categories in ENWIN's capital plan, which are detailed below:

1. Conductor Upgrades
2. Sectionalizing Load Break Switches – Scada-Mate Switching Units
3. Underground Switching Units
4. Feeder Reliability Improvements
5. Radial Branch Back-ups
6. SCADA and Communications
7. TS Upgrades

Conductor Upgrades

The projects listed under this category are typically for grid modernization purposes; however, depending on the project specifics, some of the projects could contribute toward climate change adaptations and DER.

1) Walker Road – Foster to Airport Road – Feeder Connection

This System Renewal project contributes toward grid modernization. The poles in this section of line are near EOL. An additional objective which also drives the timing of the project is, with respect to grid modernization, to relieve capacity on the Walker 2 TS, while also alleviating an issue in South Windsor requiring ENWIN to manually sectionalize feeders to reconnect "cold load" following an outage.

This project will also present longer-term benefits, such as providing future short-duration EV demand and standby demand for combined heat and power ("CHP") and/or battery electric storage system ("BESS") installations. This section of line is the last piece of a long-term project executed year by year, along with a City roadworks project, to relieve system deficiencies under a cost effective grid modernization plan. ENWIN planned to execute this project over a long-term basis to achieve cost efficiencies. Other secondary drivers for the project include:

1. Essex TS has available capacity. ENWIN's long-term goal is to offload its Walker 2 station by utilizing the available capacity of other existing supply stations, including Essex TS.
2. The Southwood Lakes subdivision load is fed only by one feeder; a backup feeder is needed.

Aside from the "Foster to Airport Road" line section, all the other related upgrades of this project were completed in conjunction with City road widening projects, EOL pole replacement, or conductor replacement work. The Foster to Airport Road section of the project was initially planned for completion under City road widening work, but the City deferred its planned work for that section indefinitely.

In terms of station capacity, the re-built Essex TS has more capacity than the Walker 2 station. Completion of this section will provide an additional full feeder to supply the ENWIN system from Essex TS. This new feeder will supply the South Windsor load, and connect to some of the 55M25 feeder-end loads. This will also eliminate South Windsor load transfer issues during contingency restoration operations in that area.

This project will further reduce the footprint of the 55M25 feeder at Walker 2, which will thereby improve feeder reliability. Further, a high capacity feeder will facilitate the introduction of a future Fault Location, Isolation and System Restoration ("FLISR") system.

Long term project benefits to the LTEP goals:

(a) This project will provide benefits with respect to DERs. While Feed-In Tariff ("FIT") & micro Feed-In Tariff ("mFIT") projects have diminished due to the cancellation of those programs, there has been a recent increase in applications for large-scale combined heat and power/battery electric storage system (CHP/BESS) projects. Moreover, many load customers, who do not wish to be fully reliant of the distribution grid for power, are applying for generator connections, but still expect ENWIN to provide full standby supply.

This project provides a high capacity feeder trunk to the South Windsor area, and will provide future short-term capacity requirements for DER-assisted loads.

(b) As forecasted in the Ontario LTEP, ENWIN expects an increase in incremental load due to the proliferation of EVs. However, ENWIN does not expect to install more capacity at the 120/240 V transformer level to supply incremental EV demand. EV loads are expected to be managed through cost-effective, high capacity wired solutions, along with the remote operability of equipment. This project will help increase the short-term capacity of the effected feeder, and provide incremental short-term capacity to adjacent feeders, thereby allowing ENWIN's distribution system to connect additional EVs for a given time.

2) Conductor Upgrade Project – 23M2 LTP1

The main driver for this project is to replace EOL poles and conductor, but the project will also contribute toward grid modernization. ENWIN's long-term reliability improvement plan identified a feeder conductor upgrade to help manage feeder reliability. This project also has additional long-term benefits such as ability to manage short-duration EV demand, to provide standby supply to CHP/BESS customers, and to increase the resiliency of the grid to respond to climate change issues.

The project will not provide expected results immediately, but the ENWIN system will gain a high capacity feeder section at a slight incremental cost for larger conductor material. After completion of this project, a high capacity line section will extend from Armanda Street to the Crawford station.

Long-term project benefits to the Ontario LTEP goals:

(a) This project provides a high capacity double circuit section between Malden TS and Crawford TS. When fully completed, the feeder section between the TSs provides a high-capacity (900 A) feeder link, which can provide additional standby load capacity, as well as an additional feeder to accommodate additional DER connections.

(b) Future excess EV demand on 120/240 V transformers can be managed by loading distribution transformers to 100% level. A typical feeder is unable to fully load all 120/240 V transformers to 100% due to conductor capacity limitations; however, this high-capacity line will help minimize those limitations.

(c) Climate change suggests that the distribution systems will face more frequent and more severe storm events. This project facilitates the restoration of customers' service in a timelier manner when other elements of the distribution system are unavailable.

3) Downtown network capacity upgrades 25M8/M12, 25M6/M9

This project is part of an ENWIN grid modernization initiative to provide increased capacity for the downtown business area. Both 25M8/M12 and 25M6/M9 are "companion feeders", which means that the feeders work as a pair with one feeder considered the primary source and the other the secondary or back-up source. When the primary source is interrupted, auto-transfer switches automatically transfer customer's supply over to the secondary source, thereby minimizing interruption to customers. This concept improves system reliability.

Main drivers of the project are:

1. downtown network feeders are constrained with respect to their capacity to serve future development; and
2. the most cost-effective way to provide more capacity for this network is to remove bottle necks rather than constructing new feeders.

Both 25M8/M12 and 25M6/M9 feeders split into two branches after they enter the downtown distribution area. The first section of the feeder cable carries both branches' load. Hence, doubling this first section of the cable thereby economically increases the distribution capacity in the downtown network.

Long-term project benefits to the Ontario LTEP goals:

(a) ENWIN forecasts more load on the downtown network, resulting from EV penetration and other development as more businesses introduce vehicle chargers for their customers.

(b) ENWIN will reduce capacity constraints to accommodate additional DER generation in the downtown area.

Sectionalizing Load Break Switches:

The "sectionalizing load break switches" program has identified several feeder sectionalizing locations at which ENWIN plans to install remotely operable devices. The objectives of this grid modernization project are to improve the time to restore power after an upset, and to enable self-healing networks, to improve reliability. The following three sectionalizing load break switches are proposed in 2020 and 2021:

1. 2020: 15M11-55M24 (Grand Marais E. and South Pacific)
2. 2021: 55M26A-MS-55M3A (Walker Rd & Sydney) #129
3. 2021: 15M7B-MS-25M14B (Tecumseh & Mercer) #131

These three projects form part of a long-term "grid reliability improvement" plan, which ENWIN introduced after phasing out its 4 kV distribution system. ENWIN*'s* distribution system was originally designed with two distribution levels, 27.6 kV and 4 kV. The 4 kV voltage level had substations with fully enclosed breakers, and the feeders fed around 400-500 customers.

When ENWIN's old 4 kV system reached EOL, it was replaced with a 27.6 kV system. As a result of this replacement, the number of customers per feeder increased by a factor of ten in some cases. No additional pole lines were built on the 27.6 kV system to compensate for this additional load. Consequently, the number of customers impacted per outage increased, and supply reliability suffered. The removal of the 4 kV breakers further negatively affected customer's reliability.

To counter this, ENWIN began a program to segment its feeders, and to provide supply ties between the segments. This was achieved by introducing additional sectionalizing reclosers and remote feeder tie devices. In addition, "remote feeder re-configurability" is being introduced to facilitate faster restoration of power to customers, and to manage increasing levels of penetration of DER.

Completion of this long-term project will increase the reliability of feeder sections, and Operators will be able to reconfigure feeders within a very short period.

<u>Long-term project benefits to the Ontario LTEP goals:</u>

These projects respond to the LTEP goals related to affordability of energy, improving performance for consumers, and the climate change challenges, as described below:

(a) The projects eliminate a requirement for one to one feeder backup by the introducing 1/3 back-up, thereby making greater use of the existing feeder infrastructure without having to construct extensive feeder back-ups as existing feeders can now support 450 A loads rather than 300 A loads. This makes greater use of the existing infrastructure and reduces cost for customers.

(b) The remote operable switch program facilitates restoration of customers' power in a timelier manner after a contingency on the distribution system, thereby improving performance for customers.

(c) The timely restoration of infrastructure improves the resilience of the distribution system, thereby improving system response to increasing storm incidents resulting from climate change.

Underground Switching Units:

The Switching Unit ("SU") upgrade program is a long-term grid modernization project.

ENWIN's distribution system has a relatively large fleet of underground live-front switches. ENWIN recognized that this fleet of switches is reaching EOL, and, due to internal flashovers of internal switch components, this fleet has become one of the most unreliable pieces of distribution system equipment.

ENWIN categorized SU assets from most to least critical, and from poorest to best asset health condition. Using those lists, ENWIN developed a long-term plan to replace existing S&C PMH Pad-Mounted Gear ("PMH") and Canada Power Product's live-front SUs with more suitable units.

The assets will be replaced in cost-effective and timely manner. The main considerations driving this project include the following:

1. These switches are no longer sufficiently reliable. In some cases, these live front switches have become the most unreliable equipment on the distribution feeder.

2. Some of the switches rust due to salt spray, needing continuous painting and dry ice cleaning to maintain reliability.

3. Some of the units suffered from internal flashover and had to be removed. Internal flashovers in the units have been a recurring problem with the units for many years.

4. To obtain remote operability and feeder reconfiguration.

The live front switching unit replacement program was developed to achieve the following key objectives:

1. Identify the units where remote control is needed for near term feeder configurability. These locations become priority replacements.

    a. If removed units are in good condition, the units will be returned to inventory to use for other locations.
    b. If removed units are not in suitable condition for direct use, the unit will be refurbished for minimal cost and used to replace another EOL unit (provided the unit is in salvageable condition). Refurbished units will be vented to eliminate moisture buildup, which has been identified as a cause of unit flashovers.

2. Identify and remove unnecessary units. In the past, simple PMH 4 switches were installed immediately downstream from their pole mounted, fused supplies. This was done so that regardless of whether an overhead crew or an underground crew were called to the location, either could open the circuit. However, ENWIN is changing to multi-purpose trained employees so regardless of which employee that is called to open

a circuit, they are able to perform the work. Failures of PMH 4 units have pointed out the redundancy and ENWIN is slowly eliminating the redundant units.

3. No new live front units are to be purchased for the system. The objective is to get the full use of existing assets with minimum reliability risk to the customers.

Based on the above plan, the distribution grid can achieve its near-term and long-term objectives through the EOL equipment replacement. Some of these switching units are in the main trunk of the feeder. Those units are critical to the reliability of the feeder.

This project is completely integrated with EOL replacement work. Even if a unit is removed earlier than EOL for near-term feeder modernization goals, that unit will be used for a location where EOL replacement is required but automation is not. Completion of this project will enable full visibility and improved reliability for the underground distribution system.

Projects are selected for the next budget cycle based on criticality. The following projects require replacement of only the switching unit—other underground cable work is not required:

1. Glengarry SU North,
2. Glengarry SU South
3. Traders SU
4. Eastcourt SU
5. Casino SU North
6. Casino SU South

The following projects require replacement of the switching unit and underground cable work to achieve its final objectives:

1. Peachtree SU-265,Village SU-257 (UG & SU Project – 2021)
2. Peachtree SU-265,Village SU-257 (UG & SU Project – 2022)
3. Foster SU ,Upgrade O/H Incoming (UG & SU Project)
4. Rendezvous SU -590,McNorton SU-573 (UG & SU Project)

The main drivers specific to the above projects are:

1. PMH type units have demonstrated a propensity to flash over in a consistent manner
2. ENWIN identified the PMH series original design was rated for a 25 kV system while ENWIN's distribution system is a 27.6 kV system
3. Many PMH units are at EOL and need replacement

<u>Long-term project benefits to the Ontario LTEP goals:</u>

These projects respond to the LTEP goals related to improving performance for consumers, improving value for customers, and climate change challenges, as described below:

(a) This project increases the reliability of the distribution system. These switches facilitate the operator's ability to move power from locations where it is available, to locations where it is needed during contingency situations. This improves performance for customers, and assists them in coping with increased frequency and severity of storms due to climate change.

(b) Customers demand highly reliable power. Customers, including residential customers, are becoming increasingly reliant on electricity. Hence, the cost of economic losses stemming from power outages is expected to increase steadily over time.

(c) Managing the future demand created by EV penetration at the 120/240V level will require increasing use of remotely operable equipment.

Feeder Reliability Improvement:

Projects listed under this category are cost-effective grid modernization projects aimed at improving system reliability.

1) The Prince to Brock Feeder Reliability project proposes to upgrade an existing double circuit line to a high-capacity double circuit line. This section of the existing double circuit is in poor condition, and the project will be triggered as EOL replacement work.

2) The Lansing to Oriole Feeder Reliability project proposes to upgrade an existing double-circuit line to a high-capacity double-circuit line. This section of the existing double-circuit is in poor condition, and the project will be triggered as EOL replacement work.

3) The Lansing Bush to Huron Church Feeder Reliability project proposes to upgrade existing double-circuit lines to a high-capacity double-circuit line. This section of the existing double-circuit is crossing a reserved conservation area. The assets are not in poor condition; however this section of the feeder is very unreliable due to tree contacts from the tall trees in proximity to the feeders in the conservation area through which the feeders pass. This area is also at the start of the feeder from Malden TS, and, consequently, any issues in this section affect the entire feeder. This project may not be triggered as EOL replacement work in near future, but it may be implemented to address customers' stated preferences for reliability in the future.

4) The Central Ave to Tecumseh #5 Feeder Reliability project proposes to upgrade an existing double-circuit line to a high-capacity double-circuit line and to connect the east side distribution to the 55M5 feeder with a high-capacity main trunk. This project may not be triggered as EOL replacement work in near future, but it may be implemented to address customer's stated preferences for reliability in the future.

These reliability improvement projects have the following objectives in common, and all projects are part of a long-term cost effective grid modernization plan:

1. Meeting customers' stated preferences for reliability of supply;

2. Providing supply for future short-duration EV demand;
3. Providing standby supply to meet CHP/BESS demand; and
4. Acquiring a resilient grid for future climate change issues.

These projects are planned for execution on a long-term basis to optimize cost-effectiveness. Main drivers for the projects include EOL replacement of assets, and seizing an opportunity to build a high-capacity section at a cost equal to the incremental cost of larger conductors.

Long-term project benefits related to the Ontario LTEP goals:

(a) When the full feeder section between TSs is completed, these high-capacity feeders can be loaded up to 900 A, thereby providing additional capacity to connect DER load on either this feeder or adjacent feeders.

(b) Future EV demand on the 120/240 V transformers can also be managed in a timelier manner by loading distribution transformers to 100%. Most feeders are unable to fully load all 120/240 V transformers to 100% due to conductor capacity limitations. Therefore, this high-capacity line will help to accommodate future EV load.

(c) This long-term project connecting stations with a high-capacity double-circuit trunk helps to transfer load even if one complete station is lost. As we expect more frequent and more severe storm events, this project helps to restore customers in a timelier manner.

5) Feeder Reliability Improvement Project – 25M7 Feeder Ring Pilot Project

The main driver of this grid modernization project is to improve feeder reliability for customers.

This is a pilot project aimed at understanding the issues associated with feeding customers using a ring feeder configuration instead of the existing radial configuration. If a high-voltage ("HV") distribution feeder is set up as a ring, only the faulted section will be isolated from system, instead of the entire line. Main drivers for the project are:

1. 25M7 is one of the worst performing feeders;
2. this feeder serves approximately 5,000 customers, and a small outage has a big impact as a result; and
3. the feeder is currently configured as two open ring sections; therefore, the investment required to implement this project is minimized.

Long-term project benefits to the Ontario LTEP goals:

This project addresses the LTEP objectives related to improving performance for customers. If the pilot is successful in demonstrating that the proposed configuration will result in improved reliability for customers, this concept can be implemented in other overhead distribution feeders.

Radial Branch Backup

Radial branch backup is part of a long-term grid modernization program. This program will provide backup supply to the existing radial customer clusters in the distribution system. A key objective of this program is to remove radial customer clusters and improve distribution reliability. Key drivers of the program include:

1. There are clusters of customers (there are over 500 customers in a cluster) that are served from a radial supply with no back-up supply. Should an interruption occur on a radial feeder, customer clusters that are served by that feeder have to stay without power until the main trunk is completely restored. The goal of this program is to provide alternate supply for radially-fed, large customer clusters.

2. Where planned outages are needed for things like tree trimming, ENWIN has a difficult time taking outages on these radial lines due to the large number of customers affected by the outage.

3. Customers in these clusters have voiced complaints about the relatively long outages that they endure during an interruption.

The projects listed below were identified to provide backup supply in the next budget cycle. The projects on this list share common drivers. Although each project is different with regards to the number of customers and associated cost, customers share the same outcome.

The projects included in the next budget cycle are:

1. 55M5-3P radial section #19
2. 23M2-1P radial section #9
3. 55M1-3P radial section #16
4. 23M1-1P radial section #8
5. 15M7-3P radial section #3
6. 4M2-3P radial section #18
7. 56M7-3P & 1P section #25
8. 55M22-3P & 1P section #21
9. 15M11-1P radial section #6
10. 4M2-3P radial section #17
11. 24M3-1P radial section #11
12. 15M7-1P radial section #4
13. 15M11-3P radial section #5
14. 55M25-1P radial section #22
15. 24M6-1P radial section #13
16. 15M11-single phase radial section #7

17. 56M1-1P radial section #23
18. 56M2-1P radial section #24
19. 25M14-1P radial section #15
20. 24M3-1P radial section #10
21. 15M5-1P radial section #2
22. 24M3-1P radial section #12

Long-term project benefits to the Ontario LTEP goals:

EV penetration is forecasted to increase in the future. As customers rely on power for their transportation needs, they will likely become more sensitive to outages. This program will provide radially-fed customers with the same level of reliability enjoyed by customers served by the rest of the distribution system.

The SCADA FCI Project

This project is part of grid modernization work. It is the continuation of a long-term project. Most of the implementation work was completed in the past years. The outstanding work pertains to communication and other auxiliary work to maintain the system.

This project has the following drivers:

1. ENWIN undertook an FCI pilot project in the downtown underground system, which was a complete success in significantly reducing fault identification time.

2. FCIs along with feeder sectionalizing and tie point connections are capable of identifying and isolating faulted sections. Generally, during a fault, typically one-third of a feeder is sectionalized, which means that at least 1,000 customers are without power. Through implementing this project, ENWIN expects to identify the fault location up to the nearest branch, or as close as possible to the nearest branch, which will minimize the number of affected customers.

3. Determining fault locations is a primary requirement for self-healing/FLISR systems.

The SCADA FCI project was developed to cover all the feeders/feeder sections in the system. The objective is to isolate the minimum number of customers within the shortest possible time. The feeder midpoint protective devices provide the first level of isolation of a faulted section, while SCADA FCIs provide the next level of fault identification within the isolated faulted section.

ENWIN expects a significant reduction in feeder patrols after implementation of this program. SCADA FCIs will use cell modems for FCI communication back to the control room.

Long-term project benefits to the Ontario LTEP goals:

(a) This project is expected to respond to the LTEP goal of improving value and performance for consumers.

SCADA Communication Evolution Design

This project is a grid modernization project, which will provide a reliable communications infrastructure for many other grid modernization projects.

Communication infrastructure will play a major role in the future distribution grid. Currently, ENWIN uses many technologies to satisfy the communication needs of the distribution grid. This program will evolve ENWIN's SCADA communication elements by providing additional radio communication hubs, the conversion of serial radios to Ethernet radios, taller antenna points for locations with difficult communications, etc. The main drivers of this project are listed below:

1. Existing radio communication links fail during summer

2. Losing a repeater hub leads to loss of communication to many devices

3. Communication reliability has been a major concern for ENWIN's operations.

ENWIN did not have in-house expertise to recommend an overall communications strategy. Hence, a specialised communication consultancy firm was contracted to perform a study and provide recommendations to understand ENWIN's long term path of communication development. A utility-owned, hybrid cellular-WiMAX system was proposed. Soon after the report was received, however, cellular prices dropped significantly, which resulted in ENWIN pursuing a different direction at the present time. ENWIN is now planning to utilize 900 MHz Ethernet radios for hubs along with cellular links where reliable communications cannot be achieved with the radio hubs.

Long-term project benefits to the Ontario LTEP goals:

This project addresses the LTEP goal of ensuring a flexible energy system. This is an enabling project to evolve the current communications infrastructure for SCADA FCI, SU automation, sectionalizing load break switches, and other grid modernization projects. As forecasted in the LTEP, the future grid will be a communication-assisted, two-way power flow grid, which will require robust communications to meet future requirements.

SCADA Distribution Management System – FLISR

This is a grid modernization project, which relies on a strong grid with remote operable devices and a reliable communication system to monitor and control them. Hence, this project cannot accomplish its objectives without the implementation of other parallel projects.

Communication and data management will play a major role in the operation of distribution grids in the future. There are operational systems available in the market today to facilitate the automatic operation of the grid. ENWIN is planning to automate its SCADA operation so that it is able to make decisions and alter the distribution system without operator intervention. Major drivers for this project are:

1. Reliability improvement of the distribution grid

2. Future DER and EV management

3. Preparation for future industry and market challenges

ENWIN will be laying the groundwork requirements for such a FLISR system in 2021. FLISR systems require many inputs in a reliable manner to function properly. Some of these inputs could be protective devices status, FCI status, present feeder configuration, feeder loading, etc.

A FLISR project cannot be implemented without other mandatory grid modernization work. To implement a FLISR project, the grid must be designed with contingency capacity to accept the loads of adjacent feeder sections, and employ sufficient remote operable devices along with a reliable SCADA system for monitoring and control.

<u>Long-term project benefits to the Ontario LTEP goals:</u>

This project responds to the LTEP goals of improving performance for customers, and responding to the climate change challenges.

Green Energy Plan (DER and LTEP Initiatives)

This is a grid upgrade project which will allow ENWIN to accept more DER on its distribution system. DER acceptance depends on available capacity at the station and feeders. Currently, ENWIN feeders and all TSs have capacity to accept generation. However, following the termination of the mFIT/FIT programs, customers are expressing interest in larger CHP and BESS projects.

The major drivers for this project are:

1. ENWIN's Walker 2 TS has available capacity to accept generation. However, it is difficult to predict a trend across the entire distribution system.
2. Pursuant to the LTEP, utilities need to accommodate more DER resources.

3. Synchronous CHP generation consumes more short circuit capacity than renewable energy generation ("REG").

The proposed plan to install reactors in the Walker 2 TS is similar to what HONI installed in their Walker 1 TS several years ago. This project will lower the short circuit level at the 27.6 kV bus and enable ENWIN to accept additional generation at the feeders supplied by ENWIN's Walker 2 TS.

The implementation of a reactor project depends significantly on government initiatives. This project is proposed in 2023 and 2024 due to uncertainty of government initiatives. The project is split over a number of years in order to balance capital expenditures between years and smooth the effect on rates.

Long-term project benefits to the Ontario LTEP goals:

This project responds to the LTEP goals related to energy efficiency and affordability by enabling the distribution system to accept more DER through the elimination of fault current restrictions.

Remote Trip Project

This is a grid modernization which will allow ENWIN to accept more DER on its system. The objective of this project is to provide a cost-effective solution for remote trip for DER customers. Major drivers for this project are:

1. Presently, it costs approximately $200k per installation to implement remote trip devices from a HONI breaker. This high cost hinders the economic viability of many DER projects, resulting in the withdrawal of many prospective DER projects. DER acceptance is limited due to this expensive remote trip requirement.

2. ENWIN also occasionally needs to install remote trip from distribution protective devices, which also adds to the cost of DER projects.

3. Additional work is required to maintain these additional devices, which increases LDC costs and exposes some customer assets to liability.

This project is a pilot project to test a "power line carrier signal" through the 27.6 kV system to all customers attached to the station as an alternate to traditional transfer trip. The project involves placing a signal transmitter in the station and installing receivers at customers' locations. The Customers' signal receiving equipment must monitor the signal continuously. When the signal fails to be received at customer locations, this triggers the opening of a protective device.

In addition to providing a cost-effective remote trip solution to the DER customers, this enables ENWIN to manage a single piece of equipment in the station instead of multiple devices connected one-to-one to customers' equipment. This will reduce the staffing requirements to maintain remote trip equipment, and allow for more DER systems to be connected to the system in a cost-effective manner (e.g. due to a less expensive transfer trip method).

Long-term project benefits to the Ontario LTEP goals:

This pilot project responds to the LTEP goals related to ensuring affordable and accessible energy, and innovating to meet future needs. If this innovation is successful, it will enable many generator projects, which were previously uneconomical due to the high cost of transfer trip, to connect to the grid.

5.2.2 Coordinated planning with third parties

A distributor must demonstrate that it has met the OEB's expectations in relation to coordinating infrastructure planning with customers, the transmitter, other distributors, the Independent Electricity System Operator (IESO) or other third parties where appropriate. A distributor must provide the following for any regional planning process, any REG related investments or any other planning initiatives that require coordination:

a) A description of any consultation(s), including:

- **The purpose of the consultation**
- **Whether the distributor initiated the consultation or was invited to participate in it**
- **The other participants in the consultation process (e.g. customers, transmitter, IESO)**
- **The nature and prospective timing of the final deliverables (if any) that are expected to result from or otherwise be informed by the consultation(s) (e.g. Regional Infrastructure Plan 10; Integrated Regional Resource Plan)**
- **An indication of whether the consultation(s) affected the distributor's DSP as filed and if so, a brief explanation as to how**

b) Where a final deliverable is available, provide details of the final deliverable; or where a final deliverable is expected but not available at the time of filing, provide information indicating:

- **The role of the distributor in any consultation**
- **The status of the consultation process**
- **Where applicable the expected date(s) on which final deliverables are expected to be issued**

c) Relevant material documents provided to the other participants in the process, for example:

- **Forecast load at existing (and proposed, if any) points of interconnection**
- **Forecast renewable generation connections and any planned network investments to accommodate the connections**
- **Investments involving grid modernization equipment and/or systems that could have an impact on the operation of assets serving the regionally interconnected utilities**

• The results of projects or programs involving the study or demonstration of innovative processes, services, business models, or technologies, and on the projects or programs of this nature planned by the distributor over the forecast period

d) For REG investments a distributor is expected to provide the comment letter provided by the IESO in relation to REG investments included in the distributor's DSP, along with any written response to the letter from the distributor, if applicable. The OEB expects that the IESO comment letter will include:

• Whether the distributor has consulted with the IESO, or participated in planning meetings with the IESO

• The potential need for co-ordination with other distributors and/or transmitters or others on implementing elements of the REG investments

• Whether the REG investments proposed in the DSP are consistent with any Regional Infrastructure Plan

5.2.2 Coordinated Planning With Third Parties

This Section 5.2.2 summarizes ENWIN's consultations with third parties, and provides information pertaining to regional planning with HONI, the Independent Electricity System Operator ("IESO"), and other LDCs.

5.2.2.1 City of Windsor Utility Coordinating Committee

ENWIN consults with the City to coordinate infrastructure planning through the Utility Coordinating Committee ("UCC").

Purpose of the consultation
The purpose of the UCC is to help manage the responsibility to regulate the locations and activities related to all plants located on public rights-of-way.

Whether ENWIN initiated the consultation of was invited to participate in it
Generally, the City initiates UCC meetings.

Other participants in the consultation process
The City invites all parties that have plant located on the public right-of-way. Other participants included in the consultation process are:

- Communication utilities (Bell Canada, Cogeco, MNSi, etc.);

- Union Gas;
- WUC (i.e. the water utility); and
- Ministry of Transportation Ontario ("MTO").

Nature and prospective timing of final deliverables

Meetings typically occur once every three months. More meetings are possible depending on the issues being addressed. ENWIN shares details of its capital projects and schedules with the committee. The main deliverable is a list of planned and ongoing projects from the attendees.

Effect on the DSP

ENWIN's DSP incorporates all the known impacts from projects of which it has been made aware. This information is reflected in the System Access projects for relocations. If new plans are brought forward by others which affect ENWIN's plant in a significant way, ENWIN may need to alter this plan to accommodate the non-discretionary projects. Changes to proposed relocations are likely based on past experience and ENWIN has a robust change management program to accommodate municipal requests.

The Historical Period System Access expenditures included major relocation projects initiated by the City, MTO (e.g. Windsor Essex Parkway) and Windsor-Detroit Bridge Authority—a Crown corporation wholly owned by the Government of Canada that is responsible for delivering the GHIB project ("WDBA").

5.2.2.2 Regional Planning Process ("RPP")

Purpose of the consultation

At the time of writing this DSP, a new regional planning cycle is underway for the Windsor-Essex region and is anticipated to be completed in Q3 2019.

Whether ENWIN initiated the consultation of was invited to participate in it

The first cycle of regional planning for the region began in 2010 and was completed in April 2015 with the release of an Integrated Regional Resource Plan ("IRRP"). In accordance with the RPP, a regional planning cycle should be triggered every five years, or less if there are emerging needs. A needs assessment completed in October 2017 was triggered by significant load growth and a new load forecast in the Kingsville-Leamington area. ENWIN was invited to participate in the process by the IESO.

Other participants in the consultation process

Other participants in the process included HONI, Essex Powerlines, E.L.K. Powerlines, Entegrus Powerlines and other customers and municipalities.

Nature and prospective timing of final deliverables

The final report concluded that some needs in the region may require regional coordination and more comprehensive planning, and should be reviewed further under the IESO-led scoping assessment process which is the second stage in the Board's regional planning process.

The IESO, in collaboration with the regional participants, including ENWIN, further reviewed the needs identified along with information collected during the needs assessment, information on potential wires and non-wires alternatives, and the overall regional impact to assess and determine the best approach for the whole or parts of the region. The scoping assessment completed in February 2018 concluded that:

1. Based on the needs identified in the needs assessment, an IRRP is recommended for the Windsor-Essex region. The IRRP scope will include the following:

    a. capacity needs in the Kingsville and Leamington areas;
    b. confirmation of the load meeting capabilities of Kingsville TS after reconfiguration;
    c. capacity needs at Lauzon and Belle River TS;
    d. system restoration needs following loss of the C23Z/C24Z or C21J/C22J or K2Z/K6Z or Z1E/Z7E double circuit lines; and
    e. Lauzon TS re-configuration or upsizing.

2. The work to implement recommendations from the previous IRRP and Regional Infrastructure Planning (RIP) should continue.

3. The IESO will conduct a separate bulk planning process in parallel with IRRP. The results will be incorporated into the regional planning processes as they become available.

4. A local planning process is recommended for EOL needs at Malden TS.

Much of the regional planning effort has been and continues to be centered around the expanding requirements for power in the county that are associated with load growth in the greenhouse sector. This growth was spurred on most recently by the new legislation decriminalizing cannabis which has resulted in prolific growth in demand in the greenhouse industry as they try to convert existing greenhouses to cannabis production and provide supplemental lighting for greenhouses.

ENWIN provided detailed station load and renewable generation forecasts for the IRRP and has participated in discussions and meetings related to the process.

<u>Effect on the DSP</u>

The result of the planning efforts to date and the expected result of the current planning effort are centered in the county (i.e. outside of ENWIN's territory). ENWIN is not expecting the planning efforts to have any material effects on ENWIN's plans or this DSP.

5.2.2.3 Windsor Essex Economic Corporation ("WEEDC")

ENWIN has regular dialogue with WEEDC with regard to ENWIN's role in assisting WEEDC with economic development opportunities.

Purpose of the consultation:

The purpose of the consultation is to discuss with prospective developers, during the early stages of projects, the availability and nature of power supply. WEEDC views ENWIN as a key partner in this process and ENWIN assists both WEEDC and prospective developers in assessing the power availability at selected properties of interest, and directing prospective developers to areas within the city where supply availability might better suit the developers' requirements.

Increasingly, developers are interested in areas where there are opportunities to generate behind the meter and/or back to the grid as part of their operation. ENWIN is able to speak to those requirements, as well as the traditional load requirements of sufficiency and reliability.

Assisting prospective developers and WEEDC in selecting optimal locations, with respect to electrical supply, to build their businesses minimizes the amount of distribution plant investment that both ENWIN, and the prospective developer, need to make. This increases the utilization of existing plant, thereby minimizing costs for all customers.

Whether ENWIN initiated the consultation or was invited to participate in it

WEEDC usually takes the lead role in these consultations whenever a large potential client is considering locating to Windsor, and regularly consults with ENWIN regarding the availability and quality of electrical service.

Other participants in the consultation process:

Other participants in the process are the City of Windsor administration (Operations, Engineering and Planning departments) and other utilities.

Nature and prospective timing of final deliverables:

Consultations are held on an as-needed basis. The main deliverable is the preliminary assessment of the power availability, and directions given to prospective developers regarding other locations in which available supply might better fit developer's requirements.

Effect on the DSP:

ENWIN's DSP incorporates known impacts from projects of which it has been made aware by WEEDC. If new plans are brought forward that affect ENWIN's plant in a significant way, ENWIN may need to alter this plan to accommodate these projects.

5.2.2 (c) Relevant Materials

ENWIN provided the IESO with a load forecast for stations supplying ENWIN's distribution system for the IRRP studies. In the case of shared stations, the forecast was for the ENWIN portion of the station load. ENWIN hired London Economics International LLC to assist with the preparation of the forecast. This forecast is discussed in Section 5.3.2 (d) of the DSP. A copy of the forecast is provided in *Appendix D – IRRP Load Forecast*.

The REG forecast was also provided, and is discussed in Section 5.3.4 (b) of the DSP.

There were no grid modernization equipment or systems investments that could have an impact on regional utilities. There were no projects, programs or studies that were relevant to other regional utilities through the IRRP and the Regional Infrastructure Planning ("RIP") processes.

5.2.2 (d) IESO Letter of Comment

ENWIN submitted its REG Investments Plan to the IESO on December 20, 2018, detailing ENWIN's ability to connect REG projects to the distribution system. The REG plan summary indicates that ENWIN has a total of 716 mFIT, 71 FIT, 6 load displacement, 5 net Metering and 3 CHP projects currently connected to its distribution system representing a total of 47.7 MW of potential generation. In summary, ENWIN does not currently see a need for immediate investment to accommodate REG connections, but is prepared to add items to its long term budget if there are unforeseen changes on specific feeders, causing investments to be required. The REG Investments Plan is attached as *Appendix E – Renewable Energy Generation Plan*.

On January 25, 2019, the IESO responded with a Letter of Comment stating that: "At this time ENWIN has no investments planned for connecting renewable energy generation, as previous investments to enable balancing load have previously been made. This technical solution enables ENWIN to connect more generation to specific feeders by increasing or decreasing the load thresholds depending on capacity needs at the feeder level. Therefore, the IESO has not provided comments on the need for coordination with others and whether the investments are consistent with any RIP".

The IESO's Letter of Comment is attached as *Appendix E – Renewable Energy Generation Plan*.

5.2.3 Performance measurement for continuous improvement

Distributors are expected to use qualitative assessments and/or quantitative metrics to monitor the quality of their capital expenditure plans, the efficiency with which plans are implemented, and/or the extent to which planning objectives are met. This information should be used to continuously improve a distributor's asset management and capital expenditure planning processes.

A distributor must provide the following information:

a) Identification and definition of the methods and measures (metrics) used to monitor distribution system planning process performance, providing for each a brief description of its purpose, form (e.g. formula if quantitative metric) and driver (e.g. consumer, legislative, regulatory, corporate). These measures and metrics are expected to address, but need not be limited to:

- **Customer oriented performance (e.g. customer bill impacts, reliability, power quality)**
- **Cost efficiency and effectiveness with respect to planning quality and DSP implementation (e.g. physical and financial progress vs. plan, actual vs. planned cost of work completed)**
- **Asset and/or system operations performance (e.g. line losses)**

b) Unit cost metrics for capital expenditures and O&M per customer, kilometer of line, and peak capacity as outlined in Appendix 5-A.

c) A summary of performance for the historical period using the methods and measures (metrics/targets) identified and described above, and how this performance has trended over the period. This summary must include historical period data on:

- **All interruptions**
- **All interruptions excluding loss of supply**
- **All interruptions excluding Major Events and loss of supply for the following:**
    - **o The distribution system average interruption frequency index (SAIFI)**
    - **o System average interruption duration index (SAIDI)**

The applicant should also provide a summary of Major Events that occurred since the last Cost of Service (CoS) filing.

For each cause of interruption, a distributor shall, for the last five historical years, report the

following data:

• Number of interruptions that occurred as a result of the cause of interruption

• Number of customer interruptions that occurred as a result of the cause of interruption

• Number of customer-hours of interruptions that occurred as a result of the cause of interruption

The applicant must also provide an explanation for any adverse deviations from trend of targets (including any established in a previously filed DSP) and any underperformance in SAIDI and SAIFI measures, and actions taken or to be taken to address the issues and any outcomes, if available.

As established in the *Report of the OEB: Electricity Distribution System Reliability Measures and Expectations*, distributors' SAIDI and SAIFI performance is expected to meet the performance target set out in the Scorecard. A distributor who wishes to establish performance expectations based on something other than historical performance should provide evidence of its capital and operational plan and other factors that justify the reliability performance it plans to deliver. Distributors should also provide the results of consultation with their customers that identify the level of reliability desired by customers as part of justification for non-historical targets.

Distributors who wish to use SAIDI and SAIFI performance benchmarks that are different than the historical average must provide evidence to support the reasonableness of such benchmarks.

d) An explanation of how historical performance has affected the DSP (e.g. objectives, investment priorities, and expected outcomes) and how it has been used to continuously improve the asset management and capital expenditure planning process.

5.2.3 Performance Measurement for Continuous Improvement

5.2.3 (a) Methods and Measures to Monitor Performance

ENWIN uses three key performance measures to monitor continuous improvements. These are:
(1) Customer-Oriented Performance,
(2) Cost Efficiency and Effectiveness and
(3) Asset / System Operations Performance.

Table 4 below summarizes the performance metrics in this section along with their driver and ENWIN target.

Table 4 Performance Metrics, Drivers and Targets

Performance Outcome	Measure	Driver	Metric	ENWIN Target
Customer-Oriented Performance	System Reliability	Regulatory/ Consumer	SAIFI	≤ 2.14
			SAIDI	≤ 0.98
			CAIDI	≤ 0.46
			MAIFI	Tracking
			MED/SED	≤ 0.4 / ≤ 13.8
	Service Quality	Regulatory/ Consumer	Customer Satisfaction Survey Results	≥ 80%
			Low Voltage Connections	≥ 90.0%
			High Voltage Connections	≥ 90.0%
			Telephone Accessibility	≥ 65.0%
			Appointments Met	≥ 90.0%
			Written Response to Enquiries	≥ 80.0%
			Emergency Urban Response	≥ 80.0%
			Telephone Call Abandon Rate	≤ 10.0%
			Appointment Scheduling	≥ 90.0%
			Rescheduling a Missed Appointment	100.00%
			Reconnection Performance Standard	≥ 85.0%
			Power Quality	Tracking
			Worst Performing Feeder	Tracking
Cost Effectiveness and Efficiency	DSP Implementation Progress	Regulatory/ Consumer	Overall DSP Financial Progress vs Plan	≥ 80.0%
	Cost Control	Regulatory/ Consumer	PEG Efficiency Assessment	Group 3
Assets / System Operation Performance	Safety	Regulatory/ Corporate	Public Awareness of Electrical Safety	≥ 80.0%
			Compliance with Ontario Regulation 22/04	Compliant
			Serious Electrical Incident Index	0
			Crew Visits	Tracking

	Grid Performance	Corporate	Distribution Losses	≤ 2.39%

The System Reliability metrics are further discussed in Section 5.2.3 (c) of the DSP.

Service Quality

Customer Satisfaction Survey Results

ENWIN has engaged a third party to conduct customer satisfaction surveys. ENWIN achieved a "Customer Experience Performance Rating" ("CEPr") of 84% in 2017, which is above the National average of 83%, and the Ontario average of 81% based on others surveyed by UtilityPULSE®. Factors that are considered as part of the overall customer experience include delivery of accessible and consistent customer service, understanding customer expectations, providing timely issue resolution, providing effective communication(s) according to customer needs, demonstrating responsiveness, conducting problem analysis to prevent recurring issues, ease of engagement on issues, seeking customer feedback and following through on recommendations. The CEPr is only one element of the customer survey. The survey also gathers information on engagement, operational effectiveness and service quality through the eyes of the customer. ENWIN reviews all of the data gathered in the survey to help drive decision making and to continuously improve ENWIN's customer experience.

ENWIN's historical performance has been consistently "Good", as ENWIN strives to maintain scores of at least 80% (ENWIN's internal target) and be above the national and Ontario average. Table 5 below shows ENWIN's customer satisfaction survey results from 2013 to 2017.

Table 5 Customer Satisfaction Survey Results

	2013	2014	2015	2016	2017
Survey Results	N/A	Good	Good	Good	Good

Minimum Service Quality Requirements - DSC

Methods and Measures

The DSC sets the minimum service quality requirements that an LDC must meet in carrying out its obligations to distribute electricity under its license and under the *Energy Competition Act, 1998*. As required by the OEB, ENWIN records and submits all performance measures, which are compared with the OEB's established levels to evaluate customer service quality. The performance metrics are described below, as per the DSC.

Low-Voltage Connections

A connection for a new service request for a low-voltage (less than 750 V) service must be completed within five (5) business days from the day on which all applicable service conditions are satisfied, or at such a later date as agreed by the customer and the LDC.

High-Voltage Connections

A connection for a new service request for a high-voltage (greater than 750 V) service must be completed within ten (10) business days from the day on which all applicable service conditions are satisfied, or at such a later date as agreed to by the customer and the LDC.

Telephone Accessibility

The OEB requires that qualified incoming calls to an LDC's customer care telephone number must be answered within the thirty-second time period as established below:

1. For qualified incoming calls that are transferred to the LDC's interactive voice response system, the thirty (30) seconds shall be counted from the time the customer selects to speak to a customer service representative.
2. In all other cases, the thirty (30) seconds shall be counted from the first ring to the call centre queue.

Appointments Met

When an appointment is either requested by a customer/representative or required by an LDC with a customer/representative, the LDC must offer to schedule the appointment during the LDC's regular hours of operation within a window that is no greater than four (4) hours. The LDC must then arrive for the appointment within the scheduled timeframe. This includes underground locate requests.

Written Response to Enquiries

A written response to a qualified enquiry shall be sent by an LDC within ten (10) business days.

Telephone Call Abandon Rate

As required by the OEB, the number of qualified incoming calls to a LDC's customer care telephone number that are abandoned before they are answered shall be 10% or less on an annual basis. A qualified incoming call will only be considered abandoned if the call is abandoned after the thirty second time period has elapsed.

Emergency Response

Emergency calls (i.e. assistance by the distributor has been requested by fire, police, or ambulance services) must be responded to within two (2) hours in rural areas and within one (1) hour in urban areas. There is no rural area in ENWIN territory.

Appointment Scheduling

When a customer or a representative of a customer requests an appointment with an LDC, the LDC shall schedule the appointment to take place within five (5) business days of the day on which all applicable service conditions are satisfied, or on such a later date as may be agreed upon by the customer and the LDC. This includes underground locate requests.

Rescheduling a Missed Appointment

When an appointment with a customer or a representative of a customer is going to be missed, an LDC must:

1. Attempt to contact the customer before the scheduled appointment to inform the customer that the appointment will be missed; and
2. Attempt to contact the customer within one (1) business day to reschedule the appointment.

Reconnection Performance Standard

Where an LDC has disconnected the property of a customer for non-payment, the LDC shall reconnect the property within two (2) business days of the date on which the customer:

1. Makes payment in full of the amount overdue for payment as specified in the disconnection notice; or
2. Enters into an arrears payment agreement with the LDC.

Table 6 below summarizes the Minimum Service Quality requirements from the DSC. It also provides historical figures on ENWIN's performance as well as the OEB and ENWIN targets which are aligned.

Table 6 ENWIN's Performance in Minimum Service Quality Requirements

Indicator	OEB Minimum Standard and ENWIN Target	2014	2015	2016	2017
Low Voltage Connections	≥90.0%	100.0%	99.1%	100.0%	100.0%
High Voltage Connections	≥90.0%	100.0%	NA	NA	100.0%
Telephone Accessibility	≥65.0%	86.8%	75.5%	70.7%	78.2%
Appointments Met	≥90.0%	100.0%	100.0%	100.0%	99.8%
Written Response to Enquiries	≥80.0%	99.2%	100.0%	100.0%	100.0%

Emergency Urban Response	≥80.0%	98.1%	100.0%	100.0%	100.0%
Emergency Rural Response	≥80.0%	NA	NA	NA	NA
Telephone Call Abandon Rate	≤10.0%	1.3%	2.8%	3.8%	3.9%
Appointment Scheduling	≥90.0%	100.0%	100.0%	100.0%	98.5%
Rescheduling a Missed Appointment	100.0%	NA	100.0%	NA	100.0%
Reconnection Performance Standard	≥85.0%	100.0%	100.0%	100.0%	100.0%

In 2017, ENWIN met all OEB minimum standards and continued to exceed them. ENWIN continues to deliver high quality service to its valued customers.

Power Quality Complaints

ENWIN has decided to further analyze its power quality to its valued customers to record reports received from major commercial and industrial customers. These numbers are based on the calls from these customers therefore there is much variability in whether a customer will actually call about events or call about the same event multiple times. It is usual for ENWIN to hear from its customers when there have been power interruptions and/or voltage sags or swells. There have been 32 complaints from major commercial and industrial customers regarding the reliability and power quality from ENWIN's distribution system in 2017, as shown in Table 7 below.

Table 7 Customer Complaints

Customer	Reports Received From Customer
ADM Canada	1
ArcelorMittal	5
Caesars Windsor / Windsor Energy / Enwave	10
FCA - Windsor Assembly	2
Ford Essex Engine	1
Hiram Walker / Pernod Ricard	2
K&S Windsor Salt - Prospect	2
Kautex Textron	3
Nemak	3
Windsor Regional Hospital - Ouellette	2
WUC Water Filtration Plant	1

The largest number of power quality complaints in 2017 is from Caesars Group of Companies. The majority of these calls resulted from auto-reclose operations on one of ENWIN's two primary feeders supplying their site, while the others are from voltage dips. These auto-reclose operations are a natural part of the system operating, and the auto-reclose operations are incidents where the system is behaving as it should be. Even though these are recorded calls, and a customer may have been impacted, the majority of the customers on these feeders

experienced no issues. The sensitive nature of certain customers requires them to identify potential behind the meter improvements to limit their impacts from normal system activity.

Historical information shows the number of historical power quality complaints yearly, as listed in Table 8 below. As to be expected, there is no clear pattern evident. This is as a result of the natural variability in system impactors (weather), system performance and issues are only recorded when a customer calls in, which is not always consistent. Therefore, there is no internal ENWIN target for this metric but it is recorded for overall feel of system performance and to be able to be responsive to repetitive customer power quality issues.

Table 8 Historical Power Quality Complaints Yearly

	Number of Power Quality Complaints
2010	44
2011	32
2012	37
2013	26
2014	21
2015	18
2016	21
2017	32

Worst Performing Feeder Analysis

ENWIN analyzes worst performing feeders on a three-year average to give an accurate representation of the worst performing feeder ranking. This ensures that unusual feeder activity in one year will not skew results. Just like the power quality complaints section, there is no specific ENWIN internal target for worst performing feeders, but the obvious goal is to target repeat worst performing feeders with projects that will improve their performance. Table 9 below shows the worst performing feeders for the years between 2012 and 2017.

Table 9 Worst Performing Feeders

Year	Worst Performing Feeders In Order
2012-2014	55M25 24M5 56M8 25M7 55M22 56M7 56M1 24M4 55M23 55M24
2013-2015	25M7 55M25 56M8 55M23 24M5 56M7 55M22 24M4 56M1 15M7
2014-2016	56M8 25M7 55M25 55M23 56M1 56M7 24M5 24M4 24M3 55M22
2015-2017	56M8 25M7 55M22 55M23 56M1 55M25 56M2 56M7 56M5 23M2

The three key feeders that have been on the list since 2012, but in different orders, are 55M25, 25M7 and 56M8. There were reliability improvement projects, such as the addition of automated switches to these feeders, to improve their rankings. The ranking calculation is based on number of customers on the feeder, total outages by feeder, total auto-reclose

("A/R") operations by feeder, and outage durations. The weighting factor is 30% for A/R, and 70% for outages greater than 1 minute.

55M25 has moved from worst feeder in 2012-2014 to second, third and eventually sixth in 2015-2017. This is due to the work that was done on this feeder to make it more automated such as automated overhead and underground switches. These switches provided the ability to sectionalizing the feeder into at least three parts which could be used to transfer the large residential loads that are able to be isolated from a contingency, to adjacent feeders. Similar work was completed on 25M7 and 56M8; however, the shift has not occurred as quickly on these to improve the worst performing feeder rankings. The main reason for this is due to the fact that these feeders are located in heavily-treed areas and, serve large residential groups of customers. Now that ENWIN's tree trimming clearance has increased to 10 feet, the performance of these feeders should also improve over time.

Cost Effectiveness and Efficiency

Distribution System Plan Implementation Progress

DSP implementation progress is a performance measure instituted by the OEB starting in 2014. The 2014 DSP outlined ENWIN's forecasted capital expenditures, over the next five years, which were required to maintain and expand ENWIN's electricity system to serve its current and future customers. This performance measure is intended to assess ENWIN's effectiveness at planning and implementing the DSP.

The DSP investment plan for 2017 was forecasted at $34.5M and included the construction of a new TS and new feeders in the west end of Windsor to adequately serve existing customers in the area, at an estimated cost of $16.5M. However, significant load was displaced due to behind the meter generation that was installed, or in the process of being installed, by two major customers (with additional projects under consideration by at least two other major customers). Hence, construction of a new TS and new feeders was deemed unnecessary, and the project subsequently cancelled.

The move to behind the meter generation was incentivized by the IESO-funded Conservation First Framework ("CFF") program, and was not anticipated when the DSP was prepared. The adjusted forecast, after removing this item, resulted in a forecast of $18.0M. The actual capital spend was $14.6M (note that this number was pre-burden rate adjustment as was the forecast comparator; the adjusted expenditure $13,236k), resulting in progress to the other elements of the DSP of 81%.

Historical performance in 2014 shows 16% progress; this was the number reported to the OEB. However, it actually represents 84% achievement in line with reporting convention for the other years' progress. ENWIN changed its reporting method in 2015 to better align with other LDCs on the reporting of DSP progress, which explains the anomaly in 2014. All the years are

considered successful by ENWIN as the actual capital spend is within +/- 20% of the planned spend.

ENWIN has continually exceeded its internal target of achieving at least 80% spend on its capital budget. Table 10 below shows the percentage of ENWIN's capital spending from 2014 to 2017 and its target.

Table 10 Percentage of ENWIN's Capital Spending

	2014	2015	2016	2017	Target
Distribution System Plan Implementation Progress	-16%	96%	83%	81%	≥80%

Cost Control

ENWIN's vision is to be a trusted leader in providing exceptional value and services to our customers and stakeholders. Therefore the cost control metrics are an important part of this vision.

Metrics for cost control are the efficiency assessment as per the Pacific Economics Group ("PEG") rating.

The definitions of the PEG assessments are shown in Table 11 below.

Table 11 Definitions of PEG Group Assessments

PEG Group	**Definition**
Group 1	Actual costs are less than 25% of predicted costs.
Group 2	Actual costs are between 10% and 25% less than predicted costs.
Group 3	Actual costs are within 10% of predicted costs.
Group 4	Actual costs are between 10% and 25% greater than predicted costs.
Group 5	Actual costs are greater than 25% of predicted costs.

ENWIN's performance in the last 5 years for the cost control metrics is shown below in Table 12 with clear improvements in the PEG in 2017 as further explained below.

Table 12 Cost Control

Cost Control Metrics	**2013**	**2014**	**2015**	**2016**	**2017**	**Target**
PEG Efficiency Assessment	4	4	4	4	3	3

Efficiency Assessment

The total costs for Ontario LDCs are evaluated by PEG on behalf of the OEB to produce a single efficiency ranking. The LDCs are divided into five cohort groups based on the magnitude of the difference between their respective individual actual and predicted costs. ENWIN's efficiency performance has been improving year over year since 2014. The PEG methodology utilizes a three-year average. ENWIN has transitioned from the Group 4 cohort in 2016 to the Group 3 cohort in 2017, which is indicative of improved cost performance results. ENWIN is replacing assets proactively along a carefully managed timeframe in a manner that balances system risks and customer rate impacts. ENWIN has always had the target of being in Group 3 and has now achieved this with full intention to maintain this rating, as ENWIN has shown performance improvements year over year since 2014.

Asset / System Operation Performance

Safety

Public and employee health and safety are key parts of the safety culture within ENWIN. The three main safety metrics, along with their performance measure and ENWIN's internal targets are listed in Table 13 below.

Table 13 Safety Metrics

Safety Metrics	2013	2014	2015	2016	2017	Target
Level of Public Awareness	N/A	N/A	83%	83%	82%	≥80%
Level of Compliance with Ontario Regulation 22/04	C	C	C	C	C	C
Serious Electrical Incident Index	0	0	0	1	2	0

Note: C represents Compliant

Public Awareness of Electrical Safety

ENWIN engaged a third party to conduct a survey of customer perception and overall electrical safety awareness in 2018, and achieved an overall score of 82%. In addition, ENWIN maintained its previous levels of public service announcements broadcasting and participation in the local Children's Safety Village programs. ENWIN will continue to support and provide education and training to our community on electrical safety through these initiatives. ENWIN continues to hold an 80% target and achieve it yearly.

Compliance with Ontario Regulation 22/04

ENWIN remains fully compliant with all sections of Ontario Regulation 22/04 – Electrical Distribution Safety ("O.Reg 22/04"). ENWIN has always had and will always have a "full compliance" target, with plans to continue to achieve it yearly. This continued achievement is reflective of ENWIN's strong commitment to safety, adherence to company procedures, policies, and the elements of the regulation itself. O.Reg 22/04 establishes objective-based electrical safety requirements for design, construction and maintenance of electrical distribution systems owned by licensed distributors. Specifically, the regulation requires the

approval of equipment, plans, specifications and the inspection of construction before it is put into service. The Electrical Safety Authority ("ESA") performs due diligence inspections throughout the year to ensure utilities remain compliant with the objectives set out in O.Reg 22/04. Both independent and ESA compliance audits yielded only a few opportunities for improvement which have all subsequently been addressed. In summary, ENWIN has successfully completed its 2017 ESA audit cycle, obtaining full compliance with O.Reg 22/04, with no 'non-compliance' or 'needs improvement' identified.

Serious Electrical Incident Index

ENWIN experienced and reported two Serious Electrical Incidents, as defined in O.Reg 22/04, for the time frame used for this measure (January 01, 2016 to December 31, 2016). Fortunately, there were no injuries to people as a result of these incidents. These incidents qualify as serious electrical incidents because there was potential for injury, regardless that there were no personal injuries. The calculated rate of incidents per 1,000 km of line is 1.792 for this period. In an ongoing effort to prevent incidents, ENWIN continues its aggressive public safety messages through radio advertising, television advertising, online advertising, bill inserts, brochures, banners, media releases, taglines, website challenge, YouTube videos, Twitter messaging, and public events. Even though ENWIN's target of 0 was not met for two years in a row, ENWIN continues the strong messaging and will continue to look for new tools to deliver its message to customers. The upgraded Customer Information System ("CIS") and new customer portal will aid in this goal going forward.

The two incidents are outlined below to show their nature and outline that, even though they are reported as Serious Electrical Incidents, there were no injuries. The first incident in May was due to a home owner trimming trees on his property. He used an aluminum ladder to reach a tree branch which was in proximity to ENWIN overhead plant. The owner reports drawing an arc as a result of his actions; however, no injury was reported. No protective devices operated as a result of the incident and there was no damage to ENWIN equipment.

The second incident in June was due to an unlicensed tree trimming person that had a tree branch fall onto the overhead plant causing the conductor and transformer to be damaged. There was no injury to the tree trimmer or public.

Crew Visits

ENWIN supervisors perform regular crew and apprentice visits to ensure the crews are performing their job safely. This is also an opportunity to ensure that any apprentice on the job is learning their job duties and has an opportunity to ask their supervisor any questions they may have. The apprentices are regularly evaluated by their supervisor as well. In 2016, ENWIN took the crew visits one step further by introducing an "Opportunity for Improvement" ("OFI") metric. This metric is aimed at the supervisors to take the crew visits one step further and provide valuable opportunities for improvement back to management for their crew's safety. These OFIs show ENWIN's determination to continuously improve its performance. Some of the themes of the OFIs are improvement to existing traffic plans, review of the Electric Utilities Safety Association rules, adherence to the Occupational Health and Safety Act and general communication between supervisors and crews to ensure review of procedures. There is no specific ENWIN target for crew visits or OFIs. Each supervisor has individual targets that vary throughout the year depending on the crew composition (Overhead, Underground, System Automation and Maintenance) and number of apprentices. The number of crew visits and OFIs from 2009 to 2017 are shown in Table 14 below.

Table 14 Crew Visits and Opportunities for Improvement

Year	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Crew Visits	2279	2297	2379	1387	2269	1755	1774	1387	1194
OFI	N/A	N/A	N/A	N/A	N/A	N/A	N/A	209	336

Distribution Losses

ENWIN's distribution system performance is shown in terms of distribution losses. Distribution losses are calculated as percentage of energy lost based on the total supply of energy and what is actually delivered to customers. Therefore, distribution losses are divided by supply total and shown as a percentage in the below table. The 5 year average distribution losses are 2.39%which includes the 2017 loss of 2.32 % which is below the 5-year average. Table 15 below shows ENWIN'S distribution losses from 2013 to 2017.

Table 15 Distribution Losses

Supply and Delivery Information kWh	**2013**	**2014**	**2015**	**2016**	**2017**
Supply Total (IESO including losses +gen)	2,528,490,207	2,516,026,877	2,460,627,824	2,530,696,462	2,423,395,058

Total Delivered to Customers	2,457,724,025	2,471,950,155	2,405,385,603	2,459,339,303	2,367,134,925
Distribution Losses	70,766,182	44,076,722	55,242,221	71,357,159	56,260,133
Distribution Losses (%)	2.80%	1.75%	2.25%	2.82%	2.32%

5.2.3(b) Unit Cost Metrics

Table 16 below outlines ENWIN's performance in the last five years with respect to the metrics required by OEB's Appendix 5-A. The five-year average is included. There is no specific internal ENWIN target for these metrics.

Table 16 ENWIN's Performance in Unit Cost Metrics

Metric Category	Metric	2013	2014	2015	2016	2017	5 Year Avg
Cost	Total Cost Per Customer	$ 263	$ 242	$ 242	$ 216	$ 262	$ 245
	Total Cost per km of line	$ 19,435	$ 18,022	$ 18,842	$ 16,868	$ 4,813	$ 15,596
	Total Cost per MW	$ 45,787	$ 46,182	$ 45,296	$ 38,703	$ 49,533	$ 45,100
CAPEX	Total CAPEX per Customer	$ 213	$ 190	$ 192	$ 163	$ 151	$ 182
	Total CAPEX per km of line	$ 15,780	$ 14,167	$ 14,894	$ 12,719	$ 2,771	$ 12,066
O&M	Total O&M per Customer	$ 49	$ 52	$ 51	$ 53	$ 111	$ 63
	Total O&M per km of line	$ 3,655	$ 3,855	$ 3,948	$ 4,150	$ 2,042	$ 3,530

Total Cost per Customer

Total cost per customer is calculated based on the CAPEX and O&M summation. The O&M costs are system Operating & Maintenance and do not included Administration costs as is included in the OEB Yearbook to match the definition of Appendix 5-A. It is important to note, when examined over 5 years, ENWIN has held the total cost per customer relatively constant despite inflationary pressures.

ENWIN's cost per customer is comparable to other LDCs serving built-out, established communities, and to LDCs serving energy-intensive customers. ENWIN is committed to infrastructure reinvestment in order to meet its customer's expectations for reliability with a

reasonable cost. While ENWIN's load base has eroded since peaking in 2006, ENWIN continues to invest in replacement of its infrastructure as that infrastructure reaches EOL. This investment is to ensure that ENWIN's customers continue to have the reliable electrical service they currently enjoy.

Total Cost per km of Line

This measure uses the same total cost that is used in the total cost per customer calculation above. The total cost is divided by the kilometers of line that ENWIN operates to serve its customers. ENWIN's 2017 total cost per kilometer of line is $4,813, which is substantially less than the prior years. This is primarily due to a change in methodology by ENWIN, which was permitted by the reporting definition, and which accounts for the presence of the utility's significant secondary (lower-voltage) distribution network. This change in methodology makes ENWIN comparable with other LDC's which have previously made this change.

Total CAPEX per km of Line

This measure shows a substantial decrease, due to the Capital Expenditure being relatively low in 2017 compared to previous years, in addition to the change in methodology as reported above. The low Capital Expenditure is partially attributed to a burden rate change which impacted the actual spend.

Total O&M per Customer

This measure shows a substantial increase in 2017 due to higher O&M costs than previous years, which was a result of a reclassification of O&M costs (specifically, a re-attribution of administrative costs from "Admin" to "System" O&M).

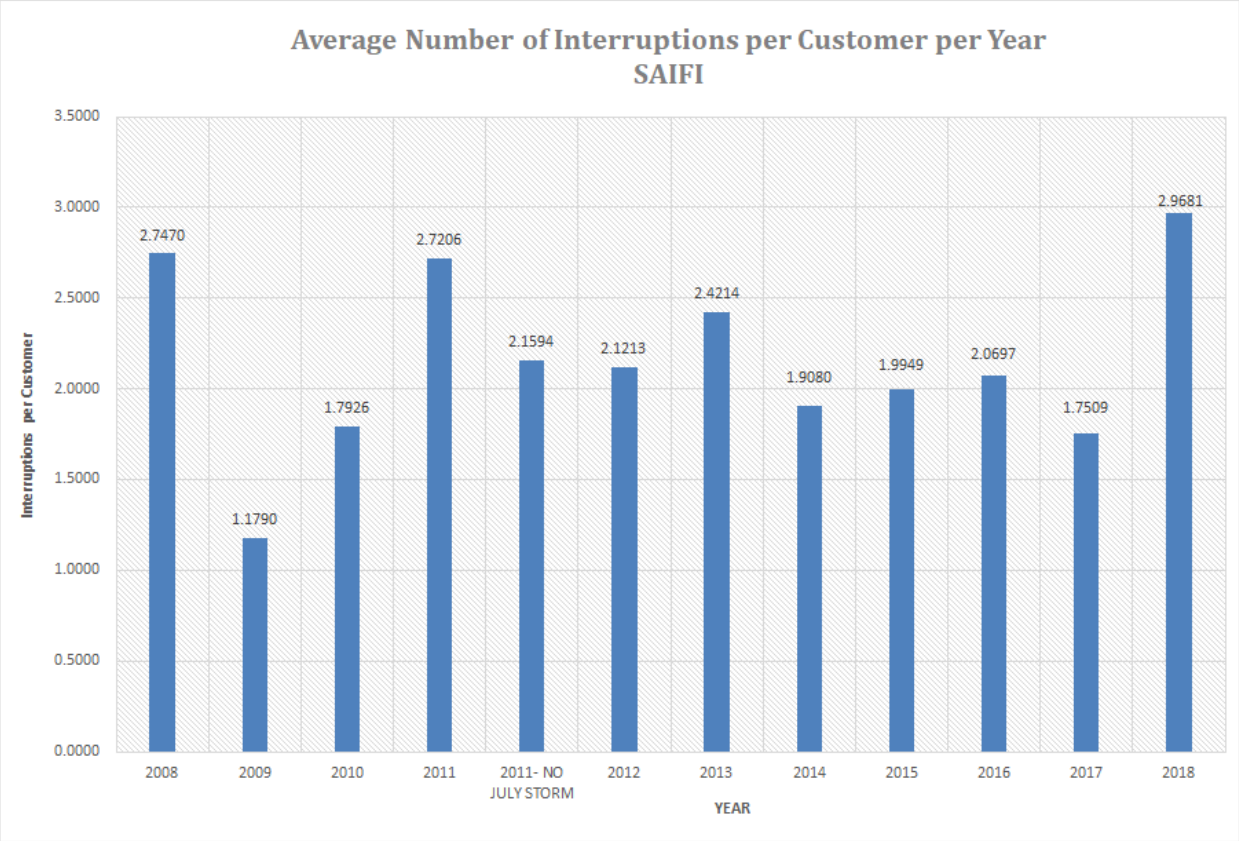
5.2.3 (c) Summary of Performance

System Reliability

The following synopsis describes the system reliability indices for 2018 along with a brief explanation of trends and causes.

SAIFI – System Average Interruption Frequency Index – this is the total number of customers affected by all the outages for the year divided by the total number of customers. This index typically is related to the weather experience for the year as well as the measures (i.e. tree trimming, system self-healing, asset stewardship, etc.) taken by the utility to minimize interruptions. The average number of interruptions is shown in Figure 1 below.

Figure 1 Average Number of Interruptions per Customer per Year - SAIFI



The 2018 SAIFI value of 2.9681 was the highest in the past 10 years, and was a result of abnormally high storm activity for the year. Windsor is the Canadian city with the greatest frequency of thunderstorms, averaging 33.2 days annually, and 2018 proved to be no exception.

In 2018, Windsor experienced a total of 131 events and 53,411 customer hours of outage caused by thunderstorm activity and adverse weather. This is defined as the summation of Adverse Weather, Adverse Environment, Lightning and Tree Contact outage cause codes. This stands in stark contrast to the conditions in 2017, which experienced only 82 events and 12,868 customer hours of outage caused by thunderstorm activity and adverse weather.

However, thunderstorms are not the only severe weather conditions that afflicted Windsor in 2018. There were three severe weather events throughout the year: an ice storm in April, a wind storm in May, and an extremely damaging thunderstorm in August. In addition to these events, Hydro One lost their incoming 230 kV supply to the Keith TS and Malden TS on September 17th, and again on September 19th.

These outages occurred during a period when construction work was being undertaken in the Keith TS and, consequently, the station was vulnerable to a single contingency outage of the 230 kV supply. The first 230 kV outage resulted in a short duration distribution system outage, while the second 230 kV outage resulted in loss of the Keith and Malden stations for approximately 20 minutes. That outage affected over 14,000 ENWIN customers.

Figure 2 SAIFI Trend

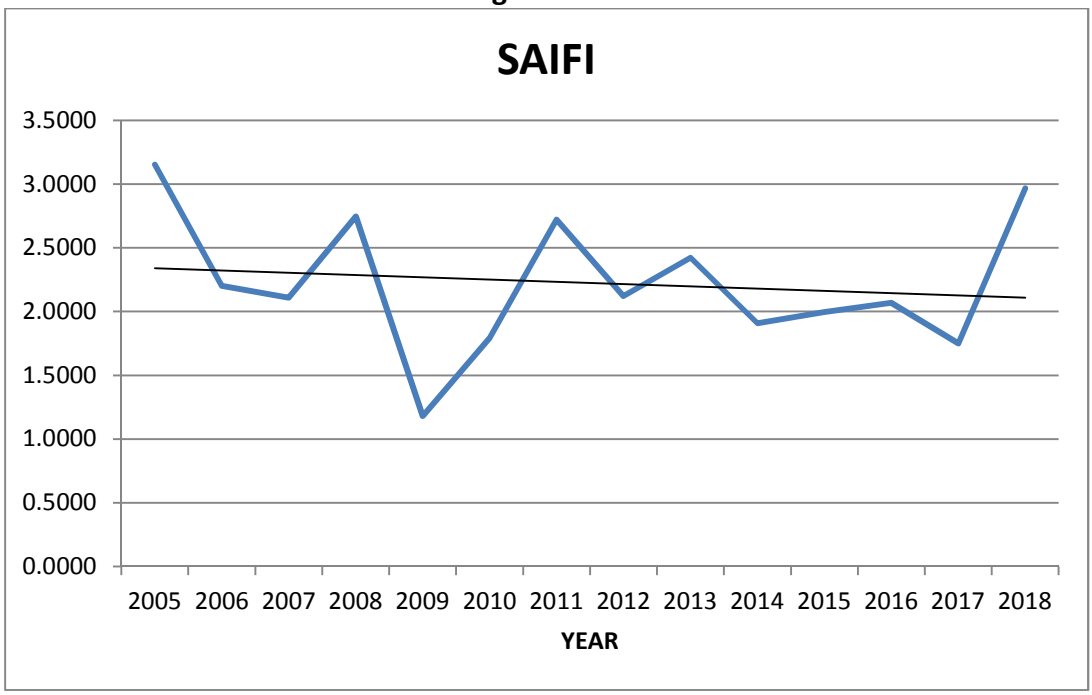


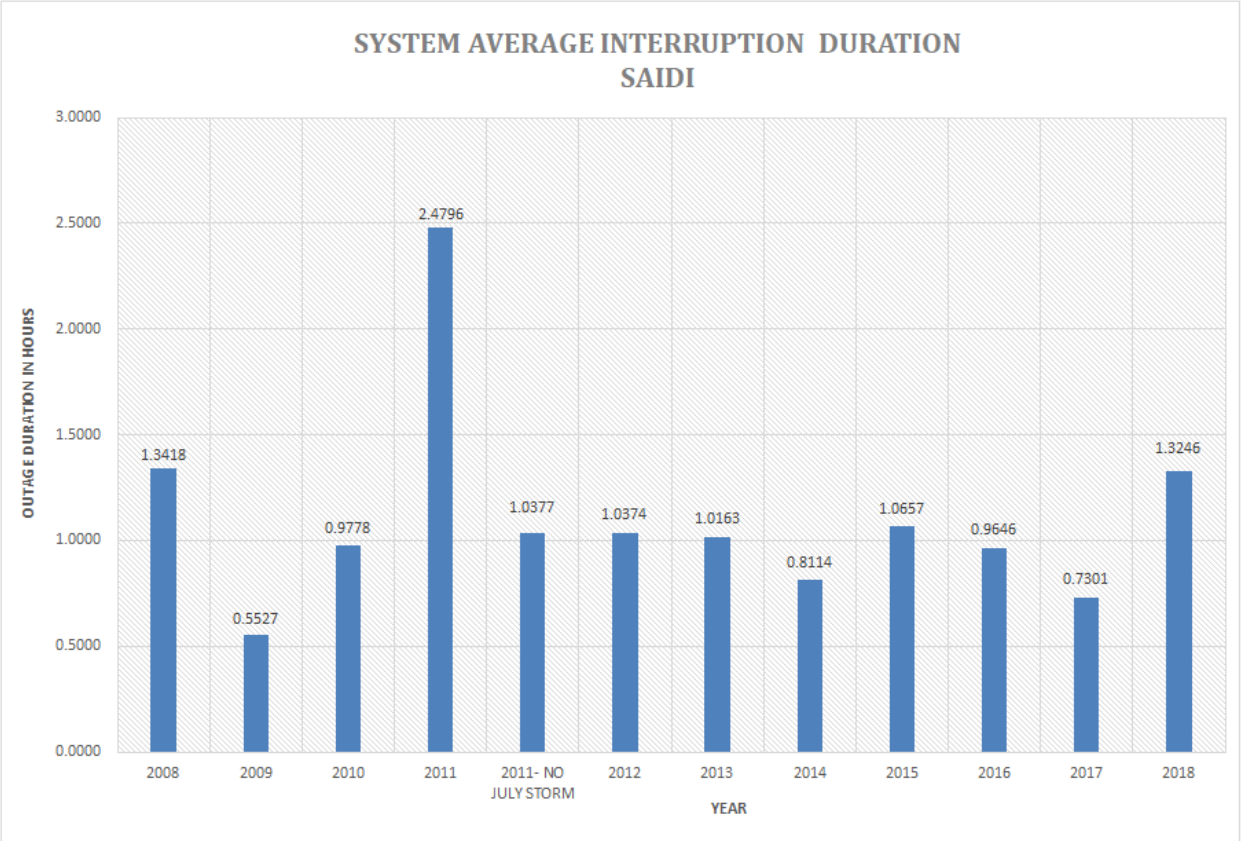
Figure 2 above shows the SAIFI trend for the period between 2005 and 2018. The 2017 SAIFI was the second lowest in 10 years despite the fact that a significant windstorm affected the area in March. During the balance of the year, there were no significant storm events resulting in a relatively positive SAIFI result for the year. Part of the reason for this is that ENWIN significantly increased the level of scrutiny of its third-party tree trimming contractor and ensured that all areas were trimmed to provide the contracted for clearances. ENWIN did this as a result of finding that the contractor had under-trimmed areas in its first year of a three-year contract. The under-trimming was discovered and the contractor was made to re-trim those areas.

Long-term trending data for SAIFI since 2005 shows a clear downward trend. The overall variation is to be expected, as large weather events will cause peaks and valleys, but the overall trend has been downward. The occurrence of typically rare weather events, attributed to climate change, has increased which will result in spikes as well. While SAIFI is generally influenced by the nature of the weather that occurs in a particular year, ENWIN has taken measures to reduce SAIFI through an improvement in its tree trimming. In 2017 ENWIN increased the tree trim clearance. Additionally, ENWIN increased the level of scrutiny placed on its tree trimming contractor to ensure that new clearances were met. ENWIN's tree trimming cycle is a three year cycle so it will take until 2020 to see the full effects of the increased clearance on SAIFI and hence on overall reliability.

SAIDI – System Average Interruption Duration Index – this is the total number of customer-hours of interruption divided by the total number of customers. This represents the average duration of all outages for the year that an average customer would experience.

This index is related to the performance of the utility to restore power after an outage has occurred as well as the ability of the assets to withstand adverse conditions. The average interruption duration is shown in Figure 3 below.

Figure 3 System Average Interruption Duration – SAIDI



The 2018 SAIDI of 1.32 was the highest in the last 10 years (when ignoring the 2011 July storm). This result is in part due to the higher SAIFI index—or greater storm experience than average. As a case study, consider the 2008 SAIFI (2.75) and SAIDI (1.34) values. In comparison, values in 2018 for SAIFI (2.97) and SAIDI (1.33) show that although the SAIFI value for 2018 is considerably higher than in 2008, the SAIDI values are comparable.

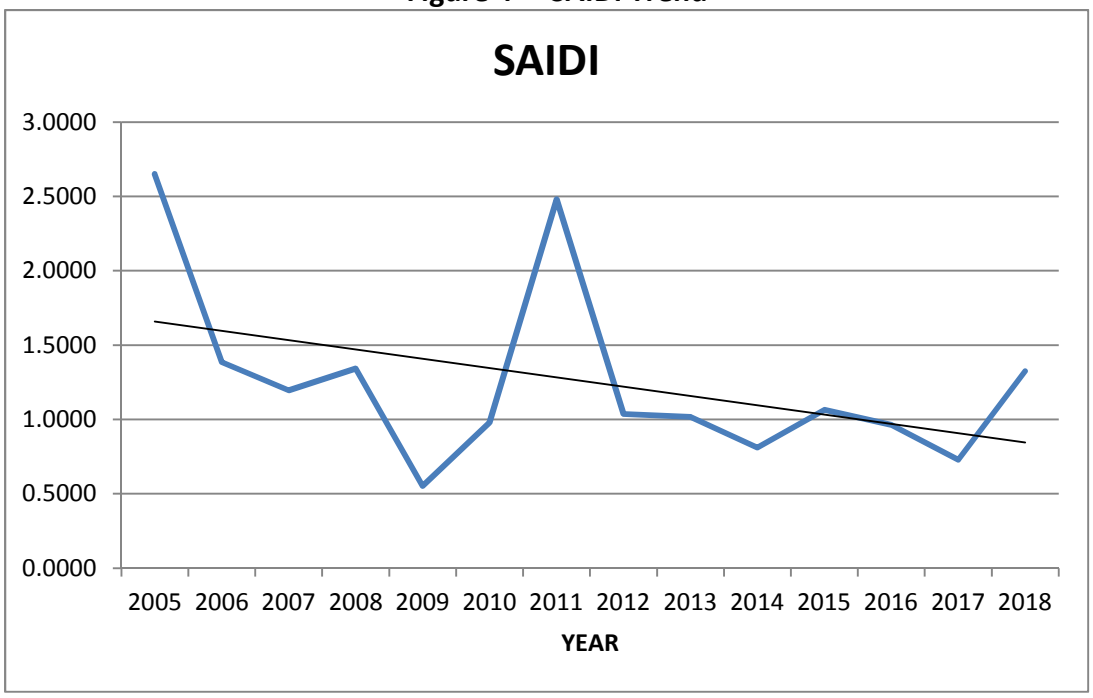
There was an increase of approximately 64% in adverse weather events when comparing 2008 to 2018, but half a minute decrease in interruption duration was experienced (1 hour and 20 minutes). These measures imply that as of 2018, ENWIN has improved its ability to withstand and restore power after experiencing severe weather.

The 2017 SAIDI was the second lowest in the last 10 years. This is a positive result and is in part due to the lower SAIFI index—or lower storm experience—than average. Additionally, ENWIN's investments in its assets, system automation, GIS and OMS are maintaining the reliability experience for ENWIN's customers. This was despite the significant windstorm experienced in March 2017. The impact of that storm should not be understated. Michigan utilities experienced the same storm and with it, the highest number of outages the state had ever

experienced. A further discussion of the impact of the storm is more fully discussed later in this section of the DSP.

Figure 4 below shows ENWIN's SAIDI trend from 2005 to 2018. There is a clear downward trend. The overall variation is to be expected as large weather events will cause spikes and drops but the overall trend has clearly been downward. The occurrence of typically rare weather events, attributed to climate change, has increased which will result in spikes as storm intensity is linked to outage duration. There was further investigation and implementation of system automation that occurred in 2012 following the large spike in 2011 in SAIDI. The system automation included adding automated load break switches (S&C Scada-Mates) and automated pad mounted switching units (S&C Vista) to the system plan.

Figure 4 SAIDI Trend



As a reminder, the previous Figures 1 to 4 show SAIDI and SAIFI with all interruptions. To summarize the last five historical years, Table 17 below shows SAIFI and SAIDI data for all interruptions, all interruptions excluding loss of supply ("LOS") and all interruptions excluding Major Event Days ("MED") and LOS. This also includes the 5 year average targets for the indices.

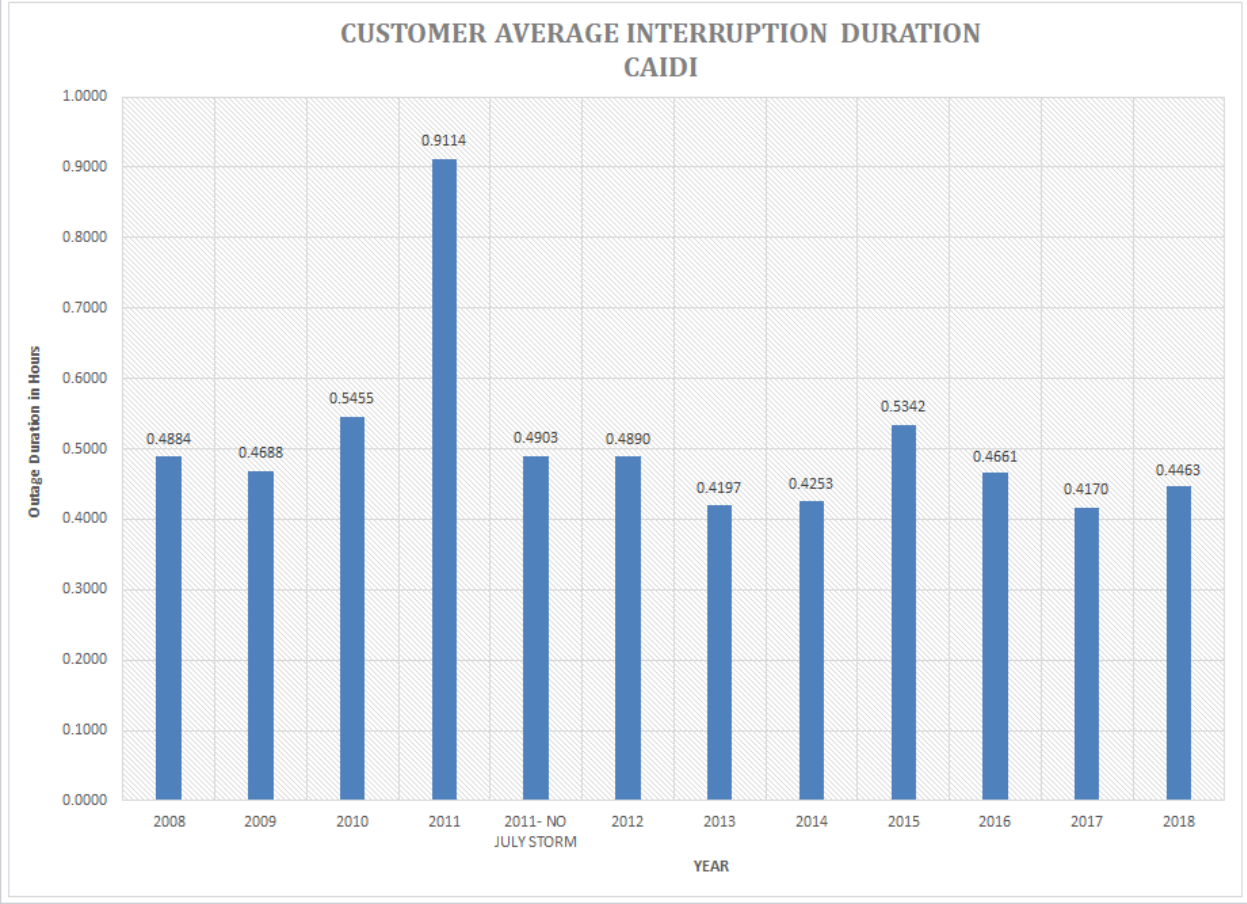
Table 17 SAIFI and SAIDI Interruptions Data

SAIFI	**2018**	**2017**	**2016**	**2015**	**2014**	**5 Year Avg**
All Interruptions	2.9681	1.7509	2.0697	1.9949	1.9080	2.14
All Interruptions - LOS	2.7476	1.6972	1.4257	1.8765	1.8463	1.92

All Interruptions - MED - LOS	2.2237	1.6972	1.1889	1.8765	1.8463	1.77
SAIDI	**2018**	**2017**	**2016**	**2015**	**2014**	**5 Year Avg**
All Interruptions	1.3246	0.7301	0.9646	1.0657	0.8114	0.98
All Interruptions - LOS	1.2767	0.7243	0.6355	1.0606	0.8063	0.90
All Interruptions - MED - LOS	1.1080	0.7243	0.4693	1.0606	0.8063	0.83

CAIDI – Customer Average Interruption Duration Index – this is the total number of customer hours of interruption divided by the number of customers affected by an outage. This number is typically less than the SAIDI index and some customers are affected by more than one outage. This number represents the average duration of a single outage. This index has fallen out of favour of the OEB as it is also calculated by dividing SAIDI by SAIFI so it is thought that those two indices adequately represent the performance of an LDC with respect to system reliability. Figure 5 below shows the average customer interruption duration.

Figure 5 Customer Average Interruption Duration



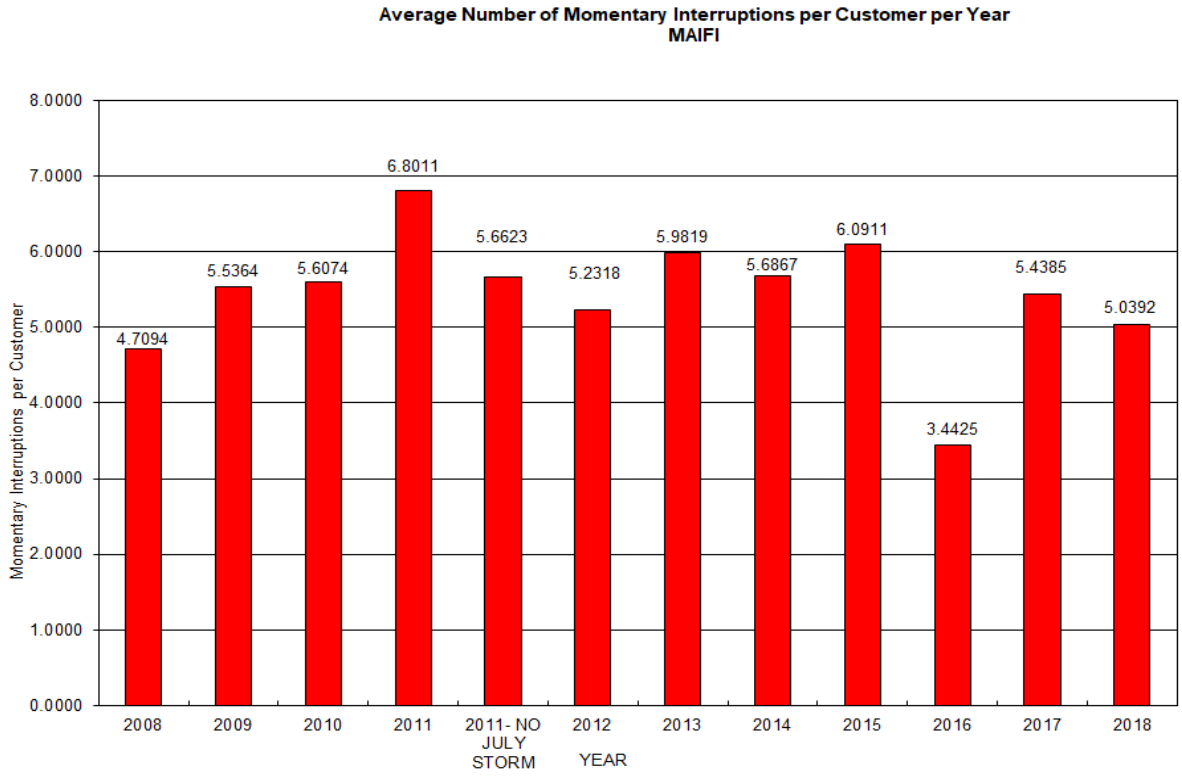
ENWIN's CAIDI is 0.4463 hours for 2018, which is below the 10 year average CAIDI value of 0.5123. This measure indicates that, on average, an interruption is restored within 27 minutes. This speaks to ENWIN's increasing ability to isolate and restore line sections that are unaffected by the root cause of the outage. This results in better service to customers in general.

Thus, while the number of interruptions was similar to the 5-year average (893 vs 899), the number of customer hours of interruption was down 25% over the same 5-year average. The overall variation is to be expected as large weather events will cause spikes and drops but the overall trend has been clearly downward.

Besides the major storm in 2011 there has not been any major spikes or drops that warrant further investigation. Once the MED in 2011 is removed the CAIDI is aligned with the other years. ENWIN's internal CAIDI 5 year (2014-2018) average target was ≤0.46 which was achieved in 2018

MAIFI – Momentary Average Interruption Frequency Index – this is the average number of momentary interruptions that an average customer experiences during the year. It is calculated by dividing the total number of customers affected by a momentary outage throughout the year by the total number of customers. A momentary outage is defined as an outage that lasts less than 1 minute. Figure 6 below shows the average number of momentary interruptions per customer per year.

Figure 6 Average Number of Momentary Interruptions per Customer per Year – MAIFI



ENWIN's MAIFI in 2018 was lower than the five-year average (5.0 vs 5.3). Momentary interruptions do cause customers grief. In particular, commercial and industrial customers often experience a plant shutdown over a momentary interruption as the control devices and computers are not tolerant to such interruptions. While momentary interruptions do cause customer grief, they are in essence a successfully avoided full interruption. Therefore, there is no specific ENWIN internal target but this is an additional measure to track ENWIN's performance and quest for continuous improvement.

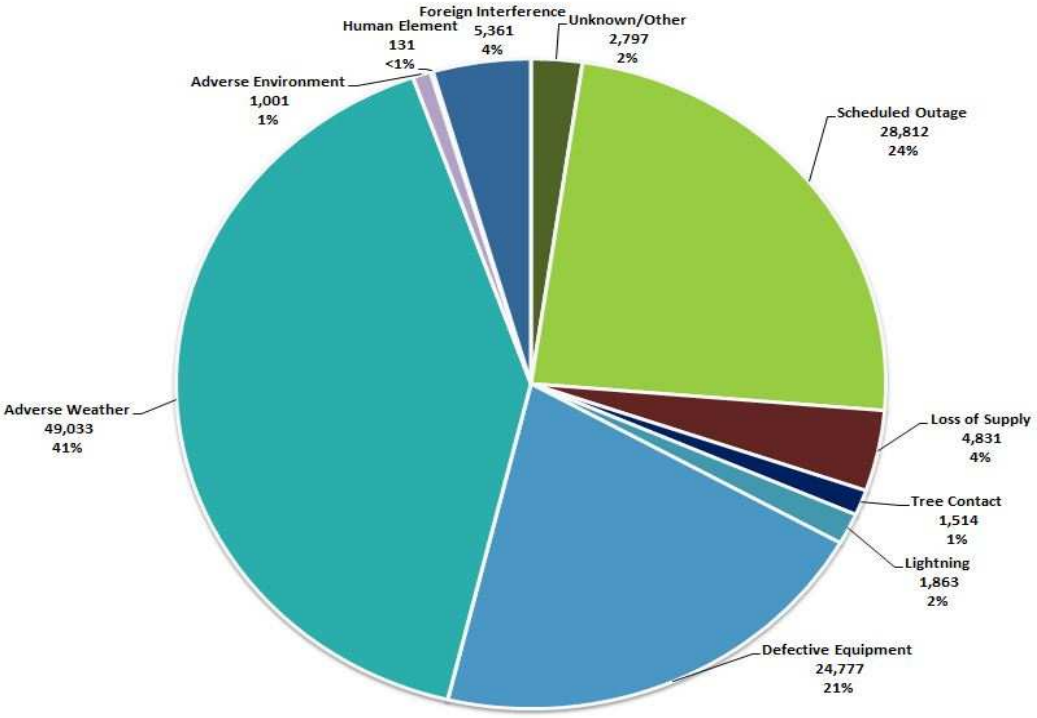
Outages by Cause – In 2018, the largest cause of outages were outages caused by Adverse Weather (41%). The total customer hours of outage due to Adverse Weather was the second highest in the past 10 years, with the highest being a result of the 2011 July Storm. Additionally, due to the high amount of storm activity in 2018, certain other outage categories were affected.

Defective Equipment outages could include some outages that occurred as a result of failures of older equipment which had weaknesses or defects that may not have revealed themselves without the presence of the storm activity.

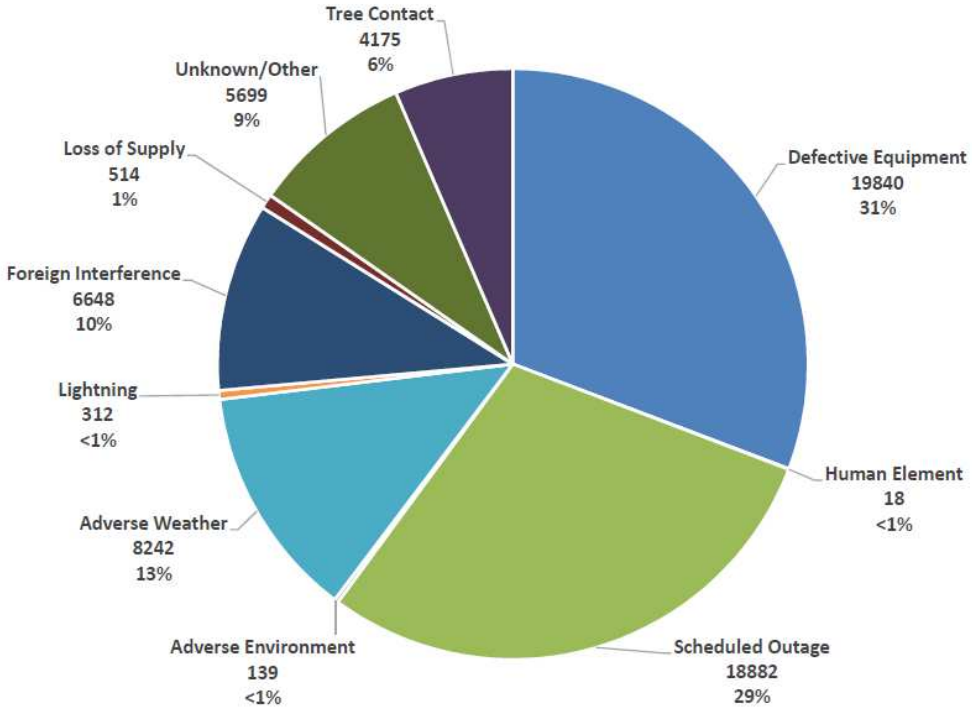
A small percentage of Scheduled Outages may also occur as a result of storm damage to assets being remedied after-the-fact. Further, Lightning and Tree Contact outages could be directly correlated to storm activity and may arguably belong in the Adverse Weather category. Figure 7 below shows the customer-hours of outage by cause in 2018 and 2017.

Figure 7 Customer-Hours of Outage by Cause in 2018 and 2017

Customer- Hours of Outage by Cause - 2018



Customer-Hours of Outage by Cause - 2017



In 2016 the largest cause of outages were Scheduled Outages (24,658 customer-hours) and an effort was made in 2017 to try to reduce the number of Scheduled Outages. Scheduled Outages arise from a number of reasons which are generally related to working safely on the distribution system. This would include third party tree trimming, placement and replacement of equipment such as transformers or switches on the network and effecting restoration after a major storm or other weather incident.

Customers receive notification of Scheduled Outages so they are generally less impactful than unplanned outages. Nevertheless, the number of customer-hours of outage due to planned work is a significant contributor to ENWIN's reliability statistics. The customer-hours of Scheduled Outage interruption was reduced in 2017 to 18,882 or a 23% reduction. This was accomplished in part due to a mild storm season and by combining work into single outages, building temporary supplies to minimize the number of customers involved in an outage and working live where it can be done safely.

The number of overhead transformer failures can vary significantly per year, and is especially dependent on the level of lightning activity. The number of underground transformer failures over the past few years has led to an increase in the submersible transformer replacements in the DSP to ensure proactive replacement of the assets instead of reactive. This results in the scheduled outage portion being a significant outage cause.

ENWIN has historically had flashovers at PMH units which resulted in a refurbishment program to add vent kits, replace worn parts and repair corrosion to existing units to minimize flashovers. In addition, where beneficial to the overall system reliability dead front automated underground switches have been installed in place of the PMH units. These factors have contributed to overall improvement in SAIDI, SAIFI and CAIDI as showed earlier in this section.

The underground cables have also been prone to failure, which has led to an underground cable subdivision rebuild program in the DSP. This program started in 2018 and will continue to target direct buried cables that are past their expected life span and prone to failure. The failure of direct buried cable results in long outages that can be prevented through a proactive approach that ENWIN has outlined in the DSP.

Further historical performance of customer-hours of outage by cause is shown in Figures 8 to 11 below.

Figure 8 Customer-Hours of Outage by Cause in 2016

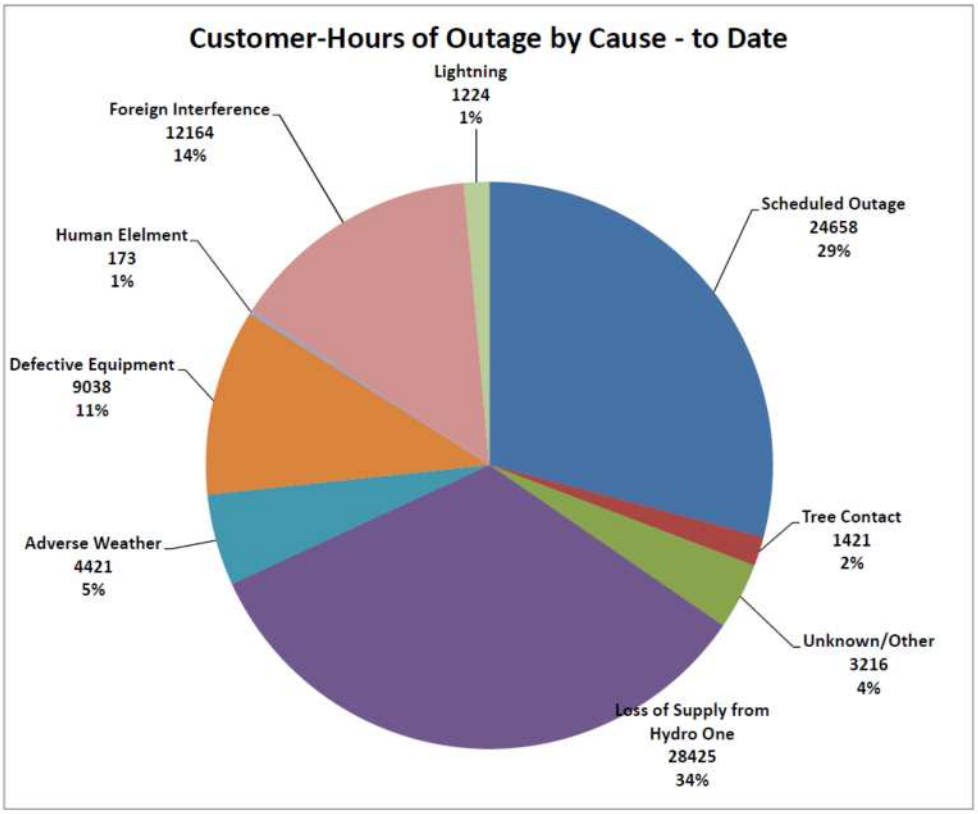


Figure 9 Customer-Hours of Outage by Cause in 2015

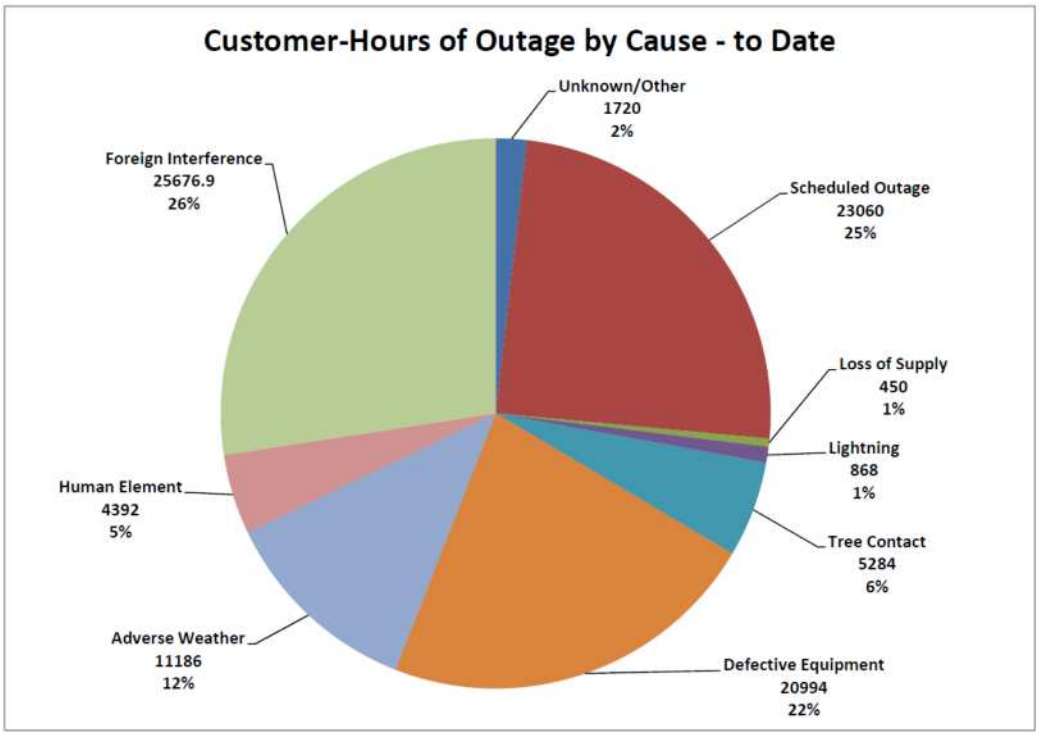


Figure 10 Customer-Hours of Outage by Cause in 2014

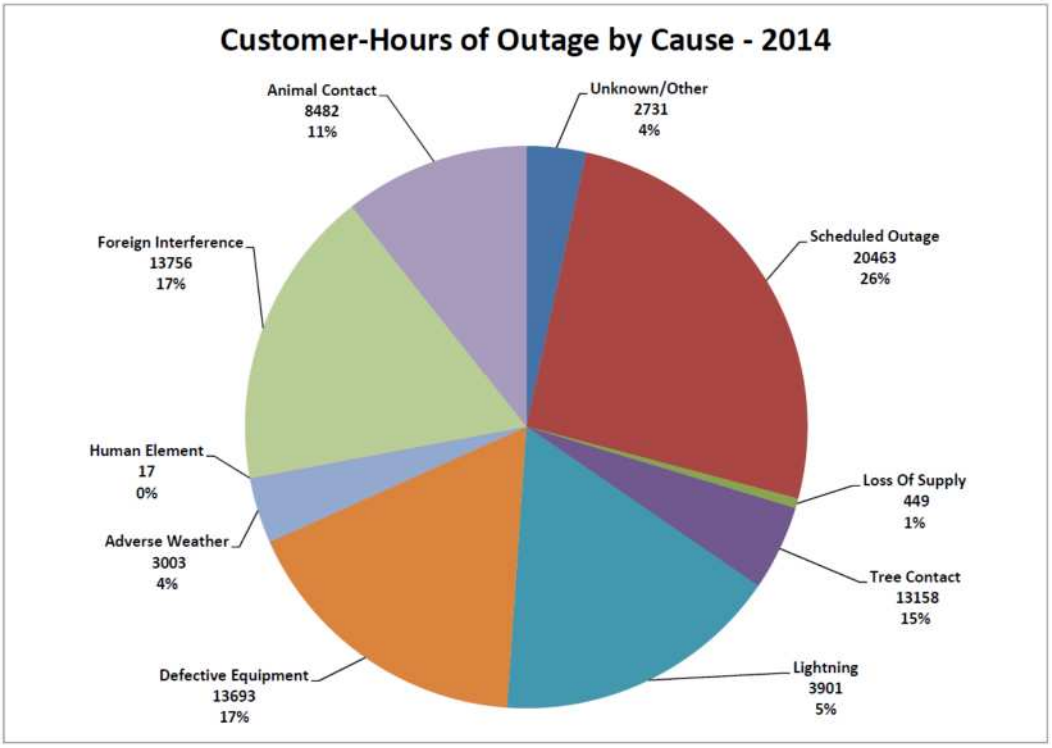
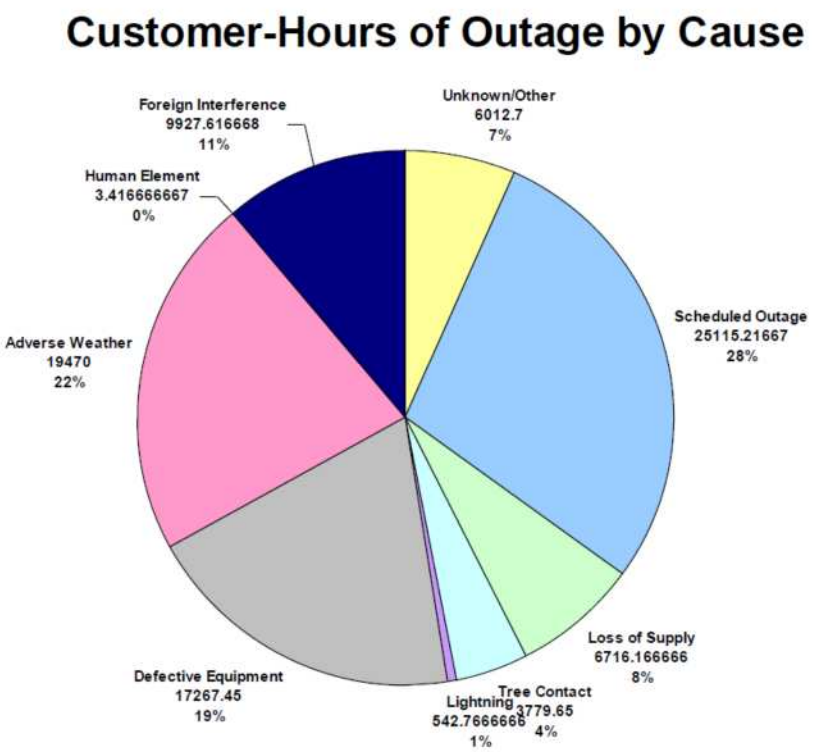


Figure 11 Customer-Hours of Outage by Cause in 2013



The number of interruptions and customers are shown in Tables 18 and 19 below for the same period.

Table 18 Number of Interruptions and Customers

Number of Interruptions	2013	2014	2015	2016	2017	2018
Adverse Environment	11	15	12	10	3	7
Adverse Weather	54	23	58	32	46	98
Defective Equipment	346	312	243	277	270	335
Foreign Interference	105	102	83	84	95	70
Human Element	2	1	13	4	1	2
Lightning					2	5
Loss of Supply	6	3	4	27	7	21
Scheduled Outage	395	379	374	447	383	500
Tree Contact	38	53	29	23	31	21
Unknown / Other	47	33	29	28	55	44

Table 19 Number of Interruptions and Customers

Number of Customers	2013	2014	2015	2016	2017	2018
Adverse Environment	7438	13220	12368	5736	70	1674
Adverse Weather	41148	4091	14887	11119	30802	84769
Defective Equipment	48218	46346	40178	26820	27995	52801
Foreign Interference	28830	35399	48100	36176	13407	26646
Human Element	6	104	12549	7345	131	2906
Lightning					7402	3426
Loss of Supply	11820	5408	10403	56964	4746	27145
Scheduled Outage	17927	21806	17051	21524	17213	23092
Tree Contact	15911	15124	3811	6834	5970	6929
Unknown / Other	40347	25857	15950	13545	46853	39896

MED – MEDs are calculated using the IEEE Std. 1366-2012 Methodology. Based on the 2018 calculation, when the number of customer hours of interruption in one day exceeds 12,969 customer hours, this is termed a “Major Event Day”, and a report on the events of the day is undertaken. Where an event causes the number of customer hours of outage to be between 1,000 and 12,969 customer hours, ENWIN terms this a “Significant Event Day” (“SED”), and a report of the SED is completed. These reports inform the determination of the performance of the distribution system and the adequacy of plant maintenance and renewal. There were 15 SEDs and one MED in 2018. ENWIN’s 2019 internal target is the five-year average for both MED and SED, as set out in Table 20 below.

Table 20 MED and SED Interruptions

	2011	2012	2013	2014	2015	2016	2017	2018	5 Year Avg / ENWIN Target
MED COUNT	2	1	1	0	0	1	0	1	≤0.4
SED COUNT	18	15	16	15	21	9	9	15	≤13.8

The following example is the most impactful event that ENWIN experienced in 2017, which was limited to only an MED as outlined below.

On March 8, 2017, a major windstorm impacted the area and the Province at large. The Windsor area was buffeted by a strong windstorm system, which saw wind gusts over 90 km/h and wreaked havoc on powerlines across the Province. ENWIN's smart meters started to signal the OMS as customers were losing power starting around 10:45 am. Outage notifications continued to grow and peaked at about 2:00 pm. Early in the process, ENWIN's crews were diverted from regular work and moved to storm response and restoration. The power outages were generally widespread across the city; these were caused by tree limbs touching powerlines or trees falling into powerlines and taking down poles and wires. At 12:34 pm, ENWIN's count of customers without power peaked at over 5500. By 2:30 pm all major feeders had been restored with power remaining out in smaller pockets of customers. ENWIN's crews continued to work late into the evening and through the night to restore power to customers. By 3:00 pm the number of customers out of power was under 500. By 10:00 pm there were about 30 trouble calls that required attendance; these were all all single service outages. By 1:30 am, all customers that could be restored to power were restored. The exceptions were customers where the winds had caused damage to the electrical service connection to their homes. Those homeowners needed to hire an electrician to make repairs, have the repairs inspected by the ESA, and then call ENWIN for reconnection.

This windstorm was the most severe storm experienced in the area since the storms of July 2011 and July 2012. In fact, Michigan utilities reported that the storm was one of the most impactful storms ever to affect the state. In Michigan, 860,000 people were left without power, and some Michigan customers were without power for a week.

ENWIN's call centre fielded over 410 trouble calls from customers during the storm. ENWIN's outage map, available on the ENWIN website also tracked outages providing information and letting customers know that we were aware of outages in their areas.

The impact the storm had on ENWIN customers was lessened by the investments ENWIN has been making in its distribution and management systems, such as its OMS, remote control switches, enabling of smart meter last gasp capabilities and other grid sensing devices. In fact, by quickly isolating faulted sections and restoring others, ENWIN was able to limit the classification of the storm to a SED rather than a MED.

In conclusion, ENWIN's distribution system, including the physical plant, the monitoring systems, the contingency systems and ENWIN's staff abilities provide the city with a robust and resilient electricity distribution system that can survive most of the severe weather that is likely to be experienced in this area.

5.2.3 (d) Effects of Historical Performance on the DSP

The historical performance of ENWIN's system has affected the DSP in multiple ways that are meant to continuously improve the ENWIN's assets and the planning process. Specific examples are provided below.

In preparing the DSP, the system realibility metrics and outage causes are analyzed to create appropriate programs and projects that will continue to drive continuous improvement. This is a combination of System Service (enhancement projects) and System Renewal (sustainment projects) required to maintain and improve ENWIN's reliability metrics.

Table 21 System Service and System Renewal Projects

Category	Program / Project Name	Year
System Service	Sectionalizing Load Break Switches – Scada-Mates	2019-2020
	Underground Switching Units	2019-2024
	Feeder Reliability Improvement	2019-2024
	Feeder Tie	2019-2021
	Radial Branch Backups	2019-2023
System Renewal	Pole Sustaining	2019-2024
	UG Padmount Sustaining	2019-2024
	Submersible Sustainment	2019-2024
	OH 3-Phase Transformer Sustainment	2019-2024
	Manhole Rebuild	2019-2024
	Switching Unit Sustainment	2019-2024

Table 21 above shows ENWIN's System Service and System Renewal projects. No investments are planned to address the distribution system losses as all the 4 kV conversion to 27.6 kV has been completed. This was a key approach to reducing line losses in the system.

ENWIN has created the following additional outage statistics to better track outages, and continue improving the grid performance as shown in Table 22 below. The DSP includes projects related to these statistics. The first statistic is a percentage of outages that impact more than 1,000 customers for over 5 minutes. It is those outages divided by the total outages for the year. This is labelled as >1,000 and >5min in the below table. This metric has been tracked since 2016 as a result of continuous improvement initiatives.

Table 22 Outages Statistics

	2016	2017	Target
>1,000 and >5min	3.07%	1.67%	≤ 5%

The first metric tracks the impact to pockets of more than 1,000 customers and shows the ability to sectionalize feeders and tie into other feeders. Projects in the DSP that are related to this are Load Break Switch Automation and Feeder Ties, which will help keep this below the corporate goal of 5% of outages. ENWIN is also targeting pockets of more than 500 customers through its Radial Branch backup project. The DSP targets these sections with the goal of ensuring that there are no branches with 500 or more customers that are radially fed with no alternate supply.

Power quality complaints are tracked, and, if common themes are apparent, ENWIN will look into options such as providing suggestions for battery storage to customers that cannot sustain momentary outages during an auto-reclose operation. However, this is up to the customer as ENWIN or any other LDC cannot guarantee uninterruptable power which is why it is not included in the project list above.

There are numerous system enhancement projects that are meant to improve the overall system this includes the worst performing feeders. There is a 25M7 pilot ring project which aims to reduce outages by automatically isolating the fault in the feeder. Further system automation will continue to improve the response time to feeders and allow for large residential loads in the worst performing feeders to be isolated and transferred to adjacent feeders quickly. The construction of the high capacity feeder loop, as outlined in the DSP, will allow system load to be transferred to a different station in the event of TS outages.

Additionally, as ENWIN ranks its investments using its risk/benefits matrix, there is a benefit attributed to a project if that project benefits a worst ten performing feeder. This will tend to promote projects that provide improvements to the worst performing feeders.

The DSP is also affected by the ENWIN's customers. The customer engagement activities clearly showed that cost of electricity, followed by reliability and safety is what ENWIN's customers value. Therefore, there is close consideration taken in the total cost per customer and total cost per km of line for the projects that ENWIN has in the DSP. The overall approach of proactive EOL replacements are evident by the sustainment programs which help reduce costs over the long term while providing a balance of reliability and safety that meets ENWIN's customers' expectations. Even though there is no target for total cost per customer or km of line, the true measure of this is achieved through the PROSORT prioritization tool as explained in this DSP.

ENWIN continues to demonstrate its pursuit of safe work practices. Due to ENWIN's high safety standards, the customers likely take this for granted as safety was the third priority in the customer engagement. Safety is a key consideration for all ENWIN dealings with the public and with its employees. There are numerous communications events that are conducted to enhance public safety awareness with the newest one being Windsor Spitfires Power Play Safety Message that ENWIN is sponsoring. Further details are provided in Section 5.2.1 (b) of the DSP. All projects in the DSP are engineered and built with safety in mind by consistently complying with O.Reg 22/04.

Furthermore, in 2017, information gathered from the Customer Engagement on the importance of various online features to our customers has helped ENWIN identify the need to upgrade its online customer portal in 2018. This project has commenced, and is on track to be completed in 2019. It will continue improving the customer experience by listening to, and addressing, the needs of ENWIN's customers.

ENWIN continues to provide excellent service to all customers though its project planning, pacing and prioritization process. ENWIN continues to set its own internal targets for these measures which at least meet, and in some cases exceed, OEB minimum standards. These targets are aimed at services which were identified, throughout the customer engagement process, as areas of high importance to ENWIN customers. There is no specific investment in the DSP to target service quality performance. The upgrade of the CIS and new customer portal will have indirect benefits to these customer service related metrics.

Measures of Grid Performance

ENWIN measures the performance of its distribution system through five measures as follows:

1. Reliability
2. Resiliency
3. Sufficiency
4. Safety
5. Power Quality

These additional measures are important as they all link to projects that are included in the DSP with the goal of continuously improving ENWIN's performance.

System Reliability

Future – There are a number of factors that will affect system reliability measures in the future. The 4 kV system has been eliminated and a large number of small feeders have been replaced with fewer but longer feeders. This would reduce ENWIN's ability to isolate problems to small sections and hence decrease reliability. At the same time, ENWIN has invested in sectionalizing and protective devices to regain some of the ability to sectionalize, restore and minimize outage durations for customers, which were lost due to the 4 kV conversion.

ENWIN has also implemented an OMS that is integrated with its smart meters in order to provide greater visibility into the operation of the distribution network. Small customer outages are now announced in the control room before customers call in to advise of the outage. Crews are dispatched to make repairs in many cases without a customer ever calling. This system has improved service to customers and helped to improve overall system reliability.

However, the system is not perfect and work continues to mitigate bugs in the technology that the vendor had not anticipated. The system will also improve ENWIN's ability to determine the impact of any outage on the customer base. This improvement may change the relationship between pre-implementation and post-implementation reliability statistics, but, at present, ENWIN has no insight as to whether reliability statistics from the new system will over or under report relative to history.

Additionally, the OMS provides the capability to offer an outage map to ENWIN's customers. While an outage map has been available to customers for over a year, the existing outage map is not perfect and does not always properly report outages. There have been many times when the map needed to be taken down from the website to apply software fixes. Additionally, the map, by design, does not provide the granularity and sufficiency of information that customers and the media would like to have.

ENWIN faced many challenges when implementing the outage map, which prevented the development of a better system. For instance, the OMS system was fraught with problems that would put implementation of a more sophisticated map at high risk, and the time and budget needed to develop a more informative map would have put the project over budget and significantly overschedule. When the OMS system is updated and stabilized, ENWIN will consider a implementing a more sophisticated map.

Finally, ENWIN plans to provide additional instrumentation on its distribution system through remotely monitored FCIs. These and other system devices will require a more extensive communication network than exists presently. Studies have been completed in 2017 to examine options for communication systems and a go-forward decision will be made in 2018. FCIs and other devices will enable the remote determination of a fault location which will then enable the isolation and restoration of unaffected portions of the circuit. This is expected to significantly improve reliability for customers in the future. This technology will also enable machine, rather than human, intervention and operation of the distribution system.

Resiliency

Resiliency is a different characteristic than reliability. Reliability is defined as "the ability of the grid to deliver electricity consistently when demanded", while resiliency is defined as "the ability of the grid to recover quickly and effectively from an event." An "event" refers to a major contingency such as a sustained loss of a feeder or feeders or loss of a station supply. The ability of the grid to recover from an event is affected by the condition of the grid assets, the operational flexibility of the grid, the utility's preparation for contingency and the ability of the utility to restore service quickly.

Asset Health

ENWIN continually inspects the condition of its distribution assets and invests in those assets to ensure they are in sufficient condition to deliver electricity to its customers on

a reliable basis, and to withstand the weather conditions to which they are expected to be subjected. ENWIN has executed on a consistent pattern of asset investment so that it both obtains the maximum useful life from its assets while minimizing risk to customers.

ENWIN's ACA (which is provided in *Appendix A – Kinectrics Asset Condition Assessment*) concludes that ENWIN's assets are in sufficient condition to continue to deliver value to customers and other stakeholders over the short to medium term.

Operational Functionality and Flexibility

Another measure of a distribution system's ability to fulfill its function is based on its operational functionality and flexibility. A functional distribution system will be able to be readily sectionalized into blocks serving modest numbers of customers, have connections to other feeders, and have capacity to support load from other feeders so that customers may:

1. have their power restored quickly;
2. be properly protected with a coordinated protection scheme so that the least number of customers are affected by a system fault;
3. have instrumentation so that human operators are notified of trouble; and
4. enjoy a high level of power quality.

ENWIN's distribution system has been reviewed in detail as part of the asset management function. Each feeder was reviewed and compared to design criteria which were established to ensure sufficiency and resiliency of service. As a result of those reviews, various deficiencies with respect to design criteria and various opportunities to improve the functionality of the feeders were identified. These deficiencies and opportunities were translated into specific projects for system improvement. The projects were then reviewed to assess their cost and benefits so that they could be prioritized for future implementation. The nature of the projects identified include the following:

1. Increasing the number of sectionalizing switches
2. Increasing the number of feeder ties
3. Re-locating unnecessary sectionalizing switches or switches that are no longer in an optimal location as circuits are re-configured
4. Increasing the number of FCIs
5. Increasing the number of switch automations
6. Optimize load balancing on feeders
7. Optimize feeder configurations
8. Opportunity to improve fault resilience
9. Opportunity to improve fault clearing and restoration

The projects that address these opportunities are described in ENWIN's AMP. ENWIN has progressed on delivering these system improvements over a number of years, and these improvements have manifested in improved reliability and resiliency of the distribution system. The number of overhead feeder segmentation switches/reclosers and feeder ties required to achieve the desired level of system flexibility was originally determined to be approximately 135 units, of which approximately 35 remain to be installed. In summary, ENWIN has implemented approximately 75% of this plan, and, assuming planned capital budgets continue at current levels, the project should be substantially complete by 2020.

Contingency Response

Another measure of the performance of ENWIN's distribution system is the effort necessary, and the time taken to restore the system after a major (storm) event or contingency. There are no standards for determining how long it should take a utility to restore service. Restoration times are a function of the extent of damage caused to the utility infrastructure, the length of time the storm persists in the area such that it prevents crews from effecting repairs, hydro crew availability, forestry crew availability, access to areas of damage (roads, muddy fields, backyards, etc.), ability to isolate affected areas, ability to switch supply to an alternate feeder or source, time of day (daylight to work), ability to locate faulted sections, etc. In most cases, the factors affecting restoration time that are not related to the severity of the storm are controllable by the utility.

The performance of ENWIN's distribution system is also informed by reviews of upset conditions. Where ENWIN experiences a failure on the distribution system, whether through storms or equipment deterioration, a review is conducted to understand the root cause(s) of the failure, and to assess whether current levels of investment in plant inspection, maintenance or renewal are adequate.

ENWIN's distribution system has been reviewed in detail for major contingency operations as part of the asset management function. As a result of those reviews, various deficiencies with respect to design criteria and various opportunities to improve the distribution system were identified. These deficiencies and opportunities were translated into specific long-term projects for system improvement. Additionally, it was identified that ENWIN's distribution system is insufficient to manage a full outage at Lauzon station during peak times without rotating black-outs. A remediation plan is in place to address this contingency; however, it will take many years to put the plan in place. The plan involves the construction of a robust loop around the city of Windsor, and, in the short term, will be pursued through opportunities that arise through other projects, such as road widening and pole replacements.

Sufficiency

Another measure of a distribution system's ability to fulfill its function is its ability to

serve new load without major enhancement. ENWIN estimates its long-term growth rate to 2040 at 0.1%, net of the effects of conservation, price elasticity, distributed generation, and EV uptake. The translation of this growth rate into estimates of demand at a TS level was also undertaken. The methodology used was to obtain data regarding system consumption on a MW/degree day basis and using recent data, and to use that data to extrapolate loading at the supply stations across the system. Table 23 below provides the results of the adjusted load forecast.

Table 23 Adjuster Load Forecast

ADJUSTED 2017 LOAD FORECAST																							
	10-Day LTR	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Keith	54.0	33.8	32.2	19.6	22.439	22.5	22.5	22.5	22.5	22.6	22.6	22.6	22.6	22.6	22.7	22.7	22.7	22.7	22.8	22.8	22.8	22.8	22.8
Walker 1	99.0	67.1	83.8	68.3	75.008	75.1	75.2	75.2	75.3	75.4	75.5	75.5	75.6	75.7	75.8	75.8	75.9	76.0	76.1	76.1	76.2	76.3	76.4
Malden	81.0	46.8	52.3	55.0	63.108	63.2	63.2	63.3	63.4	63.4	63.5	63.6	63.6	63.7	63.7	63.8	63.9	63.9	64.0	64.1	64.1	64.2	64.3
Lauzon	98.0	84.4	82.4	84.3	96.776	96.9	97.0	97.1	97.2	97.3	97.4	97.5	97.6	97.7	97.7	97.8	97.9	98.0	98.1	98.2	98.3	98.4	98.5
Essex	116.0	53.3	51.4	54.6	71.656	71.7	71.8	71.9	71.9	72.0	72.1	72.2	72.2	72.3	72.4	72.4	72.5	72.6	72.7	72.7	72.8	72.9	73.0
Walker 2	99.0	94.5	60.7	89.5	84.106	84.2	84.3	84.4	84.4	84.5	84.6	84.7	84.8	84.9	85.0	85.0	85.1	85.2	85.3	85.4	85.5	85.5	85.6
Crawford	90.0	65.9	65.3	83.8	96.123	96.2	96.3	96.4	96.5	96.6	96.7	96.8	96.9	97.0	97.1	97.2	97.3	97.4	97.5	97.6	97.7	97.8	97.9
TS total	**637.0**	**445.7**	**428.0**	**455.1**	**509.217**	**509.7**	**510.2**	**510.7**	**511.3**	**511.8**	**512.3**	**512.8**	**513.3**	**513.8**	**514.3**	**514.8**	**515.4**	**515.9**	**516.4**	**516.9**	**517.4**	**517.9**	**518.5**
GM MTS	43.0	0.0	0.0	0.0	13.089	13.1	13.1	13.1	13.1	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.3	13.3	13.3	13.3	13.3	13.3
Chrysler MTS	65.0	33.4	31.3	33.4	33.400	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4	33.4
Ford Powerhouse MTS	65.0	4.6	1.9	10.9	10.930	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Ford EEP	43.0	3.7	3.7	3.7	3.650	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Ford Annex	43.0	7.4	7.2	6.5	6.546	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Nemak WAP	57.0	7.5	8.5	8.5	8.480	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
MTS Total		**56.6**	**52.5**	**63.0**	**76.095**	**76.1**	**76.1**	**76.1**	**76.1**	**76.2**	**76.2**	**76.2**	**76.2**	**76.2**	**76.2**	**76.2**	**76.3**	**76.3**	**76.3**	**76.3**	**76.3**	**76.3**	**76.3**
System Total		**502.3**	**480.6**	**518.1**	**585.312**	**585.8**	**586.4**	**586.9**	**587.4**	**587.9**	**588.5**	**589.0**	**589.5**	**590.0**	**590.6**	**591.1**	**591.6**	**592.1**	**592.7**	**593.2**	**593.7**	**594.3**	**594.8**

Overloading at supply stations can be diminished by load transfers within the distribution system. Thus, ENWIN's supply stations will be adequate for the foreseeable future.

While it is beyond ENWIN's ability to predict what conservation incentives, environmental incentives, price changes and other programs the Province may choose to enact in the future, the 2014 IRRP activity and the 2015 RIP activities confirmed that there is an expectation that the Province will enact sufficient programs and measures to ensure that load growth in southwestern Ontario will remain flat. Figure 12 below is extracted from the RIP and shows a flat growth projection for southwest Ontario. It is noted that these plans were intended to bridge a five-year period. However, the IESO has initiated an early update for those plans. The early update is to address issues in the county and is not expected to change any conclusions regarding ENWIN's distribution system.

Figure 12 Reference Planning Forecast from IRRP and RIP

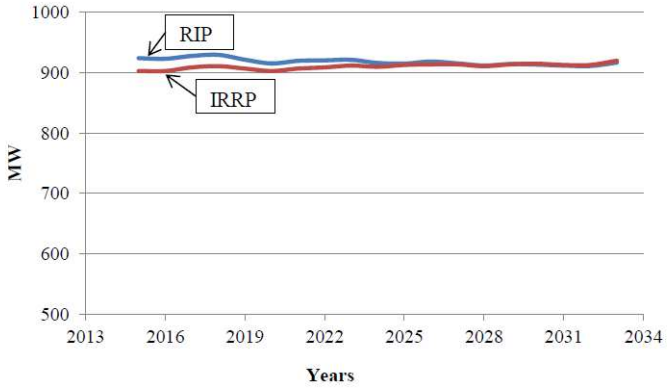


Figure 5-2 Reference Forecast in Windsor-Essex Region

ENWIN's growth planning is consistent with the area forecasts and it is expected that the "natural" growth expected in the area will be offset by conservation measures and price elasticity effects.

System Growth – There were 597 new load customers and 98 new generation customers connected in 2017. This represents an increase in load customer accounts of 0.7% which is the second highest since 2006, but is a decrease from 2016 (670). Nevertheless, the sum of the monthly system peak demand decreased in 2017 by 154 MW or 3.3% despite an increase in customers and a generally robust economy. This is evidence that the Province's and ENWIN's conservation initiatives are effectively reducing demand.

Generation – In 2018, ENWIN has connected 104 renewable microgeneration (<10kW) generators for a total installed base of 724 and 1 FIT (10kW to 500kW) generators for a total installed base of 71 customers as of the end of December. Currently, there is generally sufficient capacity on the ENWIN distribution system to accept additional generation. However, the difference between gas prices and electricity prices makes co-generation an attractive alternative to many customers that are large enough to install and operate CHP generators. Additionally, the IESO has included CHP generation within their allowable technology portfolio for conservation. This inclusion has incented many customers to apply for CHP generation connections. The government is ending this funding in July 2018, but it is expected that customers may continue to undertake CHP generation even without the incentives. ENWIN has a total of 3 CHP generation connected and 6 load displacement for a total of 804 generators.

Depending on rate of up-take, ENWIN will exhaust its capacity to accept generation at some point in the future. Once that occurs, remediating measures will need to be installed to restore some capacity to accept generation. In most cases the capacity to accept generation is limited at the supply station, which, save for Walker 2 TS and GM TS, are owned by HONI. In the short to medium timeframe, ENWIN predicts that it will have sufficient capacity to accept generation. The determination of capacity to accept

generation is specific to each individual feeder and it is possible that one single large customer could exhaust all of ENWIN's available capacity to accept generation on the feeder to which it is connected.

Safety

ENWIN's distribution system must be safe, and be adequately designed, operated and maintained to ensure that the public is not endangered due to failures of the distribution system assets. ENWIN monitors and logs incidents where asset failure creates a condition that puts the general public at risk of harm to persons or property, either through electrical contact or other physical contact with the assets (i.e. falling pole). It does not consider ancillary safety risk associated with system failure such as the risk that someone may trip and fall if the lights are out.

ENWIN is required to report any public safety incidents which meet their threshold to the ESA. While electrical contact reports have been filed with ESA since inception of this reporting requirement, there have been no incidents which arose as a result of the condition of ENWIN plant that required reports to be filed.

ENWIN also has programs in place to help ensure the safety of its workers. ENWIN reports no 2017 lost-time incidents with employees and no incidents with the public (i.e. incidents over which ENWIN would have some control—this would exclude, for example, car-hit-pole incidents). The safety incident history with employees over the last five years is shown below in Table 24.

Table 24 Safety Incident History with Employees

Hydro Division	2012	2013	2014	2015	2016	2017
First Aid	2	0	4	2	0	4
Medical Aid	8	3	6	6	5	3
# of Incidents with Lost Time	0	2	0	3	1	0
Lost Days	0	17	0	57	3	0

Power Quality

ENWIN's grid performance on power quality measures is judged to be satisfactory, and that performance is expected to continue for the short to medium term. Satisfactory grid performance for the long term will be predicated on continued investment in the grid assets and their operating systems by ENWIN. It is noted that there is room for improvement in the flexibility and functionality of the grid. Customer engagements and direction provided by the Ministry of Energy both point to increased expectations for the functionality, reliability and resilience of the grid in the future.

Additional information regarding power quality is provided under Power Quality Complaints in Section 5.2.3(a) of the DSP, above.

5.2.4 Realized efficiencies due to smart meters

Since 2006, distributors have deployed smart meters for residential and small industrial and commercial customers. This initial deployment has been completed and smart meters have been in operation for a number of years. Distributors are also required to deploy metering inside the settlement timeframe (MIST) meters to applicable GS > 50 kW customers by December 31,2020.

A distributor is required to document capital and operating efficiencies that it has realized as a result of the deployment and operationalization of smart meters and related technologies (e.g., Advanced Metering Infrastructure (AMI) communications networks, Operational Data Storage) in its networks, such as, for example, if smart meter and AMI "last gasp" technology enhances a distributor's SCADA system to assist in restoration response to service interruptions. Both qualitative and quantitative descriptions and support should be provided.

5.2.4 Realized Efficiencies Due to Smart Meters

ENWIN's smart meters were installed starting in August 2010, and were largely complete by the end of that year. The advent of the smart meters enabled a number of efficiencies with respect to the operation of ENWIN's system. These efficiencies are detailed below.

Reduced Meter Reading Costs

The number of meter reader staff has been reduced now that smart meters can report information remotely. Additionally, the "appointment reads" for meters within buildings that were normally closed during normal meter reading times (i.e. bars, restaurants, theatres, etc.) has been eliminated. Additionally, the need to manage customer's keys so meter readers could access meters that were mounted inside customer's homes when customers were not normally home during the day has been eliminated. Customers prefer this solution over having to allow the meter readers to access their homes.

ENWIN's current cost to read a smart meter is approximately $0.22 while in 2010, prior to the smart meter installation, the contract cost to read a meter was approximately $0.25. This, along with staff reductions in the meter reading department, has resulted in costs for meter reading decreasing from $44,037.27 per month, to $31,508.40 per month, which represents a saving of $12,528.87 per month.

However, there have been other costs which offset these savings. These include the cost of the meters themselves, and the incremental cost to purchase smart rather than conventional meters going forward. It also includes the costs for the following:

1. to purchase, configure and maintain a new MeterSense Meter Data Management solution to manage smart meter readings;
2. to upgrade Sensus headend servers and software to remain current with supported hardware and software;
3. to implement and maintain a customer portal so that customers have access to their data; and
4. for bill modifications to show time of use data and the cost to replace the existing customer information and billing system, and its maintenance, in order to bill time of use rates.

All costs associated with these systems have not been tracked separately with a view of determining whether or not there was a net savings due to the deployment of smart meters. It is judged, however, that the incremental costs associated with the implementation of smart meters exceeds any savings that might be associated with the change in simple read costs. The smart meters do provide additional functionality, however, which is valuable to customers. Generally, this value is difficult to quantify in a reasonable manner. The additional functionalities are described below.

Power Outage Detection

Prior to the introduction of smart meters, if a single customer lost power, ENWIN would only know about this when the customer called in to report the outage. Smart meters have a “last gasp” function whereby, when a meter loses power, the meter sends a notification to ENWIN through the smart meter communication system. ENWIN routes these messages through its OMS and to its operators. The SCADA system is monitored 24/7 by the operators, and when this type of message is received, the operators will dispatch staff to investigate and repair the service. This provides an improved service to customers, which helps reduce the duration of outage times.

Where multiple customers lose power, all the meters will send a last gasp notifications. ENWIN’s OMS will receive these notifications, and use that information to determine the likely point of interruption. The operators will dispatch staff to the location suggested by the OMS to investigate and make repairs. The smart meter data contributes to the determination of the location of the problem causing the outage which enables a faster reaction by ENWIN and shorter outage times for its customers. This also addresses stated customer preferences for reduced outage time.

Outages determined from smart meter last gasps and SCADA switch statuses are now used to produce an outage map for customers on ENWIN’s website. The outage map provides real time updates and estimated restoration times from ENWIN’s system control operators.

Additionally, when feeder protections activate, with last gasp, operators are able to know if there are pockets of customers without power. Prior to smart meters, operators would close an open breaker after line protections had operated, and would restore feeder supply without knowing if a fuse had blown, and without knowing whether there were still pockets of

customers out of power. With smart meter last gasp, the operators have the ability to know if there are still customers out of power after a feeder is restored.

Similar to last gasps, the smart meters also send power restore notices through the OMS. Again, after a line section is restored, the operators will be able to identify pockets of customers from whom no restore notice was received, identify persisting problems, and dispatch staff to investigate and restore.

Outage Statistics

Prior to the implementation of smart meters and the OMS, outage details were recorded on paper and then later entered into a database for reporting. Smart meter time stamps for outages, restoration times, and customer counts are now used to improve the accuracy of reliability statistics compared to the previous system. The OMS will generate the reliability statistics in the future.

Power Verification

The smart meters are also able to be "pinged" by ENWIN staff. When "pinged", the meters will respond, if they are able, and confirm that they have power. ENWIN use this feature to determine whether or not power is supplied to the home when a customer calls to report an outage or before ENWIN deploys a truck to investigate a power problem. If the problem is inside the customer's home, the customer is so advised. The customer can then call an electrician immediately to address the issue, thereby shortening the customer's time to resolving the problem, while also avoiding having to pay for a utility service call. Additionally, after a storm, where customers have called to report an outage, ENWIN customarily confirms those customers' power is back on. Prior to smart meters, this was done through a truck roll, but with smart meters, a meter ping is able to confirm that a customer's power is back on. This will result in faster determination of, and resolution to, on-going problems at customers' premises.

Peak Loading for Premises

Smart meters provide ENWIN with the ability to know the peak loading for any premise or customer. The hourly data available from smart meters improves greatly on the estimates that were available from observations of monthly total consumption (720 hours of consumption). This can be helpful in planning infrastructure for similar type of customers (i.e. townhouse residential, banks, convenience stores, medical offices, etc.). The improved knowledge of loading allows optimal, less costly infrastructure designs, and consequently helps minimize costs for customers.

Rate Class Determination

Commercial customers are generally categorized into demand-billed >50 kW customers and energy-billed < 50 kW customers. With conventional energy meters, there was no way to

accurately determine if an energy-billed customer's load had grown to the point where they should have been reclassified into a demand-billed customer class without installing a more expensive demand meter. With smart meters, the highest hourly consumption is a good indicator of the customer's demand. This allows ENWIN to review customer consumption for the purposes of rate class determination on a reliable basis without having to install a more expensive demand meter. This helps ensure that customers are put into the correct rate class, and that more expensive demand meters are only installed where they are truly needed, thereby saving costs that would be passed on to customers.

Transformer Loading

Prior to smart meters, engineering staff used monthly consumption information to estimate the hourly peak loading on transformers. Where transformer overloading was suspected, line meters were installed to verify the transformer loading. With smart meters, the hourly consumption for all connected meters is summed and the coincident peak load is determined exactly. This allows proper sizing of transformers so that transformer life expectancy is not shortened and customers do not suffer voltage problems. This will maintain reliability and power quality for customers.

Network Analysis

Similar to transformer loading, the availability of hourly consumption for all the meters enables the determination of coincident peak values for the entire network for various peak situations (i.e. summer peak, winter peak, minimum loading, etc.). This enables a more exact modeling of the network and a more precise determination of requirements for network constructions. This will result in lower capital and operating cost for customers.

Additionally, ENWIN has found ways to continuously improve its GIS connectivity model by identifying errors in transformer to service point relationships during an outage. ENWIN has instituted procedures to correct these inconsistencies when they are found, which improves outage prediction, customer notification of planned outages, and transformer loading analysis.

High/Low Voltage Alarms

Smart meters have the ability to send high and low voltage alarms. If these alarms are received, they are reviewed by ENWIN's system planning engineer and, where appropriate, transformers are adjusted to compensate for the high or low voltage. This improves the power quality of the service to ENWIN's customers.

Customer Decision Making

ENWIN has an application for which customers can subscribe, which allows the customer to see their hourly consumption information. This information will allow Customers to make better decisions regarding their own energy use.

Hot Socket Alarms

Smart meters have a temperature sensor in their base which triggers an alarm if the base temperature exceeds a threshold. When customers' meter bases become old, the springs on the connectors which hold the blades on the back of the meter can become weak and the connection between the meter and the meter base can become loose with consequent high resistance heating of the connection. This can result in damage to the meter, meter base and even the home. Hot socket alarms are directed to the ENWIN control room, which is manned 24/7 by ENWIN system operators. When such alarms are received, ENWIN sends staff to the meter location to investigate the cause of the high temperature. If deterioration in the customer's meter base is cause of the problem, customers are advised to contact an electrician to make a repair. This feature results in an improvement in the safety of supply for customers.

Power Theft Detection

Some customers have been known to try to tamper with their meter or install jumpers behind the meter in order to steal power. Smart meters have a feature whereby if the meter is removed from its socket, the meter will report both a loss of power, or last gasp, and a tamper alarm. Tamper alarms are reported to ENWIN's Meter department, which investigates the reason for the tamper alarm. Tampered meters or sockets are reported to police and removed. This tamper detection helps ensure that power losses are minimized, and that electricity rates for paying customers are not increased to account for losses due to theft.
Smart meter loading data can be used to compare aggregated individual service loads with loads at the source transformer using distribution transformer monitoring devices. This method has been used by ENWIN to identify and resolve theft of power issues such as illegal marijuana grow ops.

Meter Theft Detection

Customers that have their service cut for nonpayment of their electricity bills have been known to steal a meter from another property and reconnect themselves. When the meter is stolen, that meter will report a tamper and ENWIN will investigate. Usually, the meter will be stolen from a property where the homeowners are not home. Without notification and follow-up by ENWIN, that homeowner can suffer damages such as basement flooding, food spoilage, frozen/burst piping, etc. Additionally, ENWIN is able to force the re-installed, stolen meter to communicate through the nearest adjacent meter. The "buddy" meter's location is known so that ENWIN is able to "find" where the stolen meter has been re-installed. ENWIN will then follow-up with police and will once again cut the service of the offending customer.

Meter Damage Detection

From time to time, meters become damaged (e.g. through vandalism) or fail in service. When this happened with conventional meters, the damage would not be apparent until the meter was read and the meter change may take place more than a month after it stopped working. This would result in up to two billing months with estimations of consumption. When smart

meters do not report their daily consumption and the meter cannot be pinged, staff is sent to investigate and replace the meter. This minimizes the time for unmetered load and minimizes the need for bill estimates. This improves the customer's satisfaction with their bill and decreases office time to estimate billing, resulting in lower costs to customers.

Reduced Variability in Unaccounted-For-Energy

Business month-end and year-end reporting for energy will demonstrate a difference between what was received by ENWIN and what was sold by the ENWIN. There are technical (losses through transformation, line heating) and non-technical (accounting, theft, etc.) losses, but included in that difference is the error in estimation of beginning and end of period consumption. This arises due to the fact that meters could not all be read at midnight on the start/end of the period. While the errors would correct over time, they could be substantial in any given period. Smart meters have enabled those midnight readings and have eliminated end-of-period consumption estimation as part of the variability in loss determination. While having a small effect, this does eliminate some of the variability that goes into the determination of rates for customers.

Improved Inventory Control

Smart meters are all barcoded, and meter receipt, issuance and installation are now done through the scanning of barcodes on the meters. This eliminates any transcription errors that could occur, and ensures a more accurate accounting for the meters that are in-service. This will reduce costs associated with inventory management.

Reduced Meter Types/Seal Extensions

Prior to smart meters, ENWIN maintained a number of different meter types supplied by a number of different vendors. With smart meters, the number of different meter types was significantly reduced and the number of different vendors has also been reduced. This has enabled a reduction in time spent selecting and managing the various types of meters, which has reduced costs.

Additionally, for seal extension, since there were fewer vendor/types of meters and the meters were the same vintage, larger sample groups were able to be formed as the meters were homogeneous across a larger population than in the past. Thus, meters were able to be formed in larger sample groups with a net reduction in the number of samples needed to effect a seal extension for the group. This saved costs for seal extension and would reduce costs for customers.

Billing Accuracy

Prior to smart meters, ENWIN's billing systems did a pre-check on the metered consumption to catch meter reading errors that might result in unreasonable customer consumptions and bills. Meters with consumptions that were unreasonably high or low were flagged for review by

meter reading department staff. This was done manually by clerks and was known as a "Hi/Lo" check. With smart meters the chance of a meter reading error was now negligible and the clerical effort needed for checking for reasonable consumptions was vastly reduced. This saves money for customers. Additionally, the need to perform a "verification read" for reads that were suspect has been eliminated.

Faulted Circuit Indicators

When the smart meter system was installed, it provided a communications system that blanketed the city of Windsor. ENWIN took advantage of this communication system by purchasing and installing FCIs from the metering system vendor and installing them on the distribution lines. The FCIs detect faults on the distribution feeders and relay the information through the smart meter communication infrastructure to the ENWIN SCADA system. There was no additional cost for communications other than the endpoint hardware.

The system worked well for a number of years however the smart meter vendor terminated the option to continue the use of the communication system for this purpose and other means had to be found to re-establish the functionality provided by the system.

Meter Shop Cost Reduction

When ENWIN installed its Smart meters in 2010 it realized that it would not need to maintain its "Meter Shop Accreditation" status with Measurement Canada and would not need to maintain its certified meter test board. The relinquishing of the "Accredited" status with Measurement Canada provided savings in terms of avoided costs for compliance audits and the administrative burden that accompanies such status.

Additionally, ENWIN's meter test board needed to be upgraded and re-certified in order to comply with new Measurement Canada rules for "Accredited Meter Shops". The cost of upgrading and certifying the board was avoided. Now, meter testing is done by a third party through a competitive bid process. Additionally, ENWIN has been able to reduce meter shop staff complement by one (1) as a result of this change.

Finally, smart meters are lighter than the conventional "glass" meters and are easier to transport and handle and at EOL, and generate less waste than the conventional glass meters. This contributed to ENWIN's environmental sustainability goal and reduced its waste footprint.

5.3 Asset Management Process

The asset management process is the systematic approach a distributor uses to collect, tabulate and assess information on physical assets, current and future system operating conditions and the distributor's business and customer service goals and objectives to plan, prioritize and optimize expenditures on system-related modifications, renewal and operations and maintenance, and on general plant facilities, systems and apparatus.

The purpose of the information requirements set out in this section is to provide the OEB and

stakeholders with an understanding of the distributor's asset management process, and the direct links between the process and the expenditure decisions that comprise the distributor's capital investment plan.

5.3.1 Asset management process overview

The distributor must provide the OEB and stakeholders with a high level overview of the information filed on a distributor's asset management process, including key elements of the process that have informed the preparation of the distributor's capital expenditure plan. The information provided should include but need not be limited to:

a) A description of the distributor's asset management objectives and related corporate goals, and the relationships between them, including an explanation of how the distributor ranks asset management objectives for the purpose of prioritizing investments.

b) Information regarding the components (inputs/outputs) of the asset management process used to prepare a capital expenditure plan, including the identification and description of the data, primary process steps, and information flows used by the distributor to identify, select, prioritize and/or pace investments, for example:

- **Asset register**
- **Asset condition assessment**
- **Asset capacity utilization/constraint assessment**
- **Historical period data on customer interruptions caused by equipment failure**
- **Reliability-based 'worst performing feeder' information and analysis**
- **Reliability risk/consequence of failure analyses**

Use of a flowchart illustration accompanied by explanatory text is recommended.

5.3 Asset Management Process

5.3.1 (a) Description of the Asset Management Objectives

This section describes ENWIN's mission, business values, and asset management system, as well as the relationships between them, including an explanation of how the ENWIN ranks asset management objectives for the purpose of prioritizing investments.

Mission: ENWIN's Mission is "*to provide safe and reliable energy and water services in a cost effective manner*", and, as this relates to the ENWIN Electricity Distribution Operations group, that group's mandate is to deliver safe, reliable electricity to the citizens of Windsor at a just and reasonable cost.

Business Values: In relation to ENWIN's responsibility to deliver electricity to its customers through its electricity distribution assets, ENWIN has corporate business values related to Safety, Reliability, Sufficiency, Capital and Operating Efficiency, Risk Minimization and Sustainability. ENWIN also values integrity, leadership and accountability.

ENWIN's financial performance objective is to maximize the value it obtains from its assets. This includes ensuring assets deliver optimum value to its customers at minimum costs, facilitating operational efficiencies, and providing a just and reasonable return on capital investment.

ENWIN's operational performance objective is to ensure that assets are able to deliver the value expected by customers and shareholders at optimum cost. This includes ensuring adequate capacity, availability, reliability, safety and compliance to regulatory requirements.

ENWIN's risk objective is to minimize probability of occurrence and the impact of asset related negative outcomes. This includes risk to people, property, the environment, financial loss, reliability, regulatory compliance and reputation.

ENWIN's sustainability objective is to minimize the economic and environmental footprint of its operations commensurate with good utility practise. This also includes balancing expenditures on various asset types over time, choosing designs and equipment to minimize losses, minimize waste, re-use and recycle materials whenever practical, balancing economic viability with environmental and social responsibility, practicing and facilitating conservation and the use of renewable energy sources and complying with applicable rules and regulations. ENWIN strives to continually improve its health, safety, environmental and efficiency performances.

In order to reflect ENWIN's business values in decisions related to the asset investments, ENWIN's senior management has consolidated these business values into four categories, and developed a weighting for each category. This was done to facilitate the incorporation of these business values into ENWIN's decision making framework, which assesses the relative value of competing asset investments.

These business values include Safety, Reliability, Financial Risk and Sustainability.

1. **Safety** includes the safety of both the public and ENWIN's employees as well as risk of damage to property. Safety is of the utmost importance to ENWIN's senior management team as well as to ENWIN's customers, and was consequently weighted at 30%.

2. **Reliability** includes both the reliability of the distribution system as well as the resiliency of the system itself, and ENWIN's ability to restore it after an upset. Reliability also encompasses the concepts of sufficiency of supply as well as contingency and risk mitigation. These are important to ENWIN's customers and were consequently weighted at 25%.

3. **Financial Risk** includes consideration not only for costs borne by ENWIN, but also the risk that a negative outcome will result in ENWIN's customers incurring costs. This category also includes consideration of the risk of fines or legal/insurance settlements. It is important to ENWIN's customers that outages of their electricity supply not result in their suffering damages from things like flooded basements, spoiled food, loss of business, loss of product, etc. and consequently this value was weighted at 25%.

4. **Sustainability** is the final category of ENWIN's business values. This category encompasses regulatory compliance, environmental stewardship, conservation, and reputational risk minimization. While these items are important to ENWIN's regulators, shareholders, and employees, they were judged to be somewhat less directly related to customer satisfaction, as determine through ENWIN's customer engagement outreach initiative. Consequently, this business value category was weighted at 20% by ENWIN's senior management.

The Table 25 below shows the weightings for ENWIN's business values.

Table 25 Business Values and Weighting

Category	**Weighting**
Safety (including public and employee safety and property risk minimization)	30%
Reliability (including sufficiency, contingency and risk minimization)	25%
Financial Risk (including customer and utility costs risk minimization and Capital and O&M efficiency)	25%
Sustainability (including regulatory compliance, environmental stewardship, conservation, and reputational risk minimization)	20%

While cognizant of customers' voiced concern over cost, ENWIN's senior management prioritizes safety over other categories. In ENWIN's view, absent a good safety record, safety will usurp reliability and cost as priorities for customers. This is evidenced by the experience of Pacific Gas and Electric ("PG&E") where high-voltage lines are believed to have ignited forest fires in California. In that case, PG&E was directed to interrupt power where high winds were expected—placing safety at a higher priority than reliability and the cost of interruption to homes and businesses. In this particular circumstance, the priorities of safety and reliability were independent, whereas in most circumstances, measures that improve safety also improve reliability. What the PG&E circumstance demonstrates is that customers—and the courts—clearly value safety over reliability and cost where a choice must be made.

The four performance outcomes as identified by the OEB are:

1. Customer Focus
2. Operational Effectiveness
3. Public-Policy Responsiveness
4. Financial Performance

Customer Focus is prioritized based on customer needs and preferences through the various customer engagement activities that ENWIN uses to communicate with their customers. These are outlined in Section 5.2.1 (b) (Addressing Customer Preferences) and Section 5.4 (a) (Customer Engagement Description) of the DSP.

The Operational Effectiveness, Public-Policy Responsiveness and Financial Performance are linked to ENWIN's mission and business values. Overall, through ENWIN's mission and business values, the four OEB performance outcomes are satisfied as shown below in Table 26.

Table 26 ENWIN's Board Performance Outcomes

ENWIN's Business Values	**Performance Outcomes**
Safety	Customer Focus, Operational Effectiveness, Public-Policy Responsiveness
Reliability	Customer Focus, Operational Effectiveness
Financial Risk	Customer Focus, Operational Effectiveness, Financial Performance
Sustainability	Operational Effectiveness, Public-Policy Responsiveness, Financial Performance

Asset Management System ("AMS"): The business objectives described above have led ENWIN to develop a systematic plan for developing and maintaining the distribution network. ENWIN's AMS is the result of the foregoing objectives. A key objective of ENWIN's AMS is to optimize the value provided by its assets by managing the balance between financial performance (cost), operational performance, risk, and sustainability. The AMS is integrated so that a long-term view to planning is maintained, facilitating opportunities to achieve multiple objectives through a single investment. The AMS is adaptable in that there is an annual review process which

allows for changing priorities to accommodate changes in underlying drivers and resources. Finally, the AMS brings clarity to the process by which capital investments in the distribution network are identified, rationalized and committed.

Goals: In delivering its mission, ENWIN strives to manage its assets with due regard for its corporate business values related to safety, reliability, sufficiency, capital efficiency, risk minimization and sustainability. Each of these values were discussed in Section 5.2.1 (a) of the DSP. ENWIN also strives to be a good steward of the Province's energy resources, encouraging conservation amongst itself and its customers, and facilitating the use of REG resources. ENWIN's strategies for achieving goals, as they relate to the management of ENWIN's electricity distribution assets, are discussed below:

Safety Strategies:

1. ENWIN will ensure conformance to established standards.
2. ENWIN will undertake audits to ensure conformance with standards.
3. ENWIN will incorporate risk analysis and risk management principles into the management of its assets.

Reliability Strategies*:*

1. ENWIN will design its distribution system with regard to the interconnectivity of its various sections and components, such that a single contingency can be managed through switching, and so that redundancy in supply for its primary three-phase feeders is achieved.
2. ENWIN will utilize a program of inspection of its assets to ensure their continued fitness for service.
3. ENWIN will utilize a program of maintenance for its assets to ensure their serviceable life is maximized.
4. ENWIN will strive to replace distressed assets before they fail in service.
5. ENWIN will improve the reliability and economic operation of its network through the improvement of its SCADA system.
6. ENWIN will, over time, automate devices in its network, in sufficient numbers and at key locations, to detect and isolate faults, and to minimize restoration times.
7. ENWIN will strive to ensure that its remote operations (through SCADA) will be secure, and will minimize the opportunity for unauthorized intrusions to cause negative outcomes. ENWIN will comply with any cyber security standards, as may be mandated by its regulators from time to time, to achieve this security.

Sufficiency Strategies:

ENWIN will maintain a capacity reserve of an average of 1 to 2 MW per feeder. When this reserve is compromised because of load additions, ENWIN will make adjustments to its distribution system to maintain the capacity reserve or make plans to build for more capacity.

Capital Efficiency Strategies*:*

1. ENWIN will consider the full life-cycle cost, including retirement and recycling costs, for the elements that make up its distribution system.
2. ENWIN will design its assets with due regard to their efficiency of operation and maintenance over the lifetime of the assets.
3. ENWIN will maintain its assets in order to maximize their useful service life.

Risk Minimization Strategies*:*

1. Risk will be explicitly considered as part of the design of any new or replacement asset.
2. Supporting information systems and processes will be developed and maintained to enable the determination and mitigation of risk.
3. Risk assessment will be performed informally through asset inspections where assets at risk are identified and brought forward for mitigation.

Sustainability Strategies*:*

1. ENWIN recognizes that consistent capital and operating budgets contribute to consistent and predictable rates for customers and contribute to ENWIN's ability to deliver services to its customers. ENWIN will strive to minimize year over year changes in capital and operating costs, consistent with good utility practice.
2. ENWIN will build, operate and maintain its assets with due regard for environmental impacts of its asset base and operations. ENWIN will prefer products and processes which minimize impact on the environment, consistent with good utility practice.
3. ENWIN will encourage conservation and take a leadership role in the manner in which it builds, operates, and maintains its assets.
4. ENWIN strives to be a good steward of the environment and, as such, recognizes and accepts the need to reduce reliance on carbon based energy sources. ENWIN will design and operate its distribution system, having due regard to it primary obligation to serve load customers, in a manner that will facilitate the integration of REG resources onto the ENWIN distribution system.
5. ENWIN will comply with all applicable rules and regulations related to its business.
6. ENWIN will adopt a philosophy of continuous improvement in its asset planning system.
7. ENWIN will strive to maintain a high level of communication with its customers and other stakeholders. This will include increasing the level of communications during storm events which will satisfy a preference that was identified by customers during ENWIN's Customer Engagement efforts.

5.3.1 (b) Components of the Asset Management Process

The AMPRO (which was briefly discussed in Section 5.2.1 (c) of the DSP, above) begins with an analysis of the assets, the purpose of which is to consider whether the assets meet ENWIN's

requirements related to safety, reliability, sufficiency, capital efficiency, risk minimization and sustainment, now and into the future. Outputs from this activity include a list of projects and programs which are necessary to ensure that core assets are able to deliver value to customers and other stakeholders in the future. These projects and programs will be described along with the rationale for their undertaking including the benefits to be gained and the resource expenditure required.

Asset planning uses as inputs, the output of the asset knowledge, system performance review and risk review activities as well as system operational assessments and comparisons to determine any mismatch against design criteria.

Each supply station and feeder is reviewed for deficiency and opportunity; as is the interconnected distribution system. The review is intended to:

1. identify assets at risk because of their health assessment or location;
2. determine the sufficiency of the assets to serve for expected load growth;
3. determine the operational sufficiency of the system to support itself during contingencies;
4. determine where assets fail to meet the design criteria for which they are intended to comply;
5. determine deficiencies and opportunities to enable assets to fulfill future requirements (i.e. accommodating REG and DER, serving EV loads, etc.); and
6. determine deficiencies and opportunities to enable service improvements for customers (i.e. smart grid, increased reliability, home automation, etc.).

The output of the asset planning activity will be a series of projects that will provide value in accordance with the established strategic values. The projects are also assessed at a high level for the resource requirements needed to complete the project. The assessments and projects are summarized in the AMP. The AMP is a comprehensive study which provides a load forecast for the short and long term, reviews future requirements that the grid may be asked to accommodate (i.e. reverse power flow from DER, EV loading, load and generation management, etc.), reviews current grid capabilities, reviews current reliability and sufficiency, and provides a roadmap of activities needed to sustain the electricity distribution infrastructure in both the short and long term.

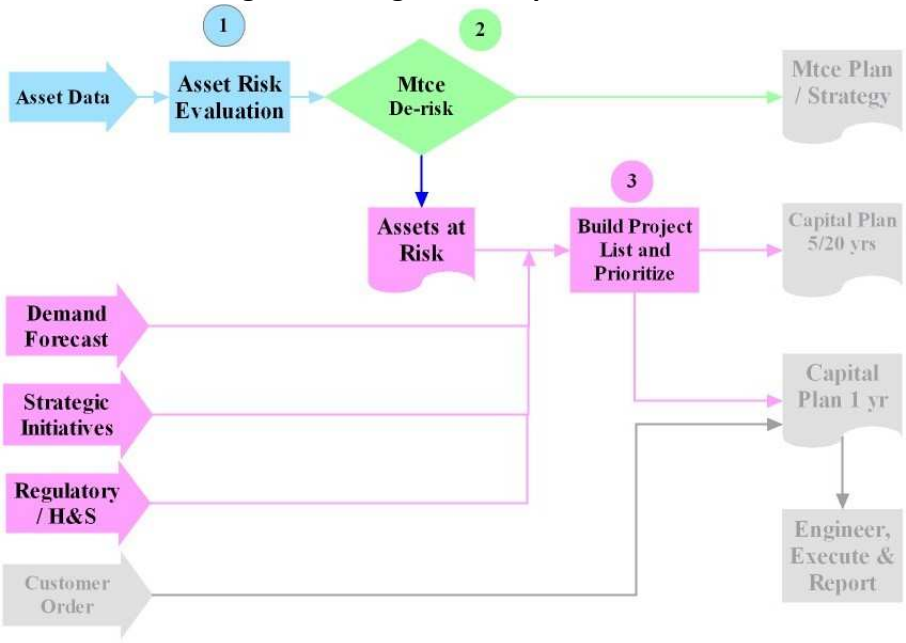
It is likely that a number of issues and opportunities will be identified through this process, which will apply across a number of feeders or the entire distribution system. In these cases, the issue or opportunity is defined as a “program” to be considered as a single opportunity rather than a multitude of activities across a number of feeders. Additionally, during the asset planning activity, any project dependencies will be identified so that these dependencies can be considered when reviewing and evaluating projects. These programs will be identified and go forward for review and evaluation as an entity.

The AMS produces a plethora of projects aimed at satisfying the corporate values and strategic objectives. In order to move forward with the most appropriate projects, the projects must be reviewed and prioritized. The project prioritization activity facilitates the identification of projects by priority.

The planning objectives that are considered relate to ENWIN's values of safety, reliability, sufficiency, capital and operating efficiency, risk minimization and sustainability. Additionally, capital investment decisions must ensure that appropriate resources are available to complete mandatory System Access projects such as new customer connections, road widenings, and other OEB mandates such as smart meters. These are balanced against expenditures for System Renewal, System Service and General Plant. Expenditure requirements are considered against inputs from customer engagement activities, as well as ENWIN's desire to minimize and smooth rate increases while satisfying the stated needs and preferences of the customers.

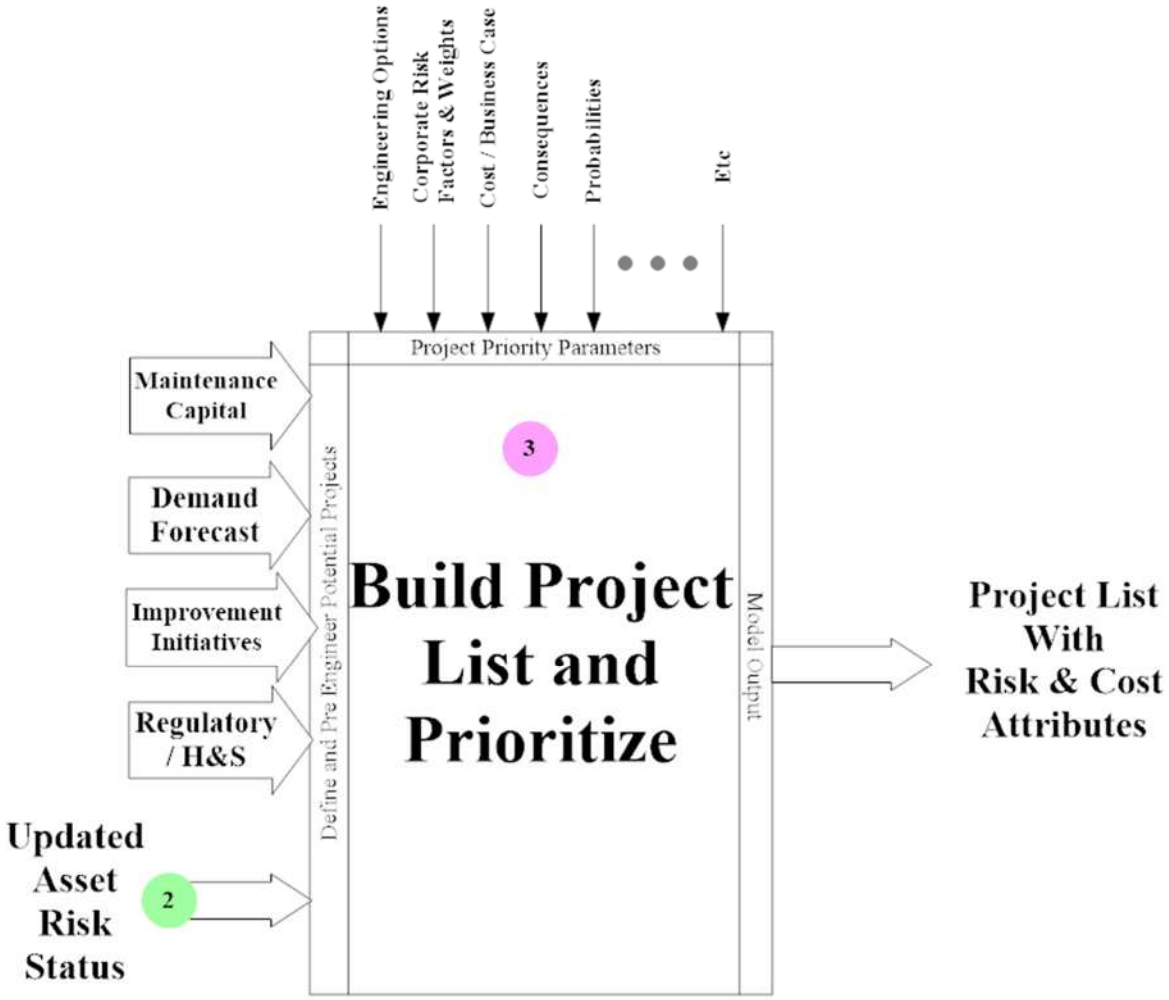
The high-level AMPRO is shown in Figure 13 below:

Figure 13 High Level Inputs to AMRPO



High-value potential capital projects may be defined and pre-engineered to more accurately determine the implementation cost. Inputs from all sources that account for regional growth forecasts, regulatory influences, strategic initiatives, health and safety as well as a list of high risk assets (step 1 in the model shown) will be used to determine all of the potential capital projects. Each capital project will be prioritized based on the pre-established strategic goal weighting factors. The simplified model is shown in Figure 14 below:

Figure 14 High Level Inputs to Project Prioritization Within AMPRO



The specifics of the data collection, risk review, asset planning and prioritization activity are discussed in detail below to further explain the AMPRO flowcharts.

Asset Knowledge Collection Activity – This is the activity of collecting the data that describes the health attributes of the assets. This data is obtained through asset health inspection programs, performance reviews and experiential inputs. The outputs of the Asset Knowledge Collection Activity are reports describing the ability of the assets to perform or continue to perform their designed functions. These reports inform the "Asset Planning Activity", described below.

Risk Review Activity – Unlike "Asset Knowledge Collection" which seeks to gather information about the health attributes of particular assets, the "Risk Review" looks at assets and the distribution system in the context of their environment and the reliance which is made upon the asset(s). Risk Review is an activity whose purpose is to identify asset-related risks, assess their likelihood, consequence and detectability, and describe the operational controls that are in place to mitigate the risk to an acceptable level. The Risk Review informs the Asset Planning Activity. The output of the Risk Review is a listing of assets that have been identified as candidates for additional risk mitigation controls.

Asset Planning Activity – This is an analysis of the assets whose purpose is to consider whether the assets meet requirements related to ENWIN's safety, reliability, sufficiency, capital efficiency, risk minimization and sustainment, now and into the future. Outputs from this activity include a list of projects and programs which are necessary to ensure the core assets are able to deliver value to customers and other stakeholders in the future. The projects and programs will be described along with the rationale for their undertaking, including the benefits to be gained and the resource expenditure required. Asset Planning includes the following components:

Asset Health Assessment – When asset health information is collected, that information is reviewed and assessed. Assets in immediate risk of failure are identified and action requests for maintenance or replacement are initiated immediately. Other assets whose health has deteriorated significantly are noted and where appropriate are scheduled for maintenance or replacement according to the risk presented by the asset. This gives rise to a number of potential asset sustainment projects which are forwarded for consideration. The condition of the balance of the assets is reviewed as well as the age of those assets in order to obtain a long-term view of the capital and maintenance requirements for the future (beyond five years).

System Performance – The performance of the distribution system is reviewed annually. The performance indicators considered are SAIDI, CAIDI, SAIFI, and MAIFI on both a system wide basis and a feeder by feeder basis. The worst performing feeders are identified and reviewed. Additionally, consideration is given to any special incidents such as storms that occurred in relation to how much damage the system sustained and how long service reinstatement took. The intention of this review is to identify areas where reliability is deteriorating and determine potential asset sustainment projects or enhancement projects which are forwarded for consideration.

Operational Objectives – The distribution system is reviewed on a feeder by feeder basis with the intention of identifying any areas where operational liabilities exist. These may be in the form of undersized cables, feeders whose load has grown and that cannot be backed up by other feeders, critical lines that cannot be accessed at certain times of the year or during storms, switches whose automation would greatly increase the speed of isolation and restoration of parts of a circuit during an outage, etc. This review also identifies areas of the system that do not meet design criteria for either serving of load, maintenance of reliability, or acceptance of generation connections. This review will identify areas where reliability improvements could be obtained or risk mitigated through the identification of System Service projects which are brought forward for consideration.

System Growth – This activity includes the review of system growth and the identification of areas that have vacant land and the capacity for growth. This is compared to the capacity of the existing distribution system to accommodate that growth. Where deficiencies exist, remedial projects are identified. In general, network

expansions do not occur unless there are real customers requesting service. Nevertheless, it may be appropriate to size a network replacement for asset health or other reasons so that it can accommodate anticipated growth in the future. In some cases, where load growth is more certain, projects may be initiated and forwarded for consideration in the short term. The system load growth considered here is related to but different than the forecast load growth related to the billable quantities. Asset management is concerned with the ability to supply anticipated loads (demand) during peak periods while growth related to billable quantities may be related to energy consumption and demand during all periods.

REG – This activity includes the review of embedded generator connection requests and forecasts for future requests, management of system capacity to accept generation, and the development of any plans to expand or enhance the distribution system to accommodate increased levels of embedded generation.

Prioritization Activity – This activity takes the output of the Asset Planning Activity and prioritizes the projects and programs on the basis of value delivered, through the PROSORT project prioritization model ("PPM") (see 5.4.1 (b) for a description of the PROSORT tool). The PPM combines weighted corporate values with the project or program attributes to provide a relative "score" of overall value to the company. The determination of value in this exercise is the degree to which the execution of a given project reduces the risk to the customer and the company associated with not executing the project (status quo).

The corporate values that are used in the PPM include safety, reliability, financial performance (including risk of costs to customers and ENWIN), and sustainability (including environmental impact, regulatory compliance and reputation). Project prioritizations are then reviewed for sustainability as it relates to financial continuity. This means the prioritized list will be used to select the projects and programs to be included within a capital and operating cost envelope that has been determined to be consistent with the balance between system performance risk and the rates that customers are willing to pay for the value they obtain from their electricity service. This balance is determined through a customer engagement process and this CoS. The output of the prioritization activity is a capital and maintenance project and program lists for the upcoming year and the five following years. Plans for assets for the longer term are also identified but are maintained in the Asset Planning Activity output but are not moved to capital plans until timing is appropriate for them to be acted upon.

ENWIN General Plant and Other Assets (Asset Register and Asset Condition Assessment)

Fleet and Site Asset Register: ENWIN's primary asset register for fleet is its corporate enterprise resource planning ("ERP") system, SAP®. It is ENWIN's intention that all serialized point assets be identified in that system. The SAP asset register contains the basic attributes associated with the fleet vehicles and equipment, as well as building structure envelopes, and interior and mechanical equipment attributes associated with each of the ENWIN properties. All preventive maintenance and mandated inspections are scheduled using the SAP database and maintenance module. All data pertaining to maintenance, repair and inspection of the fleet and real property assets is collected and stored in the ERP work order and equipment modules. The SAP equipment module houses the relevant serial numbers, ages, descriptions and history information.

Asset Condition Assessment - Fleet: ENWIN determines the condition of its fleet assets through maintenance/repair records and physical inspections. A rolling five-year forecast for the replacement of fleet equipment is updated each year. Prior to each budget year, a review of the fleet equipment identified for replacement is completed and the vehicle condition is evaluated and scored on a matrix. When equipment scores below a pre-determined threshold, it is earmarked for replacement. The evaluation criteria for replacement vehicles includes the expected life and cost of vehicle repair, the year to date repair costs, the estimated future repair cost (if the vehicle were to be retained), the market value of the vehicle, and the estimated lease/capital payments for the proposed replacement vehicle. This information is then used to create a business case to support either retaining the vehicle for another budget year or replacing the vehicle.

With regard to the fleet assets, each year prior to budget preparation ENWIN determines the number of fleet vehicles required for the department staffing level. This rationalization of equipment-to-staffing has allowed ENWIN to reduce the fleet count over the years as staff levels decreased. In addition, vehicle types and designs are standardized wherever possible, which achieves two benefits: (1) ENWIN reduces expenditures by avoiding specialty types of vehicle design, and (2) the equipment is able to be easily shared among various departments.

Asset Condition Assessment - Site: Each building's building envelope and mechanical equipment are assessed each year. A rolling five-year plan is maintained for the maintenance/replacement of these assets. Each year, maintenance records and inspections are reviewed and health indices are evaluated to provide a judgment as to the relative health of any particular building asset. Strategies for the replacement of the mechanical equipment vary with risk of failure (consequence and likelihood of failure). For example, heating-ventilating-air conditioning ("HVAC") boilers, chillers, and air handlers are assessed for condition, and a replacement date is determined with the view of replacement prior to failure. Conversely, non-critical equipment such as unit heaters and domestic hot water heaters are run to EOL and replaced at time of failure.

By utilizing the expertise of professional inspection services to assess the condition of equipment/buildings, ENWIN is able to determine the necessary repairs required to extend the lifecycle of the assets and the appropriate replacement timeline. The utilization of an engineering service to assist with consultation and design of replacement equipment helps to

ensure that ENWIN procures the best energy efficient design and equipment for the required application.

All HVAC equipment is subject to a preventive maintenance and inspection program. These preventative maintenance services and inspections are designed to follow the manufacturers' recommendations and performance measurements. These preventative maintenance services and inspections are completed by a contract service that supplies the qualified service personnel for each particular type of equipment (e.g. refrigeration mechanic, boiler technician, etc.). Elevators, fire suppression systems, and emergency generators are all scheduled for monthly inspections to ensure their safety and performance. These types of equipment are scheduled for preventative maintenance and inspection either quarterly or annually, in accordance with the relevant regulatory requirements and manufacturers' recommendations. All HVAC and lighting equipment is replaced with the highest energy efficiency equipment available.

Roofing systems are evaluated by a professional inspection service to identify condition, repairs required and remaining life expectancy. Identified areas are subsequently repaired, and a five-year budget forecast for roof repair and replacement is maintained, and is reviewed each fiscal year in advance of budget creation.

Building envelopes are reviewed by a professional engineering service, which inspects the cladding, glass, and structure of each building. Items that require remediation are identified, and a forecast including budget amount and budget year for work completion is created. These forecasts are incorporated into the five-year budget plan. The budget amount is submitted either as capital or operating dollars as determined by the ENWIN's finance department. A mechanical engineering service is utilized when HVAC equipment is identified for replacement in order to acquire the most efficient equipment and ensure all regulations and codes are adhered to. A structural engineering service is engaged whenever remediation of the building structure is to be undertaken, again to ensure the integrity of the repair/replacement and that all codes and regulation are adhered to. A mandate of the ENWIN Site department is to incorporate justifiable energy saving improvements into repairs/replacements.

Asset Register – Meters: ENWIN's electric meters are tracked through its CIS system rather than its ERP system due to the close relationship between meters and billing. Meters are tracked individually and assigned to one of the meter categories. Inspection of the meters is governed by Measurement Canada rules, as are the record retention protocols. ENWIN's meter base is new, having been generally renewed through the smart meter program starting in 2010.

Asset Condition Assessment – Meters: ENWIN's residential class meters (includes small commercial single phase, non-demand meters) are managed through a statistical sampling program which reviews meter accuracy and makes a determination of the suitability of the meters to remain in service, according to Measurement Canada rules. ENWIN began retesting smart meters in Q4 2018. It is expected that the meter's life will be extended by an additional 8 years from its original 10 year seal period. ENWIN is sampling its meters earlier than 2020 in order to ensure that if the meters' seals will not be extendable, that there will be sufficient time to replace the meters. ENWIN's meters have been formed into meter populations of 20,000

meters for the purposes of sampling. This size meter population was chosen as a manageable size given the risks of group failure and ENWIN's capacity to change out the meters and the financial impact of the change.

ENWIN's complex (demand) meters are also eligible for seal extension through sampling; however, ENWIN chooses to manage these meters on an individual basis. The reason for this choice is that these meters measure the highest energy totals, and it is judged that ENWIN can best assure its customers of accurate metering by individually validating the measurement accuracy. At the present time the number of meters in this category is manageable for ENWIN to test individually. This may change as the retest program matures. The actual testing of meters is contracted to a third party.

Asset Register – Municipal Transformer Stations ("MTS"): ENWIN owns five MTS stations with three serving automotive plants and two serving ENWIN's distribution system. The station equipment and systems are tracked in ENWIN's ERP system. This station equipment is scheduled for inspections through this system, but some records of inspection are kept manually as the inspections are performed with specialized equipment which produces an electronic file or a paper record of test results.

Asset Condition Assessment – MTS: ENWIN's MTS stations transformers are inspected on a bi-annual basis (five-years for relays), and the automotive MTS inspections are scheduled to coincide with the automotive plant summer shutdown periods. The detailed inspection results are reviewed by ENWIN's system planning engineer. Some of the testing is prescribed by the IESO, and those tests are performed at the prescribed frequency and the results are compared against prescribed criteria and filed with the IESO.

There is further discussion on how General Plant investments are assessed under the overall asset management process in Section 5.4.1(b) of the DSP.

Asset Capacity Utilization / Constraint Assessment

ENWIN also reviews its assets for sufficiency. In particular, the loading of transformers is reviewed relative to their capacities. Where transformers appear to be significantly overloaded, that loading is verified and, where the loading is indeed over the transformer's capacity, those transformers are scheduled to be changed and upgraded. Similarly, transformers that are significantly under-loaded may be considered for replacement.

The distribution system is also reviewed on a feeder-by-feeder basis with the intention of identifying any areas where operational liabilities exist. These may be in the form of undersized cables, feeders whose load has grown and that cannot be backed up by other feeders, critical lines that cannot be accessed at certain times of the year or during storms, switches whose automation would greatly increase the speed of isolation and restoration of parts of a circuit during an outage, etc. This review also identifies areas of the system that do not meet design criteria for either serving of load or maintenance of reliability. This review will identify areas where reliability improvements could be obtained or risk mitigated through the identification of projects which are brought forward for consideration.

ENWIN also performs a review of system growth and identifies areas with vacant land and the capacity for growth. The outcome of this review is compared to the capacity of the existing distribution system to accommodate that growth. Where deficiencies exist, remedial projects are identified. In general, network expansions do not occur unless there are real customers requesting service. Nevertheless, it may be appropriate to size a network replacement for asset health or other reasons so that it can accommodate anticipated growth in the future. In some cases, where load growth is more certain, projects may be initiated and forwarded for consideration in the short term.

ENWIN also reviews renewable generator connection requests, prepares forecasts for future requests, and compares this forecast with the system capacity to accept generation. Where deficiencies exist to accommodate renewable generation, ENWIN develops plans to expand or enhance the distribution system to accommodate increased levels of renewable generation.

Historical Period Data on Customer Interruptions caused by Equipment Failure

ENWIN monitors outages by cause and produces monthly and annual reports showing this. Preventable causes, in particular, are noted and reviewed so that any trends are taken into account in the development of capital and maintenance plans. Equipment failure is noted in particular, as ENWIN's intention is to generally replace equipment prior to failure and on a planned basis to minimize customer inconvenience. For example, outages due to tree contacts are reviewed and are an indicator of the success of ENWIN's vegetation management program. Further information on the worst performing feeder analysis is located in Section 5.2.3 (a).

Reliability-based 'Worst Performing Feeder' Information and Analysis

A worst performing feeder analysis is performed annually and informs capital and maintenance priorities in the annual budgeting process. The number of customers affected by a feeder outage is taken into consideration in the determination of the relative ranking of feeder performance. By giving priority to projects intended to improve reliability on worst performing feeders, ENWIN tries to improve the experience of the most customers with the poorest reliability. At present, ENWIN's means of assessing individual customers' reliability experience is only able to be done manually, so ENWIN is unable to rank reliability performance by customer. The worst performing feeder determination is done using a summation of the last 3 years of history and using number of outages, duration of outages, number of momentary outages, and number of customers affected by each outage. Further information on the Worst Performing Feeder Analysis is located in Section 5.2.3 (a) of the DSP.

Reliability Risk / Consequence of Failure Analyses

Reliability risk and consequence of asset failure are part of ENWIN's AMPRO and dealt with in project pacing and prioritization. ENWIN analyses the risk of proposed projects in terms of their likelihood and consequence profile. The projects are prioritized by dividing the total cost of the project by the change in the risk score which calculates the "Risk Reduction Factor". This

is performed using PROSORT. The use of that tool and methodology is more completely described in Section 5.4.1 (b) Asset Risk Management.

5.3.2 Overview of Assets Managed

Assessment of DSPs requires an understanding of the scope and depth of the assets managed by a distributor. Distributors vary in terms of the types of assets managed (e.g. some own high voltage equipment and others do not). Detailed characteristics and data on the assets covered by the asset management process are to be filed, including but not necessarily limited to:

a) A description and explanation of the features of the distribution service area (e.g. urban/rural; temperate/extreme weather; underground/overhead; fast/slow economic growth) pertinent for asset management purposes, highlighting where applicable expectations for the evolution of these features over the forecast period that have affected elements of the DSP. A distributor may provide more detailed geographic and/or engineering maps where these may help reviewers better understand specific application components, such as the distributor's capital expansion or replacement programs, its network assets such as transformer stations, and its interconnections with other transmitters, distributors and generators (e.g. such as for host or embedded distributor connection).

b) A summary description of the system configuration, including length (km) of underground and overhead systems, number and length of circuits by voltage level, and number and capacity of transformer stations

c) Information (in tables and/or figures) by asset type (where available) on the quantity/years in service profile and condition of the distributor's system assets, including the date(s) the data was compiled

d) An assessment of the degree to which the capacity of existing system assets is utilized relative to planning criteria, referencing the distributor's asset related objectives and targets

• Where cited as a driver of a material investment(s) included in the capital expenditure plan, distributors must provide a level of detail sufficient to understand the influence of this factor on the scope and value of the investment.

5.3.2 (a) Service Area

The City of Windsor, Canada's southernmost city, is situated on the south shore of the Detroit River and Lake St. Clair. The city is strategically located at the centre of the Great Lakes basin directly across from Detroit, Michigan. ENWIN is Windsor's LDC and is responsible for the distribution of electricity and water, and the servicing and maintenance of electricity & water infrastructure, excluding the annexed area of the City of Windsor. ENWIN is also a management services company providing fleet, billing, collections, credit, financial, human resources, customer service, and information technology services to the WUC and the City.

In December 2002, the Province of Ontario approved the transfer of approximately 2,600 hectares of land ("Annexed Lands") from the Town of Tecumseh and Essex County to the City of

Windsor; this Annexed Land to the City of Windsor has been and continues to be served by the HONI.

Table 27 Service Area within the City of Windsor

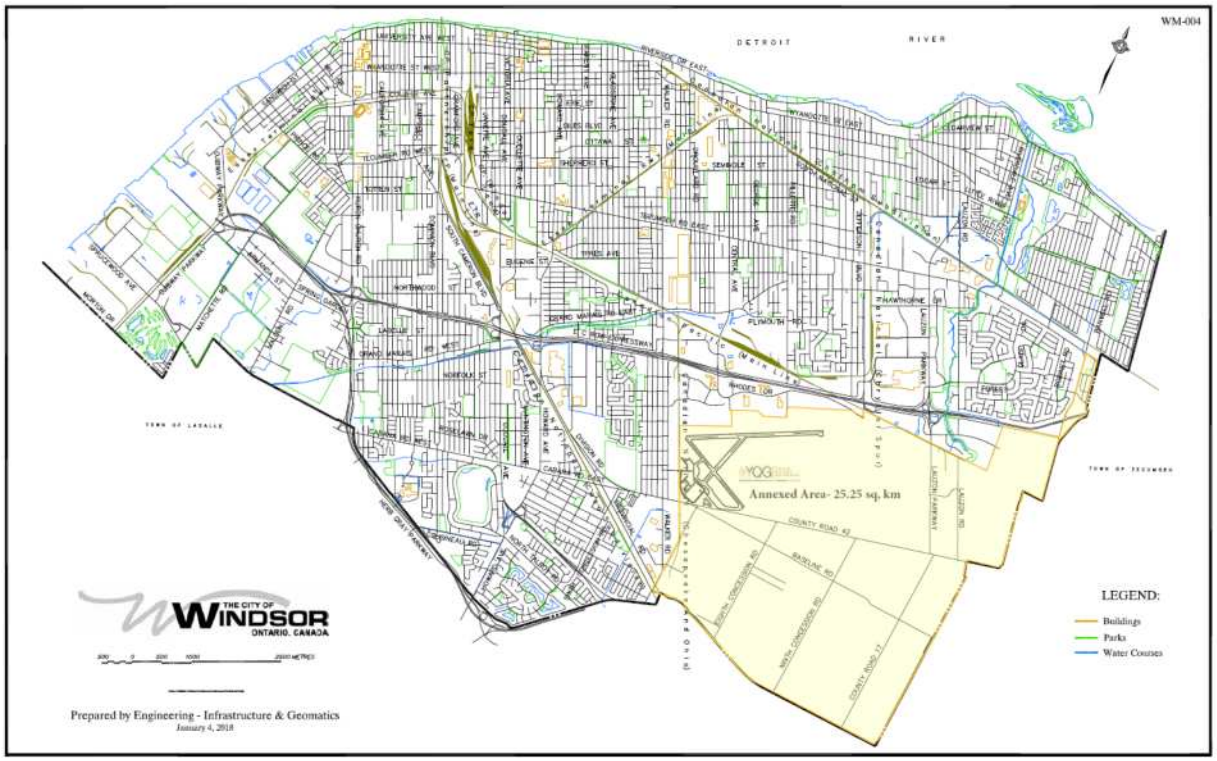
2016 Census Population and Dwelling Counts	Windsor, ON
2016 Population	217,188
ENWIN Customer Count (2017)	88,721
Land Area, sq km	146.38
Annexed Area, sq km	25.26
ENWIN service Area, sq km	121.12

ENWIN is owned by Windsor Canada Utilities Ltd., a holding company that is 100% owned by the City ("WCUL"). WCUL is a private company, registered under the *Ontario Business Corporations Act* and overseen by an independent Board of Directors consisting of six members, appointed by City council. WCUL owns and operates two subsidiary companies, ENWIN and its unregulated affiliate, ENWIN Energy Ltd. which provides streetlight and sentinel lighting and maintenance services to the City, as well as engaging in other energy related services. ENWIN maintains a contract of service with the WUC to supply water to the residents of Windsor and two neighbouring towns.

Table 27 above shows ENWIN's service area within the City of Windsor. As at the 2016 census, ENWIN served a population of over 217,000 residents in the City of Windsor, and at the end of 2017, ENWIN served 88,721 customers. ENWIN's service territory is the area within the City of Windsor boundary as of December 2002. It does not include the City of Windsor areas that were annexed in January 2003, which are served by HONI shown in Figure 15 below.

ENWIN does not have any load transfers in effect with adjacent utilities. ENWIN's service territory is considered entirely urban with no rural areas within the service territory. ENWIN is considered a primarily overhead utility with a 60/40 overhead/underground split of primary feeder conductors. ENWIN's service territory has experienced a slow growth rate. This is in part due to a long-lasting recession from 2008, which lead to a longer recovery than the rest of the Province, largely due to the fact that most of the available land area in Windsor has already been developed. It is this constraint that is expected to limit ENWIN's residential growth.

Figure 15 Map of City of Windsor showing Annexed Area



The land use zoning for the City of Windsor is shown in Figure 16 below. Windsor currently has two border crossing, and the third border crossing is being built at the west end of the city (i.e. GHIB). As a result of this major investment project, ENWIN expects more industrial load growth in that area in the future. As shown in the land use zoning map in Figure 16 below, the west end of the City of Windsor has undeveloped industrial land, and ENWIN, therefore, expects more load on HONI's Malden TS and Keith TS.

ENWIN's service territory is generally warmer than the rest of Canada as Windsor is Canada's southernmost city. Windsor is also the highest isokeraunic area in Canada which means that it is the "lightning capital" of Canada as noted in Current Results Publishing Ltd.'s summary of Environment Canada data. In describing Canadian cities subject to wind, rain, snow and lightning it states:

> "*While Windsor doesn't get as much intense rain and snow as the other three cities, it does have enough drenching rain (six days) and blustery wind (four days) to make the top ten of both those lists. Where Windsor particularly excels is at thunderstorms. This city tolerates more than any other in Canada, averaging 33 days a year with thunder and lightning*".

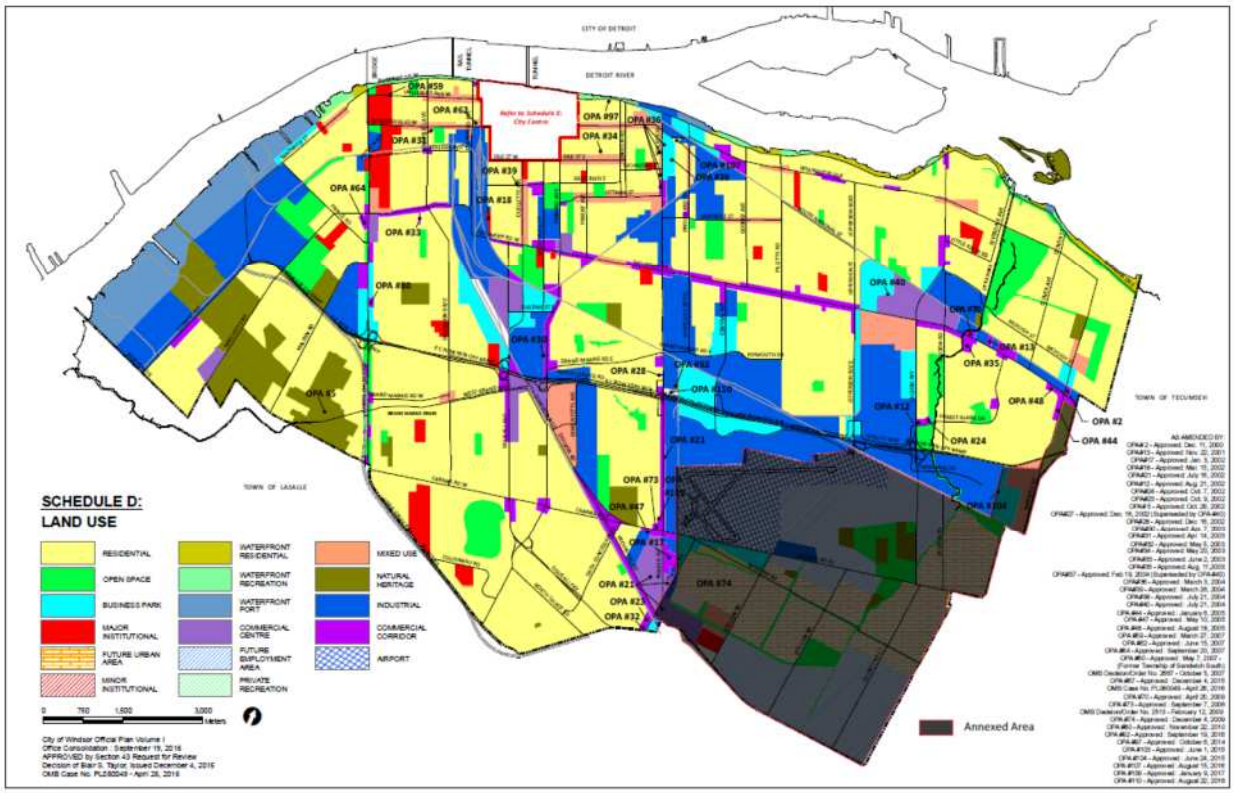
Table 28 below shows the average number of thunderstorm days annually by city.

Table 28 Average Number of Days Annually with Thunderstorms

Average number of days annually with thunderstorms

City	Days a Year
Windsor, Ontario	33.2
London, Ontario	30.9
Kitchener - Waterloo, Ontario	29.3
Brantford, Ontario	29.3
Guelph, Ontario	29.2
Oshawa, Ontario	29.1
Toronto, Ontario	28.0
Hamilton, Ontario	27.7
Calgary, Alberta	27.4
Barrie, Ontario	27.0

Figure 16 Land Use Map



ENWIN's peak system delivery (656.7 MW) occurred on August 2nd, 2006. ENWIN's peak load in 2017 occurred in July and was 464.2 MW, representing a 29% reduction over the 2006 peak.

ENWIN's distribution system is supplied by HONI's transmission infrastructure through eleven bulk TSs, five of which are owned by ENWIN. Three of ENWIN's five TSs serve automotive plants in the City of Windsor. Three of the HONI stations also serve other utilities that serve adjacent territories. There are no embedded distributors within ENWIN's service territory. ENWIN's automotive customers have a dedicated 115kV supply arrangement to feed dedicated TSs for reliability, namely Ford Power House MTS, Ford Annex MTS, GM MTS and Chrysler MTS.

The ENWIN-owned GM TS that formerly served an automotive plant was converted to distribution system service in 2016.

Expected Changes in the Distribution Territory

The City amalgamated certain portions of lands in the county in 2003; there have been no further amalgamations since that time. The political climate surrounding amalgamation is negative and no further amalgamations are expected in the short term. This means that ENWIN's service territory is not likely to expand and the capacity for growth within that territory is limited.

Nevertheless, there are still undeveloped areas within the City that offer opportunities for load growth. There was a large amalgamation of territory that took place in 1966 and the 1971 census, which raised Windsor's population to 209,300. However, in each of the 10-year census reports leading up to 2011, the population was less than the 1971 figure, indicating negative growth. The 2011 census reported the first increase in population since 1971 at 210,900. The 2016 census shows that there has been modest growth since 2011 with the population at 217,200.

With respect to climate change, the City of Windsor is currently preparing a climate change risk assessment and, while still in draft form, the prediction is that by the 2050s the area will see a 25% increase in ten-year storm events and a 40% increase in 100-year storm events. Figure 17, below, is excerpted from a 2016 paper by Dr. Paulin Coulibaly et al, entitled, "A Comparison of Future IDF (Intensity, Duration, Frequency) Curves for Southern Ontario".

Figure 17 Comparison of Change in Rainfall Intensity from Baseline

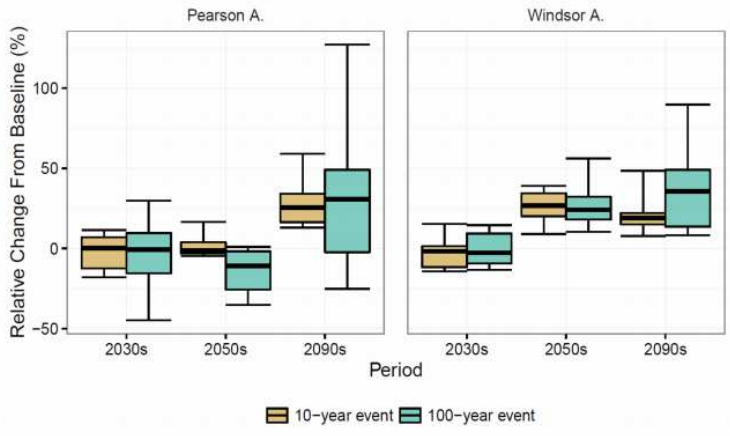


Fig. 3: Comparison of the range in relative change in rainfall intensity from baseline for the 2-hour event for 10- and 100-year return periods (0% on y-axis is no-change from historical baseline). Shaded boxes represent the inter-quartile range (25th to 75th percentile), the horizontal bar represents the median, and whiskers represent the minimum-maximum range for the ensemble.

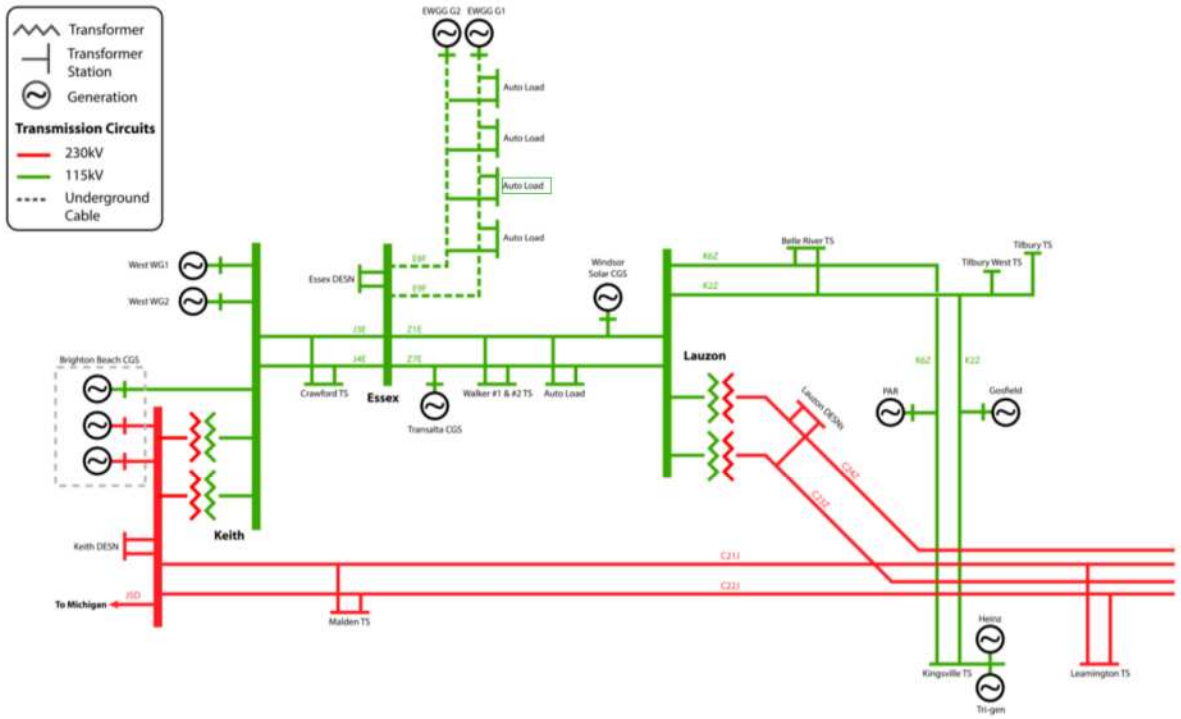
This means that the infrastructure that is to be built now will be the infrastructure that faces an increased level of stressors in the future. The infrastructure that is most at risk in ENWIN's

territory is the feeders which run through treed, backyard, and closed alleys. While there is little ENWIN can do, from a practical standpoint, to move these feeds out of backyards, ENWIN ensures that things like transformers are placed at the head ends of the alleys (street/bucket truck access) rather than mid-alley and that fusing is adequate to isolate faults in the alleys while letting the trunk feeders continue in service. Additionally, ENWIN is building a flexible, resilient distribution system in order to provide its customers with the level of service which they expect.

5.3.2 (b) Summary of System Configuration

The Windsor-Essex area is fed from two 230 kV double circuit lines (C21J/C22J & C23Z/C24Z), which directly feed Lauzon TS, Malden TS and Keith TS. The Keith TS and Lauzon TS 230/115 kV step down transformers make a 115 kV connection between Keith and Lauzon stations through the Essex Station. The Windsor transmission network has a 230 kV tie connection (J5D) to Michigan for power export/import. Figure 18 below shows the system configuration.

Figure 18 System Configuration



The radial 115 kV circuit (E8F/E9F) going north from Essex TS is for the major automotive customers. Windsor has a long history of advanced manufacturing, especially in the automotive sector. In light of this, the transmitter and distributors have made historical investments in electricity infrastructure to enable a very high standard of reliability, which is of strategic importance to the regional and provincial economies.

ENWIN's distribution system is a 27.6 kV grounded Y four-wire radial feeder system. ENWIN's standard feeder size is a 556 MCM aluminum conductor with a nominal ampacity rating of 450

A and peak (emergency) rating of 600 A. Electricity came to Windsor in 1914, with 2014 marking the centennial for electricity in Windsor, and parts of the distribution system are on their third iteration.

There are 44 distribution feeders served by six HONI TSs and two ENWIN TSs. ENWIN also owns and operates three dedicated automotive customer supply stations fed from a HONI 115 kV supply.

Table 29 Feeder Count

Station ID	Owner	Capacity (MVA)	# of Circuits	Circuit Length (m)							# Customers	# Customer %
				Primary Overhead	Primary Underground	Secondary Overhead	Secondary Underground	Service Overhead	Service Underground	Total		
GM MTS	Enwin	2-20/27/33	2	36,297	490	40,787	41	114,939	6,666	199,221	5,498	6.06%
Ford Powerhouse MTS	Enwin	2-30/40/50	2	418	317					735	1	0.00%
Walker 1	Hydro One	2-50/67/83	5	80,334	28,259	91,642	478	205,315	131,577	537,605	11,229	12.37%
Walker 2	Enwin	2-50/67/83	6	104,259	90,874	113,521	161	189,378	364,519	862,711	14,380	15.84%
Essex	Hydro One	2-50/67/83	6	99,178	47,115	95,704	503	224,982	182,160	649,642	13,674	15.06%
Crawford	Hydro One	2-50/67/83	10	88,277	27,999	94,937	2,721	253,859	35,998	503,791	12,754	14.05%
Malden	Hydro One	2-75/100/125	6	103,659	52,773	92,298	868	129,287	179,495	558,379	9,238	10.17%
Lauzon	Hydro One	2-150/200/250	7	102,491	198,013	100,029	170	149,896	704,614	1,255,214	19,187	21.13%
Keith	Hydro One	2-50/67/83	4	55,737	7,651	54,126	636	88,929	28,861	235,941	4,832	5.32%
Total			**48**	**670,650**	**453,493**	**683,043**	**5,577**	**1,356,585**	**1,633,890**	**4,803,238**	**90,793**	**100.00%**

In addition to the above feeder count in Table 29, Chrysler MTS has four feeders and Ford Annex MTS has two feeders.

ENWIN's system is primarily an overhead distribution system with 670 circuit km of overhead primary line and 453 circuit km of underground primary lines. ENWIN's main feeder trunks are primarily overhead with underground sections in the downtown core and at various locations where there are obstructions, such as the EC Row Expressway. ENWIN's downtown core is supplied by four feeders, which operate as two parallel sets. Customers served from these parallel feeders are supplied through auto-transfer switches such that if there is a permanent fault on one of those parallel feeders, then supply automatically switches to the other feeder.

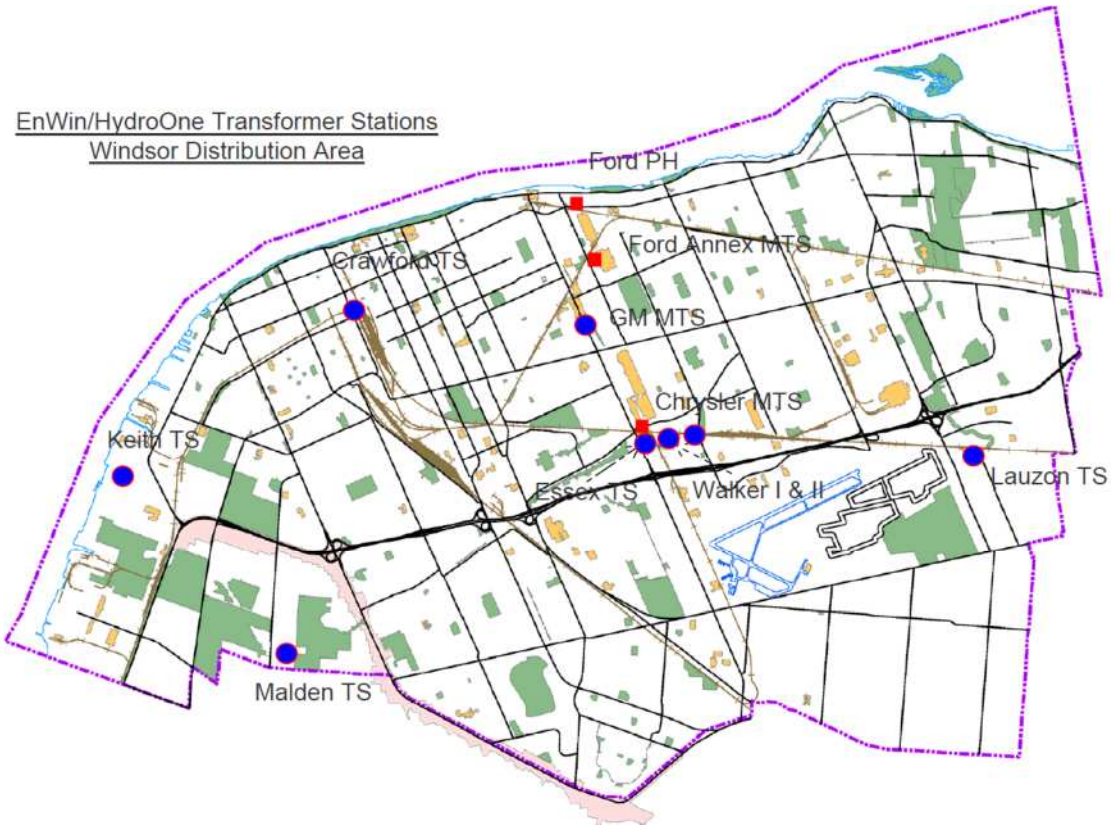
Windsor has both older and newer sections in the City. Older sections have been served from overhead back lot feeder branches. These areas were originally constructed on alleys and the City of Windsor has been closing these alleys and selling the lands (with utility easements) back to the residents. ENWIN also has, just over 800 generators connected to its distribution system, generating over 46 MW. An additional 16 MW of generation has applied for connection and is in various stages of completion.

ENWIN completed the elimination of its 4 kV distribution system in 2015, as the last remaining pieces of that system were replaced with 27.6 kV feeders. ENWIN's feeders are generally short

(with a maximum length of 8 to 10 km), and, consequently, ENWIN does not use any capacitor banks on its system for voltage support. ENWIN has used a Survalent SCADA system for over 20 years, and operates a 24/7 manned operations centre. ENWIN's feeders have reclosers, sectionalizing switches and tie switches, many of which are remotely operable through the SCADA system. ENWIN also has a Sensus Advanced Metering Infrastructure ("AMI") smart meter system, SAP ERP and Enterprise Asset Management systems, a CYME® interface with GIS, a NorthStar® CIS and an Esri GIS system.

Figure 19 below shows where the ENWIN/HONI TSs are located in the Windsor distribution area ("WDA").

Figure 19 Location of ENWIN and HONI TSs



Tables 30 to 38 below provide the details of the transformation stations located in the WDA.

Table 30 Crawford TS

Feeder ID	Primary Circuit Length (m)					Secondary Circuit Length (m)					Service Circuit Length (m)					# of Customers
	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	
25M5	4,366	2,872		1,365	8,603	5,692	330			6,023	15,269	117	1,241	407	17,034	790
25M6		20		3,835	3,855				82	82		87		286	373	14
25M7	16,390	15,270	1,630	981	34,271	27,865	7,998	420		36,283	93,528	3,294	9,449	12,271	118,542	4,903
25M8			50	6,462	6,511	100	494	414	891	1,899	470	4,700	679	2,791	8,640	317
25M9	118	294		3,798	4,211	523	692	70	228	1,513	2,791	2,767	48	1,818	7,424	333
25M10	8,120	8,785		1,029	17,933	14,265	3,817	36	89	18,207	57,865	2,879	1,820	916	63,480	3,000
25M11	3,097	4,777		1,587	9,461	7,232	2,199			9,431	28,749	2,019	152	745	31,665	1,399
25M12				6,679	6,679	62	94		433	589	109	140	339	840	1,428	62
25M13	9,160	8,977	136	319	18,592	13,431	1,954	57		15,442	27,166	1,407	842	518	29,934	1,410
25M14	344	5,686		130	6,159	3,779	4,409			8,188	7,297	3,206	118	716	11,337	526
Total	**41,595**	**46,682**	**1,815**	**26,184**	**116,276**	**72,949**	**21,988**	**997**	**1,724**	**97,658**	**233,245**	**20,614**	**14,689**	**21,309**	**289,857**	**12,754**

ENWIN owns all the feeder fed by this TS, and HONI owns the Station. This station has two set of underground feeds: 25M8/12 and 25M6/9, which feed Windsor's downtown area. These feeders utilize full redundancy, such that the entire customer load on each feeder can be auto transferred to the healthy companion feeders in the event of failure on one feeder. These feeders are the only feeder on ENWIN's distribution system that enjoy such redundancy, which enhances reliability for customers connected to these feeders.

Table 31 Keith TS

Feeder ID	Primary Circuit Length (m)					Secondary Circuit Length (m)					Service Circuit Length (m)					# of Customers
	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	
23M1	8,512	11,261	26	858	20,657	19,951	4,780	172	401	25,304	38,771	1,984	1,243	3,674	45,671	2,061
23M2	14,476	12,315	3,196	2,051	32,037	24,572	2,584		4	27,160	43,696	2,870	21,406	2,286	70,258	2,740
23M21		987			987					0					0	2
23M6	86	8,101	537	984	9,708	1,973	266	60		2,299	1,609		242	10	1,861	30
Total	**23,074**	**32,664**	**3,759**	**3,893**	**63,389**	**46,496**	**7,630**	**232**	**405**	**54,763**	**84,075**	**4,853**	**22,891**	**5,970**	**117,790**	**4,833**

Keith TS is a shared TS, and it is located at the west end of the city. HONI owns the TS. ENWIN has three feeds from the Keith TS standard Dual Element Spot Network ("DESN") station. The other feeders are owned by HONI. One dedicated feeder (23M21) has been set up under a special arrangement with HONI for a west end casting plant. The 23M21 feeder is supplied from a single transformer, and no redundancy is available for the transformer. There are no other means to feed 27.6 kV through 23M21 feeder on the HONI side.

This arrangement forced ENWIN to allocate distribution back-up capacity for the casting plant on its 23M6 feeder. While ENWIN can manage capacity on its own feeder, it does not manage

capacity allocation at HONI's stations. HONI manages and assigns that capacity on the basis of actual/historical consumption.

Table 32 Lauzon TS

Feeder ID	Primary Circuit Length (m)						Secondary Circuit Length (m)					Service Circuit Length (m)					# of Customers
	Overhead 1 Phase	Overhead 2 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	
56M1	9,846		15,134	2,003	3,456	30,439	25,676	4,045		79	29,801	51,348	3,674	17,304	4,613	76,939	2,760
56M2	8,869		10,070	1,628	751	21,318	19,414	3,424			22,838	39,935	3,669	12,765	2,610	58,979	1,965
56M3	20		11,734	15,617	7,689	35,061	6,179	2,679		91	8,949	2,676	981	56,580	10,679	70,917	1,450
56M5	14		9,185	20,094	6,595	35,889	3,562	2,657			6,219	1,122	3,353	76,040	5,681	86,195	1,765
56M6	489		5,844	7,524	2,069	15,927	3,254	913			4,167	2,914	3,330	28,501	1,360	36,105	731
56M7	5,652	14	10,027	17,779	3,863	37,335	12,827	135			12,962	20,559	586	71,461	7,563	100,168	2,803
56M8	1,043		14,549	98,202	10,742	124,536	11,827	3,437			15,264	14,073	1,678	406,756	2,701	425,208	7,713
Total	**25,933**	**14**	**76,543**	**162,848**	**35,165**	**300,504**	**82,739**	**17,290**	**0**	**170**	**100,199**	**132,626**	**17,270**	**669,407**	**35,207**	**854,511**	**19,187**

Table 33 Malden TS

Feeder ID	Primary Circuit Length (m)							Secondary Circuit Length (m)					Service Circuit Length (m)					# of Customers
	Overhead 1 Phase	Overhead 2 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 2 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	
24M1	9		5,509	1,266		1,993	8,776	1,142	1,377			2,519	198	299	3,753	979	5,229	117
24M2	176		8,664	685		1,891	11,417	844	670			1,514	1,406	118	5,701	1,059	8,283	154
24M3	11,396	2	9,776	13,431	476	4,350	39,431	19,586	306			19,892	28,422	357	51,332	8,924	89,035	2,362
24M4	9,692		8,886	9,390	502	1,873	30,343	14,369	122	467		14,957	25,129	142	48,902	224	74,397	2,017
24M5	9,025		7,176	4,839		3,317	24,358	16,993	429			17,422	24,326	98	28,137	402	52,962	1,699
24M6	14,944		18,405	4,022		4,736	42,107	31,997	4,464	401		36,861	45,555	3,238	18,129	11,953	78,876	2,889
Total	**45,242**	**2**	**58,416**	**33,634**	**979**	**18,161**	**156,432**	**84,931**	**7,367**	**868**	**0**	**93,166**	**125,036**	**4,251**	**155,953**	**23,542**	**308,782**	**9,238**

Table 34 Essex TS

Feeder ID	Primary Circuit Length (m)					Secondary Circuit Length (m)					Service Circuit Length (m)					# of Customers
	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	
15M5	11,410	6,685	382	1,134	19,612	14,418	1,008			15,426	39,941	398	549	2,088	42,975	2,125
15M6	9,622	11,108	933	2,828	24,492	15,926	4,389			20,315	50,749	1,835	3,923	1,285	57,792	2,849
15M7	3,533	7,433		1,735	12,701	6,362	1,694	89		8,145	23,194	3,545	153	702	27,594	1,246
15M8	4,018	20,836		3,632	28,486	15,144	11,279		65	26,488	52,072	9,771	1,162	4,589	67,593	2,714
15M10	108	1,651	10,356	777	12,891	1,703	293			1,996	2,378	157	42,584		45,120	866
15M11	8,876	13,897	22,898	2,439	48,111	18,063	5,424	106	243	23,835	36,530	4,412	110,323	14,802	166,067	3,874
Total	**37,567**	**61,610**	**34,570**	**12,546**	**146,293**	**71,617**	**24,087**	**194**	**308**	**96,207**	**204,865**	**20,117**	**158,694**	**23,466**	**407,142**	**13,674**

Table 35 Walker I

Feeder ID	Primary Circuit Length (m)					Secondary Circuit Length (m)					Service Circuit Length (m)						# of Customers
	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 2 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	
55M1	4,682	8,993			4,155	17,829	10,479	4,869		19	15,367	48,012	2,384	342	3,112	53,850	2,362
55M2	6,556	8,865			442	15,863	8,911	4,250			13,161	27,116	877	294	336	28,623	1,284
55M3	3,005	10,198	17,531		3,779	34,512	15,506	9,383	21	295	25,206	21,713	4,123	83,160	8,950	117,946	2,684
55M5	9,505	10,920	307	35	1,132	21,898	18,309	4,280	54		22,642	59,766	6,369	5,781	24,892	96,807	3,037
55M6	6,547	11,064	38		841	18,491	11,899	3,755	41	48	15,743	32,858	2,098	1,106	3,605	39,666	1,862
Total	**30,294**	**50,040**	**17,877**	**35**	**10,348**	**108,593**	**65,104**	**26,537**	**116**	**362**	**92,119**	**189,464**	**15,851**	**90,683**	**40,895**	**336,892**	**11,229**

Table 36 Walker 2

Feeder ID	Primary Circuit Length (m)					Secondary Circuit Length (m)					Service Circuit Length (m)					# of Customers
	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	
55M21	3,828	5,776	16,376	2,911	28,890	10,709	1,568			12,277	13,506	953	56,790	1,964	73,213	1,709
55M22	19,078	13,747	7,305	560	40,691	31,573	4,462			36,035	78,764	2,896	42,802	3,018	127,481	4,321
55M23	5,239	4,996	663	480	11,378	12,194	2,917			15,112	27,678	1,813	3,110	293	32,895	1,468
55M24	1,488	12,347	9,642	2,430	25,906	7,381	1,807		146	9,334	11,233	3,227	36,755	7,381	58,595	1,321
55M25	12,490	16,054	44,935	4,863	78,342	27,438	4,424			31,862	36,633	2,322	197,550	3,821	240,325	5,139
55M26	85	9,132		709	9,926	3,122	5,927		15	9,063	3,303	7,049	162	10,873	21,387	422
Total	**42,208**	**62,052**	**78,921**	**11,953**	**195,133**	**92,416**	**21,105**	**0**	**161**	**113,682**	**171,117**	**18,261**	**337,170**	**27,349**	**553,896**	**14,380**

Table 37 GM MTS

Feeder ID	Primary Circuit Length (m)					Secondary Circuit Length (m)					Service Circuit Length (m)					# of Customers
	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	
4M1	13,742	9,465	166	119	23,492	22,408	2,121			24,530	57,262	831	5,315	509	63,917	2,858
4M2	6,796	6,295		205	13,296	11,380	4,877		41	16,298	53,167	3,680	611	231	57,689	2,640
Total	**20,538**	**15,759**	**166**	**324**	**36,788**	**33,788**	**6,998**	**0**	**41**	**40,827**	**110,429**	**4,510**	**5,926**	**740**	**121,605**	**5,498**

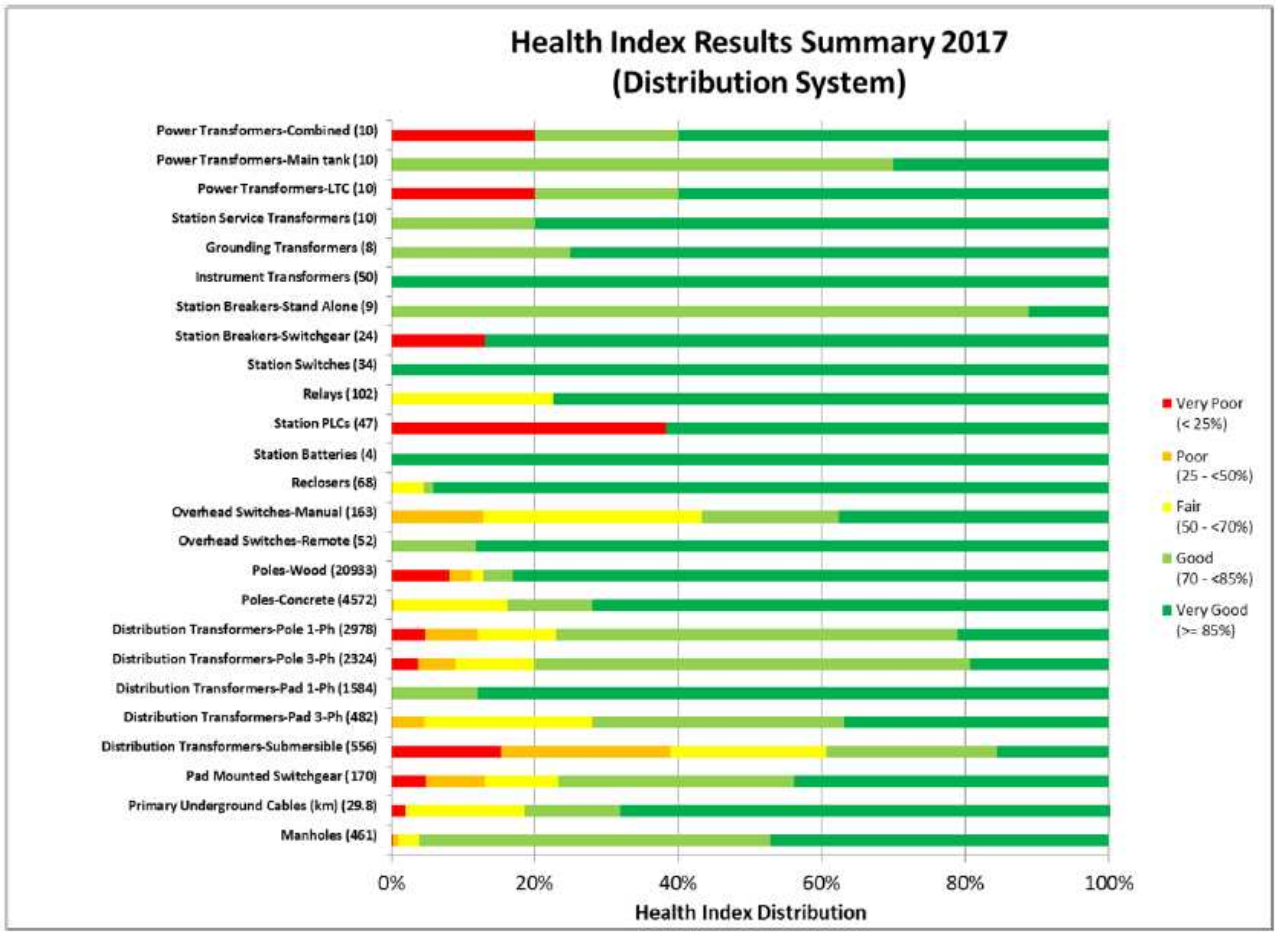
Table 38 Ford Powerhouse:

Feeder ID	Primary Circuit Length (m)					Secondary Circuit Length (m)					Service Circuit Length (m)					# of Customers
	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	Overhead 1 Phase	Overhead 3 Phase	Underground 1 Phase	Underground 3 Phase	Total	
5M1		408		74	482											
5M2		10		243	253											
Total	**0**	**418**	**0**	**317**	**735**											

5.3.2 (c) Asset Service Profile and Condition

Kinectrics was hired in 2017 to complete an ACA of ENWIN's distribution system. This report produced a quantifiable evaluation of asset condition, and assists in prioritizing and allocating sustainment investments. The complete report is attached hereto as *Appendix A– Kinectrics Asset Condition Assessment*. A summary of the health of ENWIN's assets can be seen in Figure 20, below.

Figure 20 Health of ENWIN's Assets



Of the 24 sub-categories, 21 were found to have over 70% of their asset units classified as being in “good” or “very good” condition. Moreover, 15 of the asset sub-categories were found to have an average health index score of greater than 80%.

The asset groups that were found to have over 95% of their asset units in “good” or “very good” condition included power transformers (main tank), grounding transformers, instrument transformers, station breakers (standalone), station switches, station batteries, reclosers, overhead switches (remote), distribution transformers (pad 1-ph) and manholes.

Station programmable logic controllers (“PLC”) and distribution transformers (submersible type), were the asset groups that were found to be of greatest concern. Almost 40% of the units in each of these two asset groups were classified as being in “poor” or “very poor” condition. Another asset group that is of some concern is power transformers, or more specifically, the power transformer’s LTCs, where about 20% of LTC units were classified as being in “poor” or “very poor” condition.

A summary of the health and age of all assets can be found below in Table 39.

Table 39 Summary of Health and Age of All Assets

Asset Category		Population	Sample Size	Average Health Index	Health Index Distribution					Average Age	Age Availability	Average DAI
					Very Poor (< 25%)	Poor (25 - <50%)	Fair (50 - <70%)	Good (70 - <85%)	Very Good (>= 85%)			
Power Transformers	Combined	10	10	71%	2	0	0	2	6	19	100%	98%
	Main tank	10	10	83%	0	0	0	7	3	19	100%	98%
	LTC	10	10	75%	2	0	0	2	6	19	100%	40%
Station Service Transformers		10	10	89%	0	0	0	2	8	19	100%	0%
Grounding Transformers		8	8	88%	0	0	0	2	6	20	100%	0%
Instrument Transformers		50	44	95%	0	0	0	0	44	20	88%	0%
Station Breakers	Stand Alone	9	9	73%	0	0	0	8	1	28	100%	89%
	Switchgear	24	23	83%	3	0	0	0	20	16	96%	58%
Station Switches		34	22	97%	0	0	0	0	22	19	65%	0%
Relays		102	102	92%	0	0	23	0	79	6	100%	0%
Station PLCs		47	47	70%	18	0	0	0	29	8	100%	0%
Station Batteries		4	4	100%	0	0	0	0	4	1	100%	0%
Reclosers		68	68	92%	0	0	3	1	64	9	100%	22%
Overhead Switches	Manual	163	125	73%	0	16	38	24	47	21	77%	0%
	Remote	52	34	97%	0	0	0	4	30	3	54%	27%
Poles	Wood	20933	20051	86%	1608	644	314	831	16654	24	96%	85%
	Concrete	4572	4351	87%	2	16	683	514	3136	23	95%	54%
Distribution Transformers	Pole 1-Ph	2978	2969	72%	141	215	328	1658	627	14	98%	97%
	Pole 3-Ph	2324	2316	73%	86	122	251	1409	448	15	98%	97%
	Pad 1-Ph	1584	1342	97%	0	1	1	159	1181	17	85%	63%
	Pad 3-Ph	482	482	78%	0	22	113	169	178	19	99%	43%
	Submersible	556	556	58%	85	131	121	132	87	24	98%	28%
Pad Mounted Switchgear		170	146	76%	7	12	15	48	64	17	81%	70%
Primary Underground Cables (km)		29.8	29.8	87%	0.6	0.0	4.9	4.0	20.3	14	100%	0%
Manholes		461	386	88%	1	3	11	189	182	49	37%	35%

Table 40, below, summarizes ENWIN’s distribution assets as of October 21, 2018.

Table 40 ENWIN’s Distribution Assets

Asset Type	Asset Subtype	Quantity
Poles	TOTAL	20,229
	Wood Poles	15,582
	Concrete Poles	4,609

	Composite Poles	23
	Steel Poles	15
Transformers	TOTAL	6,720
	Station Transformers	4
	Pole Mounted Transformer	5,577
	Pad Mounted Transformers	494
	Mini-pad Transformers	1,639
	Submersible Transformers	555
	Dry Type Transformers	13
Overhead Switches	TOTAL	940
	Load Break Switches	138
	In-Line Switches	488 (3-phase counts as 3 switches)
	OH Disconnect Switches	211 (cluster mounted dip poles)
	OH SCADA Switches	103
Underground Switches	TOTAL	183
	Live Front Switching Units	110
	Dead Front Switching Units	36
	Auto Transfer Switches	35
	Oil Switches	2
Dynamic Protective Devices	TOTAL	126
	Reclosers	113
	Circuit Breakers	13
Conductor	TOTAL	4,880 km
	OH Primary Conductor	676 km
	UG Primary Conductor	454 km
	OH Secondary Conductor	2,053 km
	UG Secondary Conductor	1,697 km
Meters	TOTAL	89,908
	Smart Meters	88,897
	Other/Primary Meters	1,011
Manholes	TOTAL	461

Power Transformers

ENWIN owns ten power transformers, each with one main tank and one LTC. The average age of the power transformers is 19 years, and the average health index is 71%. Two LTCs are flagged for action as they are in very poor condition, and maintenance was scheduled and performed in 2018 to put them into good condition. Figures 21 and 22 show the health index of power transformers.

Figure 21 Power Transformers – Main Tank Health Index Distribution

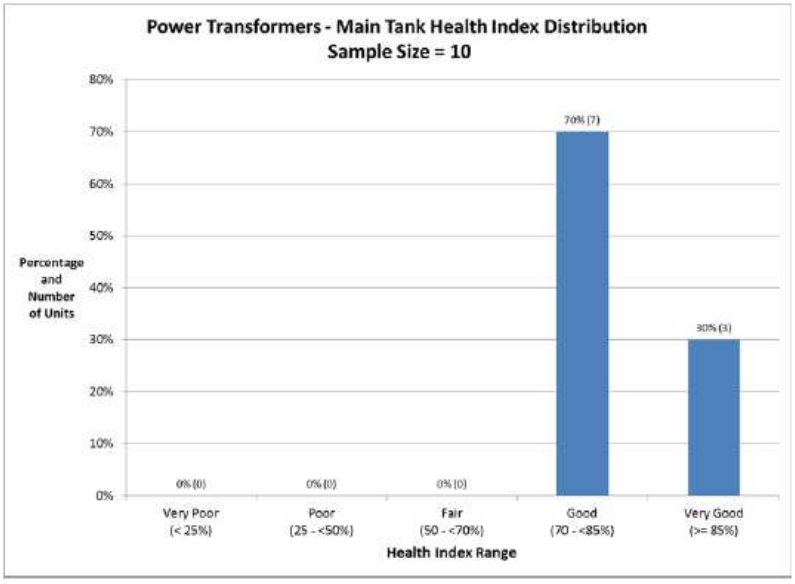
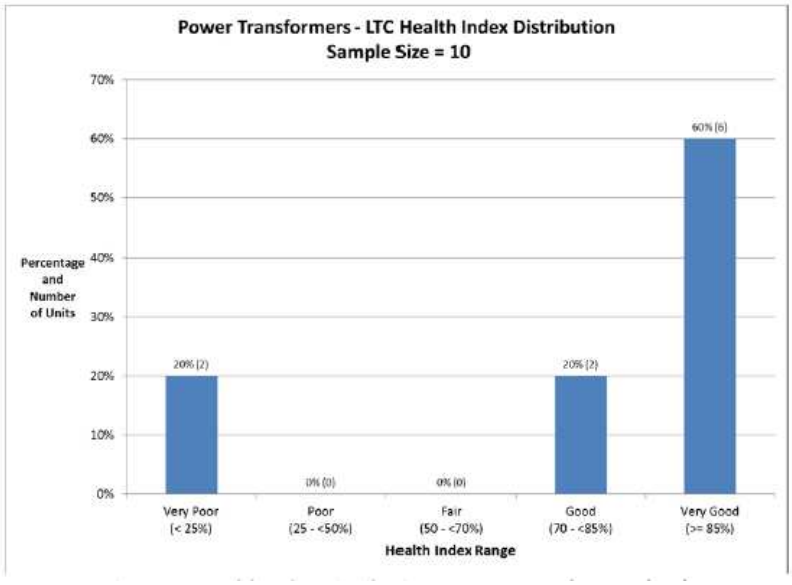


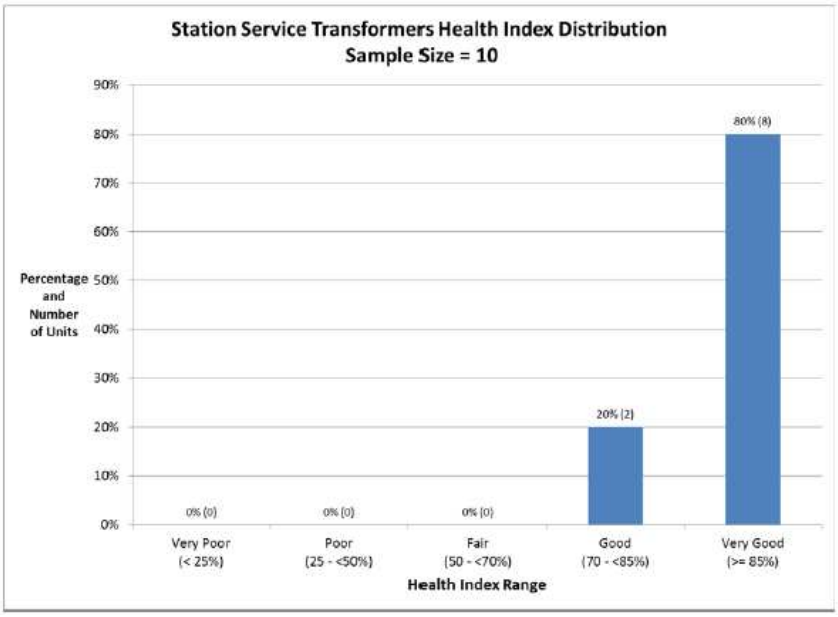
Figure 22 Power Transformers – LTC Health Index Distribution



Station Service Transformers

ENWIN owns ten station service transformers with age information available for all transformers. Using the cumulative likelihood of survival at a given age, it was determined that eight station service transformers are in very good condition, while two are in good condition. Figure 23 below shows the health index of station service transformers.

Figure 23 Station Service Transformers Health Index Distribution



Circuit Breakers

ENWIN owns nine stand-alone circuit breakers and 24 switchgear circuit breakers. The average health index is 73% and 83% for stand-alone and switchgear circuit breakers, respectively. All assets are in very good or good condition with the exception of three switchgear circuit breakers, which have a condition of very poor. These circuit breakers are scheduled for factory maintenance in Q4 2018 to bring them up to good condition. Figures 24 and 25 below shows the health index of circuit breakers.

Figure 24 Circuit Breakers – Stand Alone Health Index Distribution

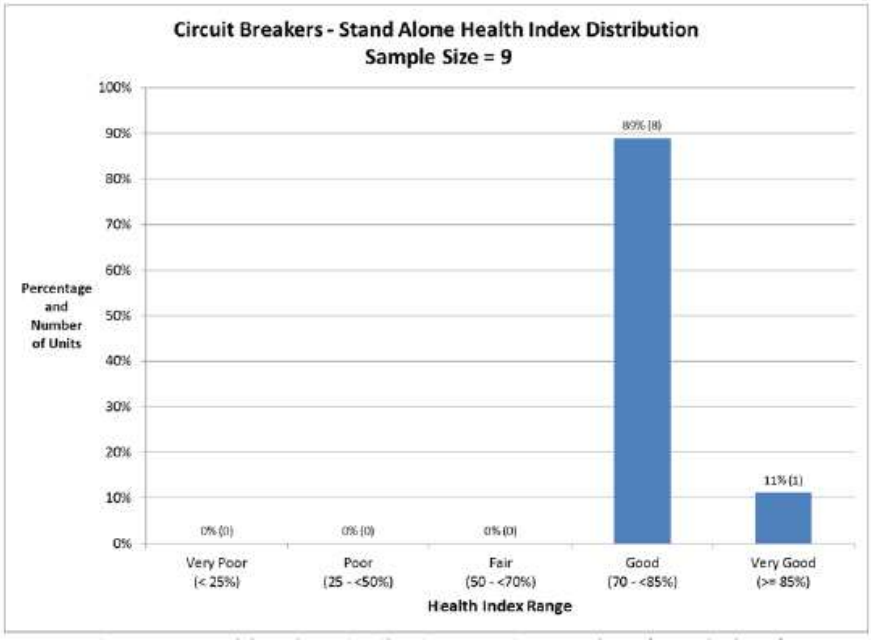
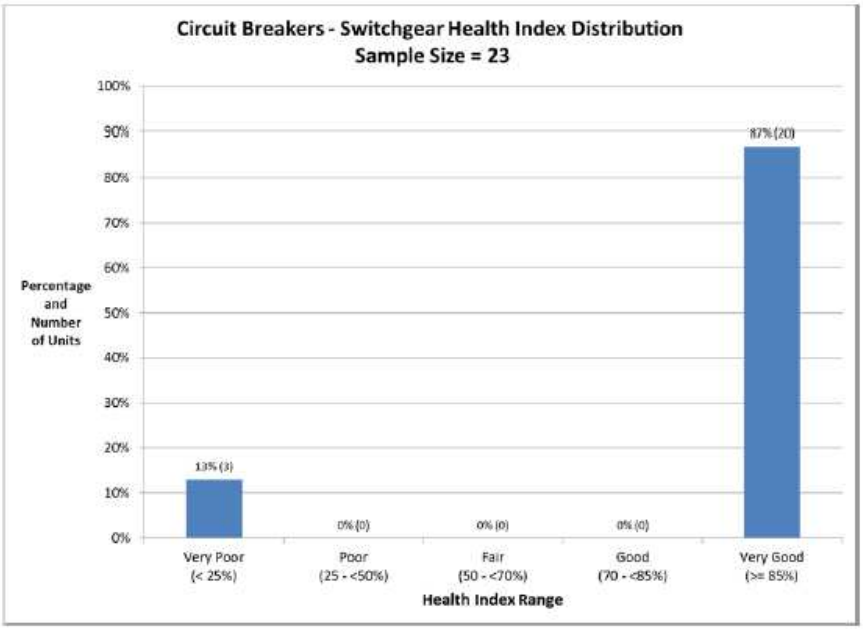


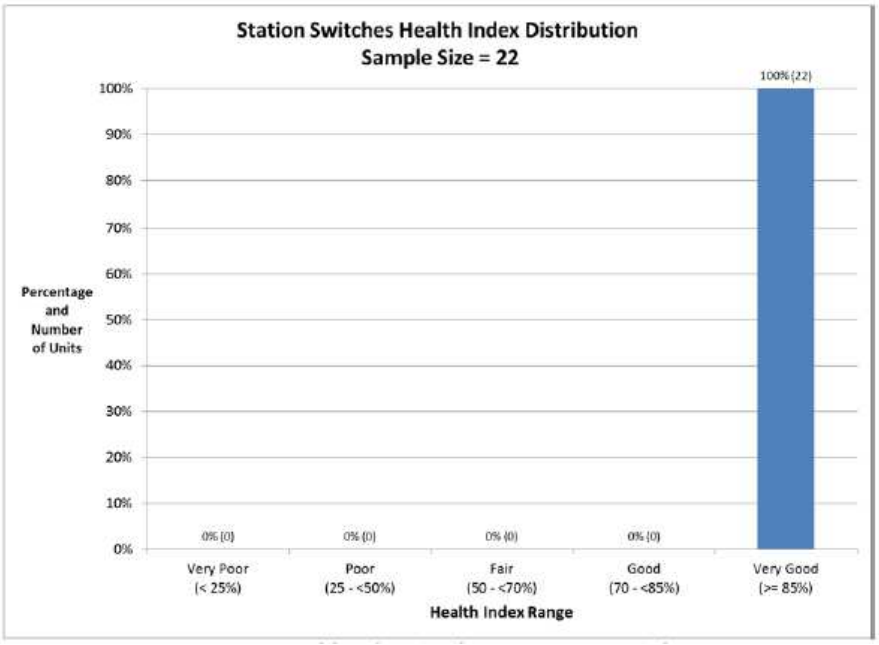
Figure 25 Circuit Breakers – Switchgear Health Index Distribution



Station Switches

ENWIN owns 22 station switches, for which asset age data is available. Based on the cumulative likelihood of survival at a certain age, all station switches were deemed to be in very good condition. Figure 26 shows the health index of station switches.

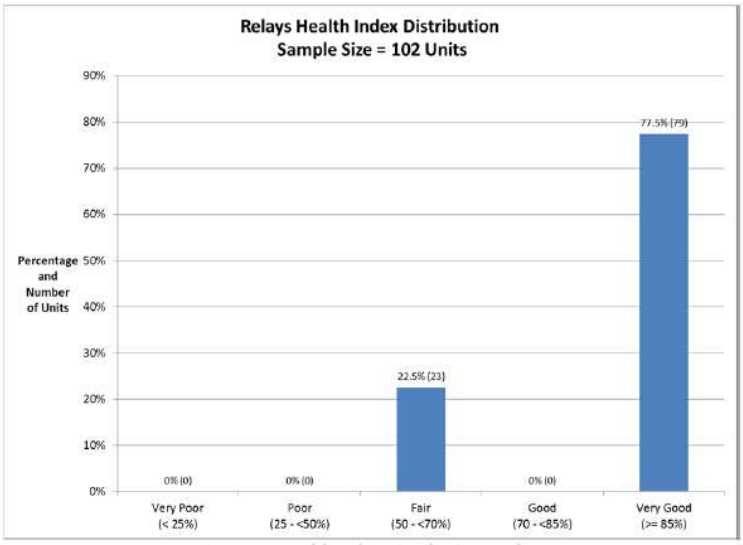
Figure 26 Station Switches Health Index Distribution



Relays

ENWIN owns 102 relays, all of which have asset age information available. Based on the cumulative likelihood of survival at a certain age, 79 relays are in very good condition and 23 relays are in fair condition. Figure 27 shows the health index of relays.

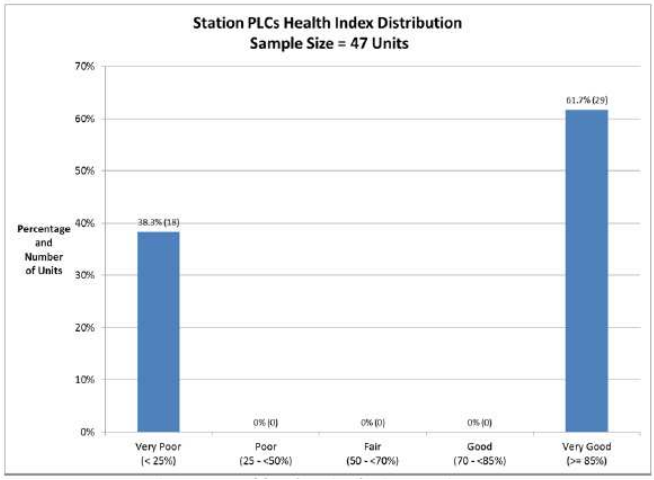
Figure 27 Relays Health Index Distribution



Station PLCs

ENWIN owns 47 station PLCs; asset age information is available for each unit. Based on the cumulative likelihood of survival at a certain age, 29 station PLCs were found to have very good condition and 18 were found to have very poor condition. The PLCs in poor condition were replaced at the Ford Powerhouse MTS in 2017, and at the GM MTS in 2018. Figure 28 below shows the health index of station PLCs.

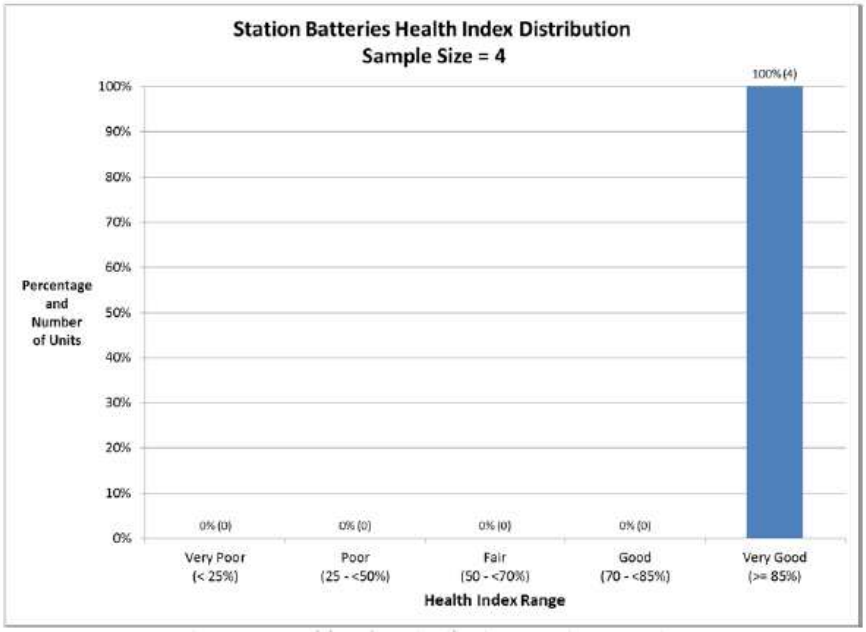
Figure 28 Station PLCs Health Index Distribution



Station Batteries

ENWIN owns four station batteries. Asset age information is available for all four units. Based on the cumulative likelihood of survival at a certain age, all station batteries were found to have very good condition. Figure 29 below shows the health index of station batteries.

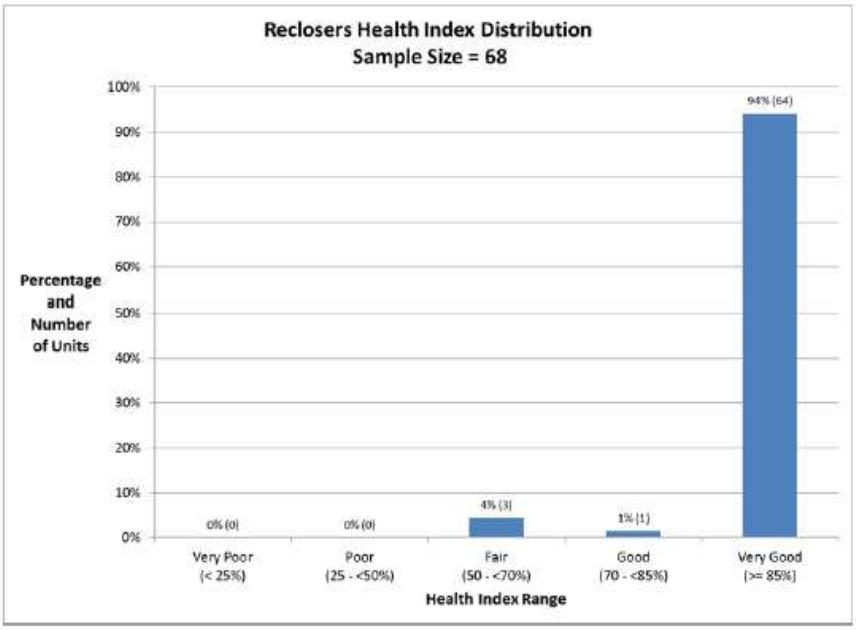
Figure 29 Station Batteries Health Index Distribution



Reclosers

ENWIN owns 68 reclosers and all assets have sufficient data for health indexing. The average health for reclosers is 92%, with 64 reclosers classified as being in very good health, one recloser with good health, and three reclosers with fair health. Figure 30 below shows the health index of reclosers.

Figure 30 Reclosers Health Index Distribution



Overhead Switches

ENWIN owns 163 manual overhead switches; 125 units have sufficient data for health indexing. ENWIN also owns 52 remote overhead switches, for which 34 units have sufficient data available for health indexing. The average health of manual and remote overhead switches is 73% and 97%, respectively. There are 16 manual overhead switches that are in poor condition, and the rest are in fair to very good condition. All remote overhead switches are in good or very good condition. Figures 31 and 32 below shows the health index of overhead switches.

Figure 31 Overhead Switches – Manual Health Index Distribution

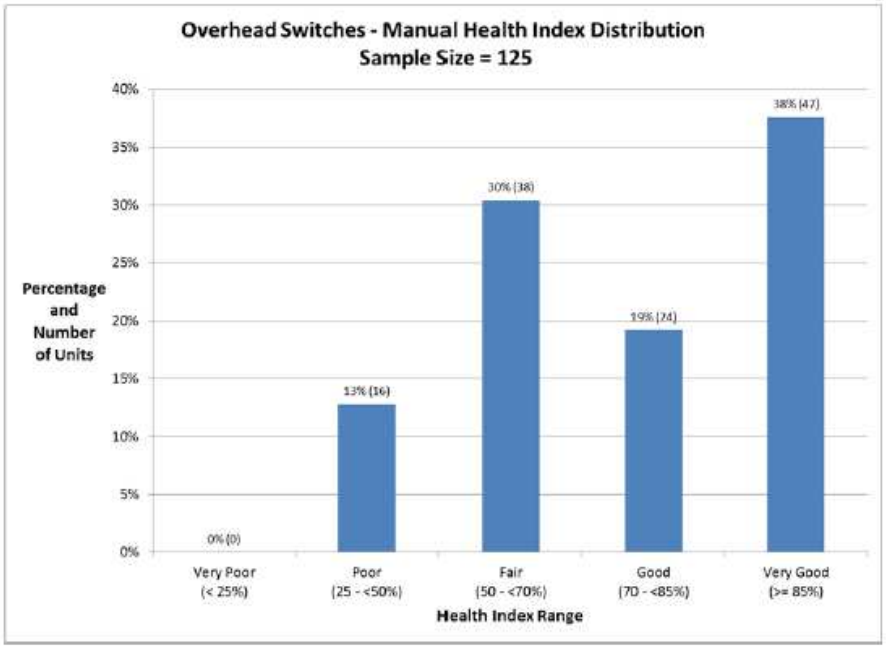
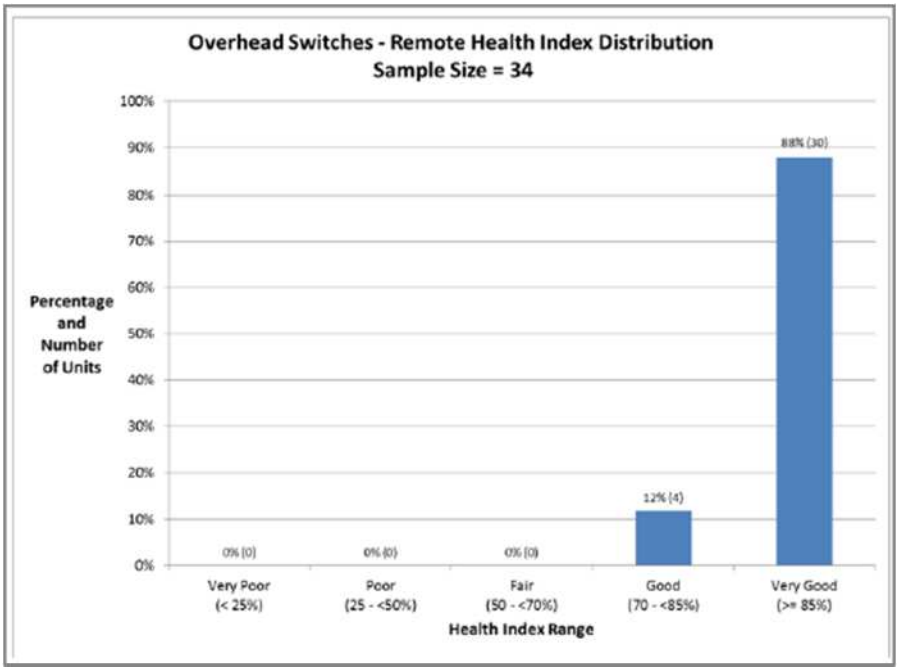


Figure 32 Overhead Switches – Remote Health Index Distribution



Poles

ENWIN owns:

1. 20,051 wood poles, all of which have sufficient data for health indexing; and
2. 4,572 concrete poles, 4,351 of which have sufficient data for health indexing.

The average health of wood and concrete poles is 86% and 87%, respectively.

1,608 wood poles are in very poor condition, and 644 poles are in poor condition. The remaining wood poles are found to be in fair to very good condition. Two concrete poles are in very poor condition and 16 are in poor condition. The remaining concrete poles are in fair to very good condition. Figures 33 and 34 below shows the health index of poles.

Figure 33 Wood Poles Health Index Distribution

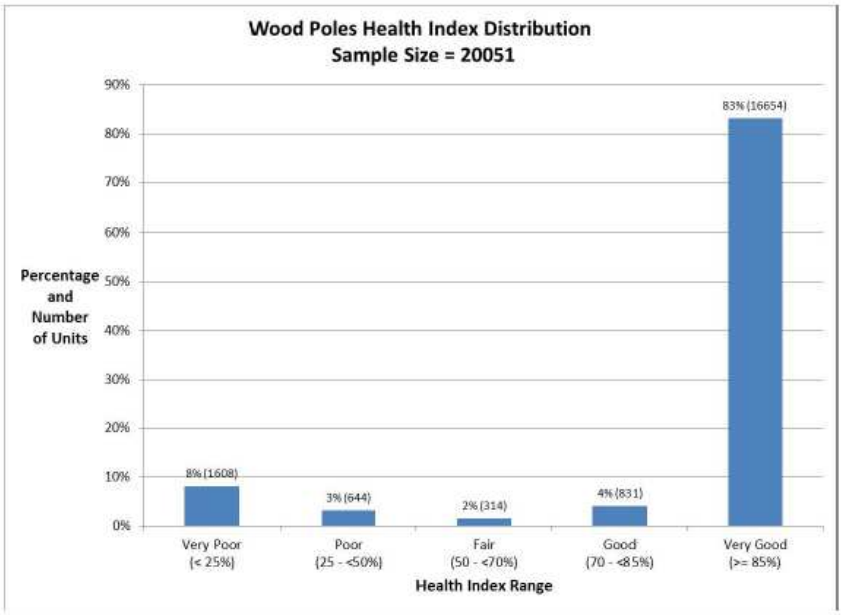
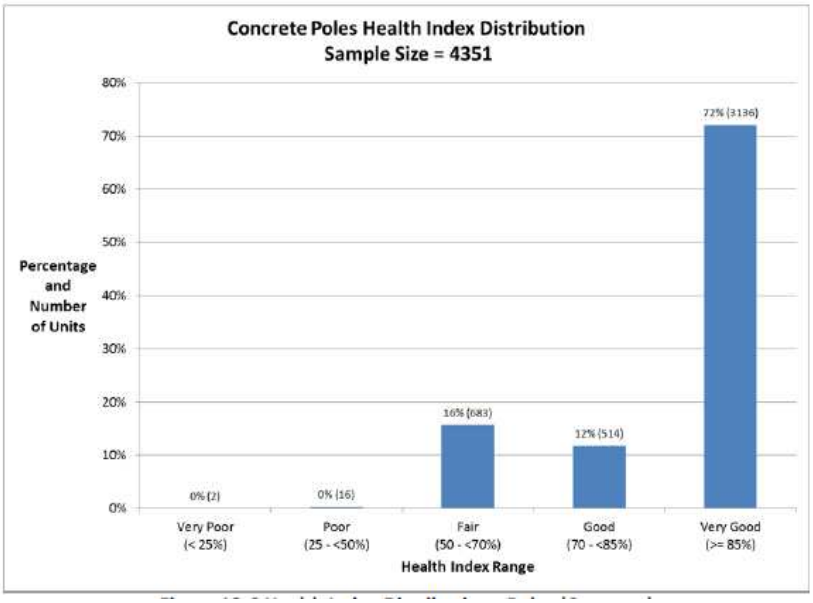


Figure 34 Concrete Poles Health Index Distribution



Distribution Transformers

ENWIN's system contains a total of:

1. 2978 units of pole top single-phase distribution transformers. Among them, 2969 units have sufficient data for a health indexing.
2. 2324 units of pole top three-phase distribution transformers. Among them, 2316 units have sufficient data for a health indexing.
3. 1584 units of pad mounted single-phase distribution transformers. Among them, 1342 units have sufficient data for a health indexing.
4. 482 units of pad mounted three-phase distribution transformers. All have sufficient data for a health indexing.
5. 556 units of submersible distribution transformers. All have sufficient data for a health indexing.

The average health index score for this asset group was 70%, 70%, 97%, 78% and 58%, for pole top single-phase, pole top three-phase, pad mounted single-phase, pad mounted three-phase, and submersible distribution transformers, respectively. Figures 35 to 39 below shows the health index of distribution transformers.

Figure 35 Distribution Transformers – Pole Top 1-Ph Health Index Distribution

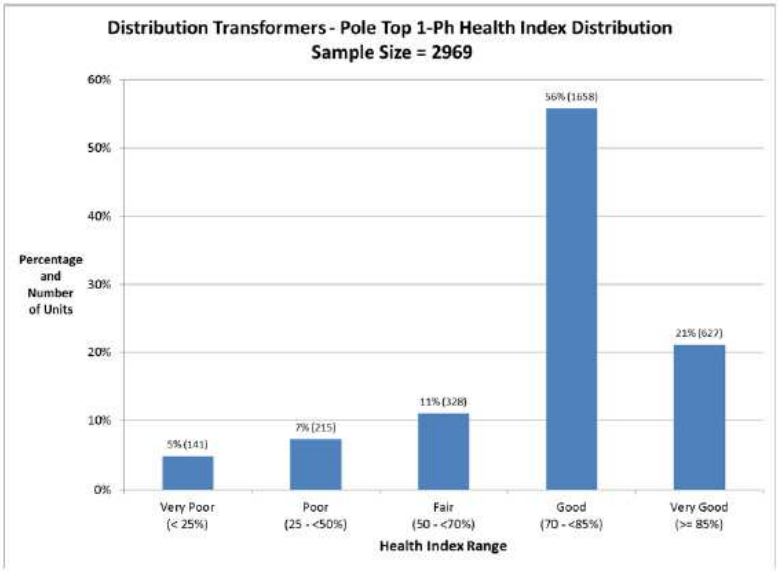


Figure 36 Distribution Transformers – Pole Top 3-Ph Health Index Distribution

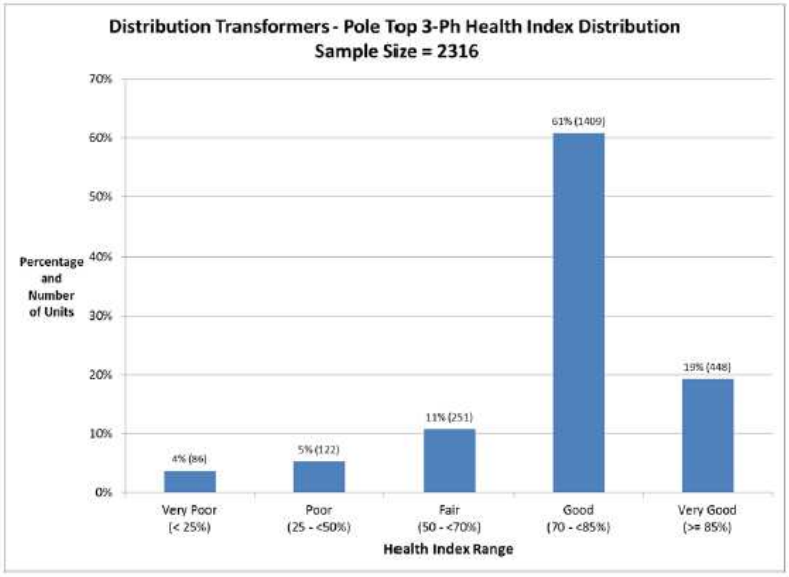


Figure 37 Distribution Transformers – Pad Mounted 1-Ph Health Index Distribution

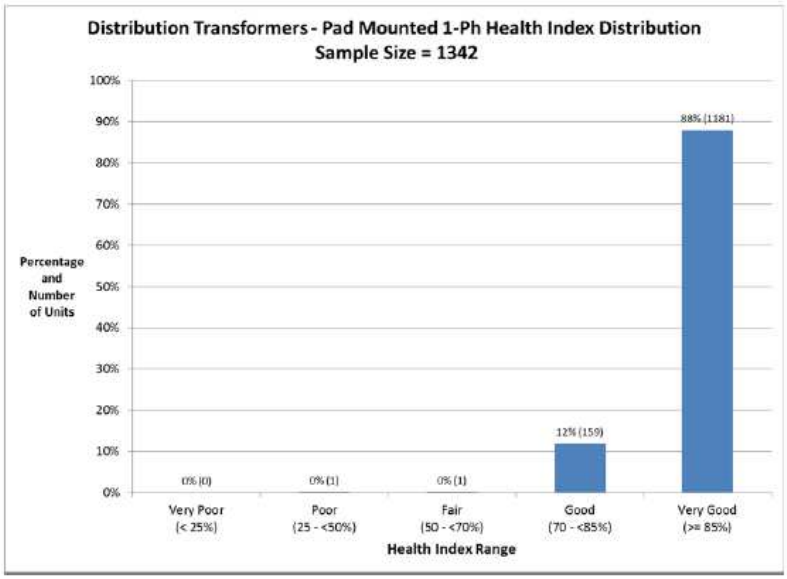


Figure 38 Distribution Transformers – Pad Mounted 3-Ph Health Index Distribution

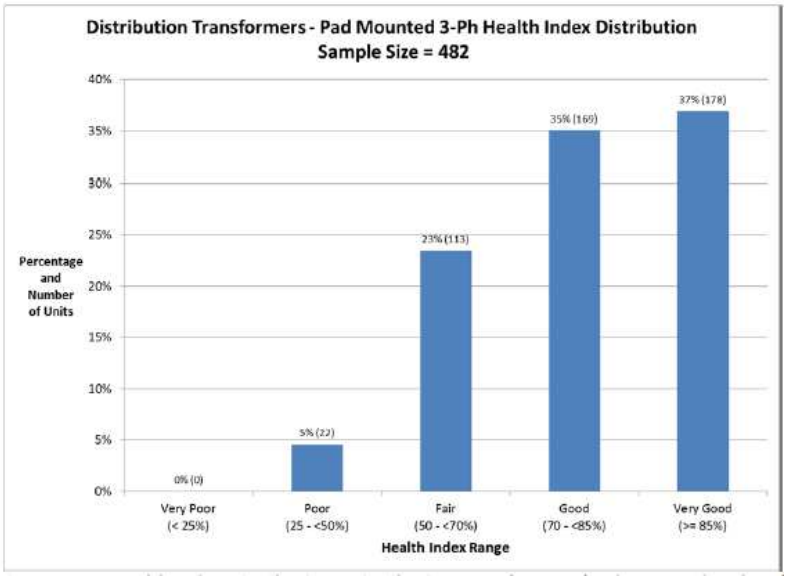
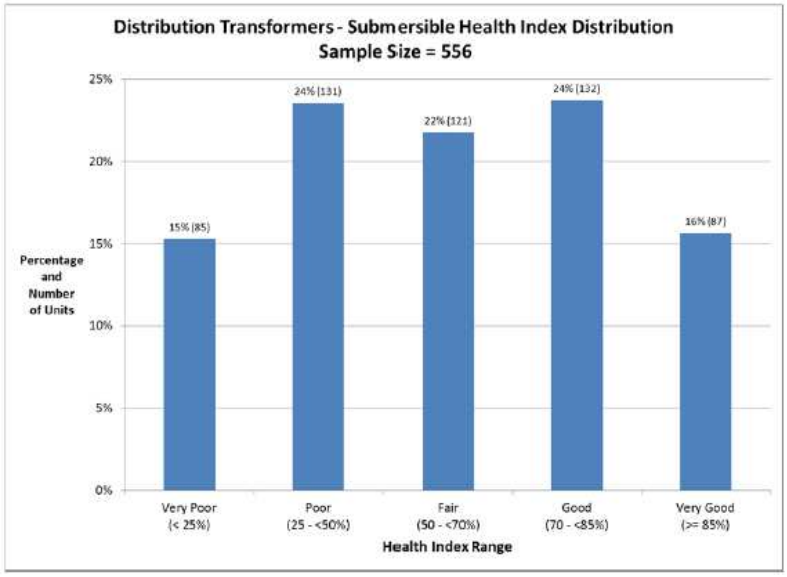


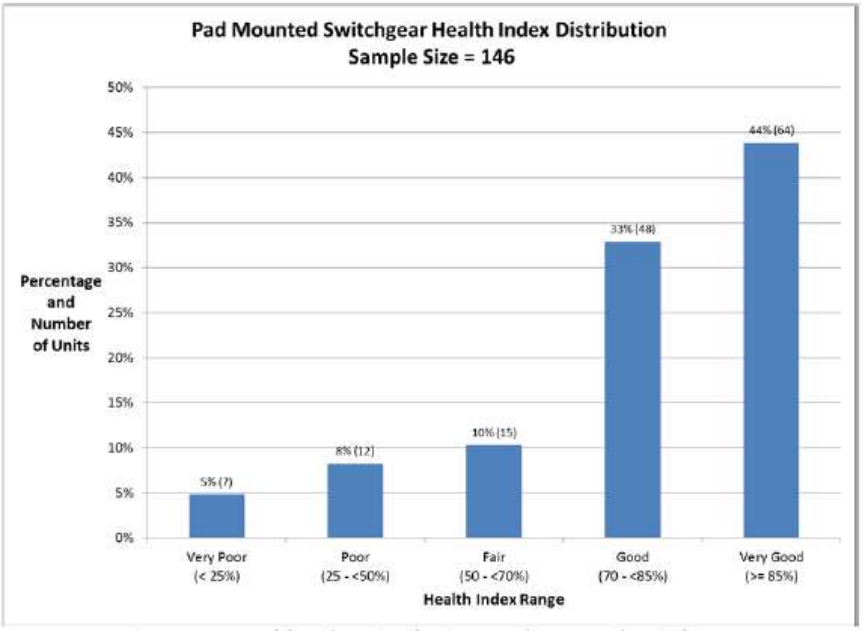
Figure 39 Distribution Transformers – Submersible Health Index Distribution



Pad Mounted Switchgear

ENWIN's system contains a total of 170 units of pad mounted switchgear. Among them, 146 units have sufficient data for a health indexing. The average health index score for this asset group is 76%. Figure 40 below shows the health index of pad mounted switchgear.

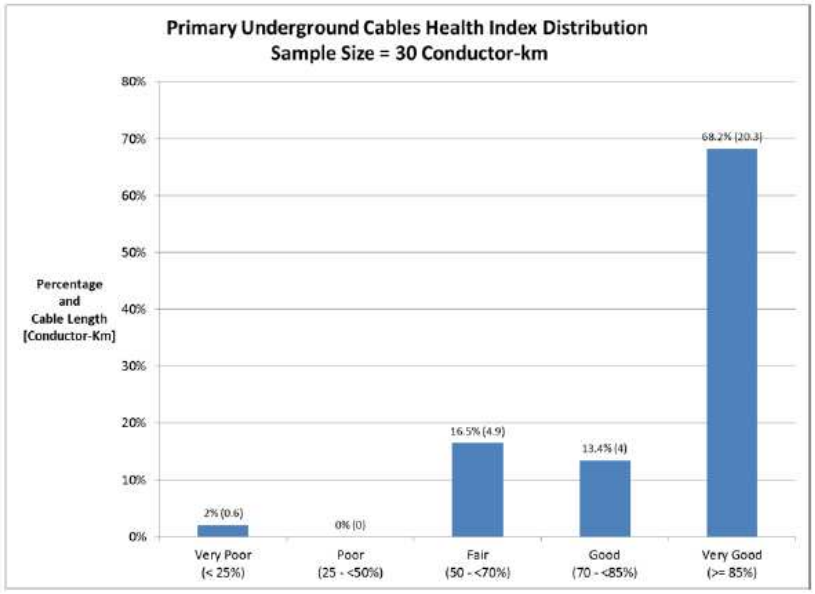
Figure 40 Pad Mounted Switchgear Health Index Distribution



Primary Underground Cable

ENWIN's system contains 454 km of primary underground cables. All had age data available. Based on the cumulative likelihood of survival at a certain age, the average Health Index for this asset group is 87%. Figure 41 below shows the health index of primary underground cables.

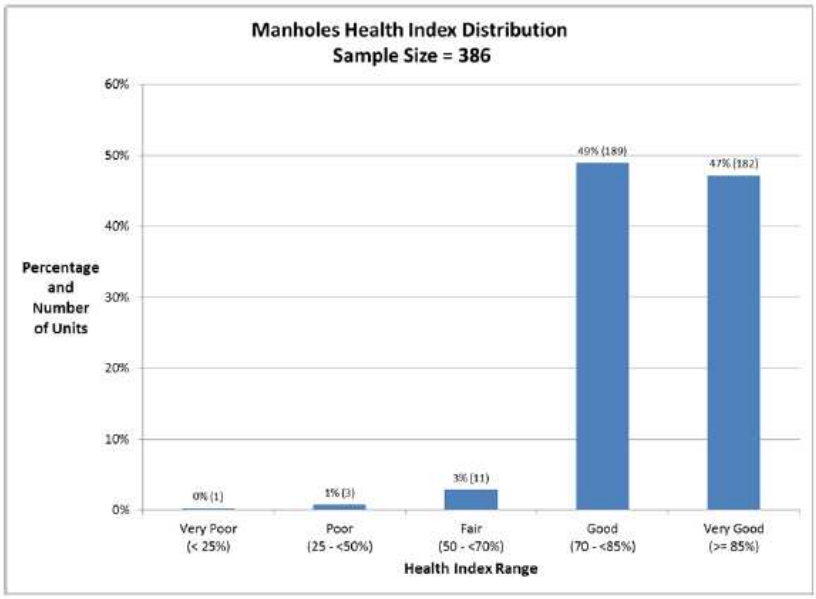
Figure 41 Primary Underground Cable Health Index Distribution



Manholes

ENWIN owns 461 manholes, 386 of which have sufficient data for health indexing. The average health index for these assets is 88% with one manhole in very poor condition, three in poor condition and 11 in fair condition. The remaining manholes are all in good or very good condition. Figure 42 below shows the health index of manholes.

Figure 42 Manholes Health Index Distribution



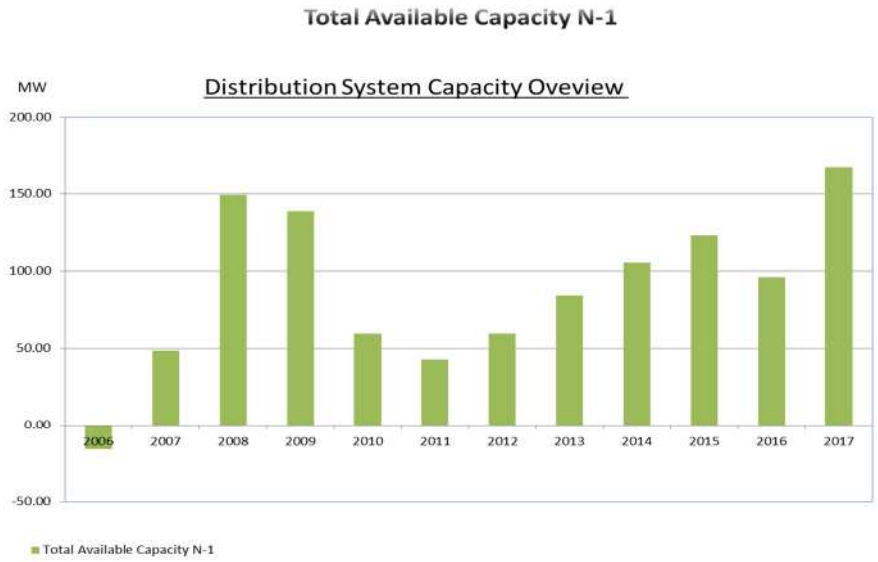
5.3.2 (d) System Utilization

ENWIN's distribution area is served by eight DESN TSs. The maximum distribution capacity of a TS is the limited time rating ("LTR") of the station transformers. Generally, the ten day LTR limit of the station transformers is taken as the station peak loading limit; therefore, ENWIN's total distribution system capacity is limited to the total LTR capacity limit of those eight DESN stations.

Power system asset utilization is based on the system's supply configuration, and its ability to respond to contingencies, as per the planning criteria. Possible contingency situations vary depending on the supply infrastructure (e.g. contingencies could arise in the 115/230 kV transmission supply, the 115/230/27.6 kV TS, the 27.6 kV distribution feeders, or there could be coincident contingencies). From an asset utilization perspective, the most important factor is the contingency that the system is designed to manage without customer outages. In ENWIN's case, that contingency is the loss of the most critical DESN station.

Based on the transmission and distribution infrastructure in the Windsor-Essex area, ENWIN can expect a total station failure, due to 230 kV or 115 kV supply interruptions. Total station failures are not common; however, ENWIN experienced two complete station interruptions within one calendar year (Lauzon TS in 2017), and the simultaneous loss of two stations twice in 2018 (Keith TS and Malden TS). Figure 43 below is ENWIN's Distribution System Capacity Overview.

Figure 43 Distribution System Capacity Overview



ENWIN's total distribution capacity[1] is planned assuming that a contingency has removed supply to one total station. As shown in the system capacity overview, in 2006, ENWIN's system

[1] Transformer capacity LTR levels based on 2009 HONI data.

was not able to function if one station totally failed. The 2008 recession and the government's *Green Energy Act* reduced ENWIN's coincident peak load. Further, HONI's Essex TS upgrade added 50 MVA capacity in 2007/2008, and ENWIN's conversion of the GM TS to a distribution station added another 42 MVA capacity to the distribution system. Today, there is sufficient transformation capacity supplying ENWIN's distribution systems such that it has the capability to withstand the loss of a full station contingency.

ENWIN's distribution system is supplied by two transmission voltages: 230 kV and 115kV. Three TSs are supplied from the 230 kV transmission system, and five TSs are supplied from the 115 kV transmission system.

Figure 44 Total Coincident Peak Load

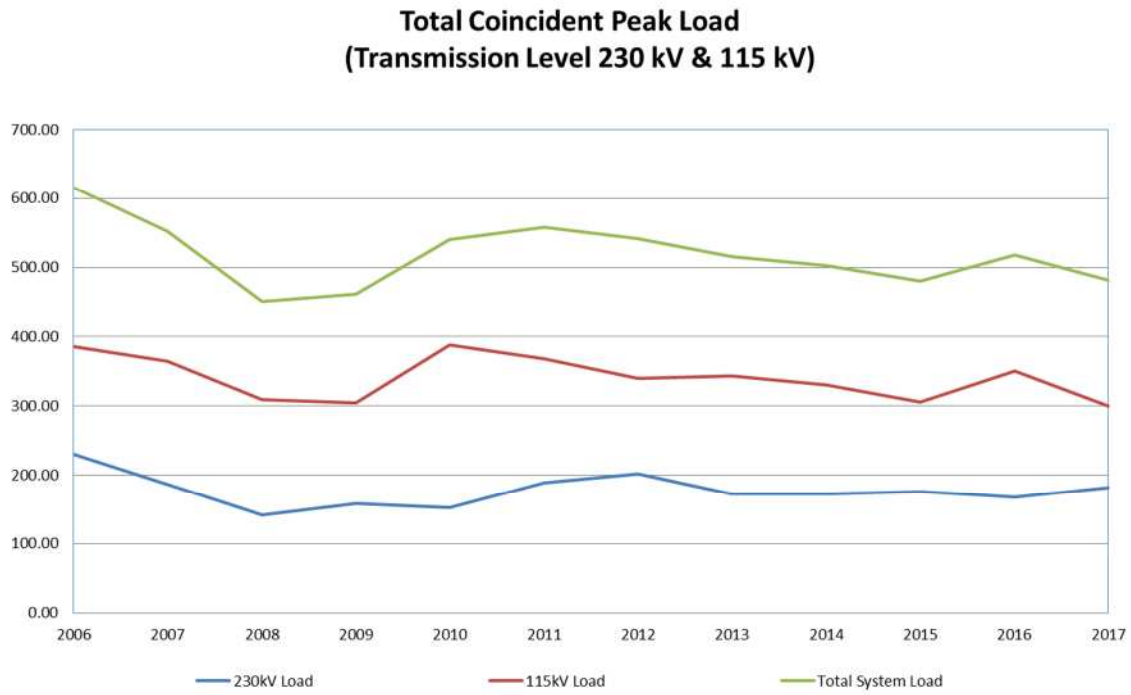


Figure 44 above displays the total coincident peak load.

The 115 kV transmission system in Windsor lies between two 230 kV TSs and is fed through auto-transformers located at the Keith TS and Lauzon TS. Transmission operators will, from time to time, request to transfer load from the 115 kV system to the 230 kV system through the ENWIN distribution system in order to manage 115 kV system capacity. These requests are frequent—there were three such requests in 2018 (January 28th, July 16th and August 17th), and in 2017, there were four requests (January 23rd, February 8th, September 22nd and September 29th). ENWIN uses its inter-tie capability to transfer load between stations.

Another important aspect of system utilization is feeder capacity management. ENWIN's primary feeders are all rated at 600 A, but some may have different contingency capacities. Similar to most Ontario LDCs, ENWIN's distribution system was originally designed following a one-to-one back up feeder planning concept, where alternative capacity would be required when average feeder load exceeds a 300 A limit. One-to-one back up capacity means one feeder always has capacity to accept the full load of a companion feeder. Under this scheme, half of the feeder capacity is held in reserve for use as contingency capacity for an adjacent feeder.

ENWIN does not follow the one-to-one companion feeder concept for reliability. Instead, ENWIN feeders are generally sectionalized to 1/3 of the feeder capacity, and the feeder average load is limited to 450 A. As such, each feeder is required to reserve 150 A of capacity (instead of 300 A) for an adjacent feeder. This changes the feeder design capacity from 300 A to 450 A, and increases the feeder assets utilization level by 50%. This reduces the need to build feeders as feeder loads increase. It also increases the minimum loads that feeders can carry, and, thus, enables the connection of larger amounts of REG without having to provide transfer trip capabilities. This reduces costs for generators.

From a planning standpoint, DESN TS capacity is limited to its LTR level, and feeder capacity is limited to 450 A. If any asset reaches its planning capacity limit, this means that the asset is 100% utilized.

Table 41 Asset Utilization Level

Asset Utilization Level	Classification
< 50%	Low
51-80%	Medium
81-100%	High
100%>	Asset Investment

ENWIN assesses feeder utilization in relation to the supplying TS capacity. Table 41 above provides the classification of asset utilization level. Some stations have more feeders with the same transformer capacity. For example, Essex TS and Lauzon TS have the same capacity station transformers, but Lauzon TS has eight feeders and Essex has only six feeders.

Keith TS Distribution Area

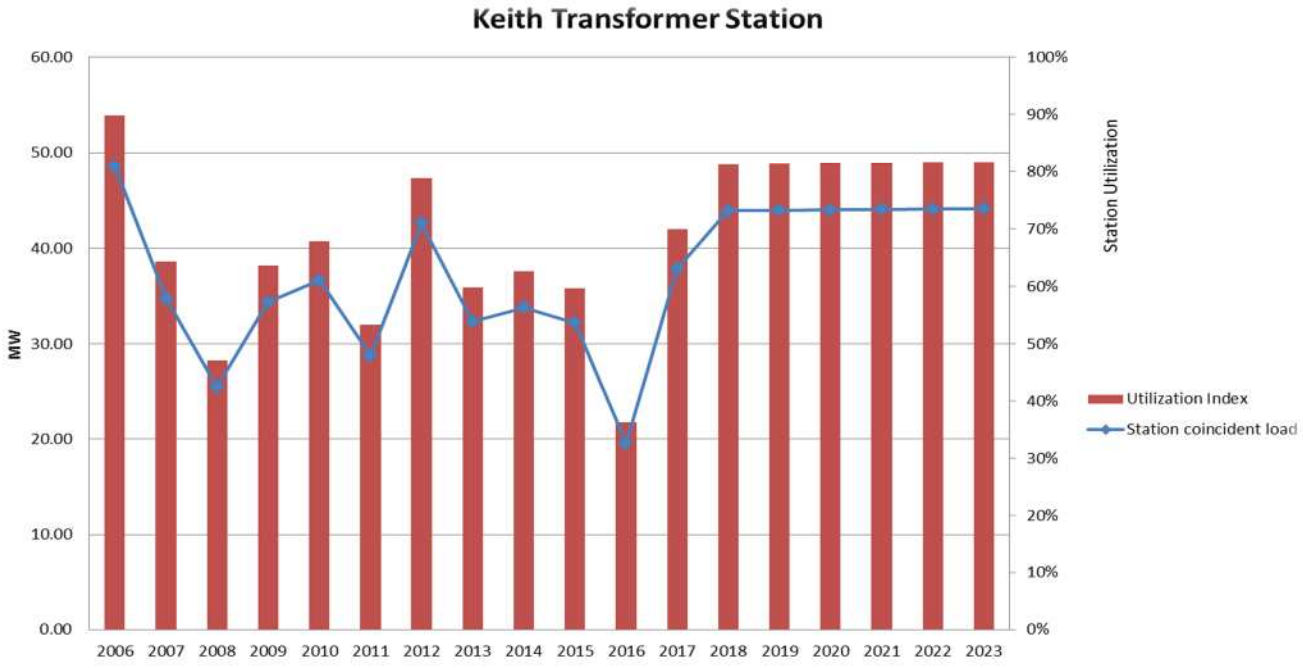
Keith TS is located in the west end of the city. This is a standard DESN station with two (T22, T23) 50/67/83.3 MVA, 230 kV/28 kV transformers. The 10-Day LTR limit of this station is 108 MVA at 35^{o}C. Keith TS is a shared TS between HONI and ENWIN, where ENWIN owns three feeders and HONI owns three feeders. Besides the standard three feeders, one more dedicated three-wire feeder (23M21) feeds an automotive customer in the Keith Area. This dedicated feeder feeds from the Keith TS 23T1- 25/33/42 MVA, 115 kV/28.4 kV transformer. This 23T1 transformer feeds from Keith TS 115 kV yard and no redundancy is designed for this feeder. As a result of this design, the 23M21 feeder adds additional burden to the normal Keith

distribution circuits. The 23M6 feeder is always loaded to keep additional capacity in order to provide backup support to the 23M21 feeder. Table 42 is an overview of the details of Keith TS. Figure 45 below is a graph showing Keith TS's station utilization and Table 43 is the corresponding numbers to Figure 45.

Table 42 Overview of Keith TS

Feeders	23M1, 23M2, 23M6, 23M21
Customers	4,832
Primary feeder (m)	63,389
Secondary feeder(m)	54,763
Service wires(m)	117,790
Total Service Area Sq.km	9.3

Figure 45 Keith TS – Station Utilization



Note : Half of this station feeders are Enwin feeders, therefore for planning and reporting purposes EnWin assumes 50% of station capacity is allocated for EnWin distribution.

Table 43 Keith TS – Station Utilization

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Keith	48.49	34.76	25.47	34.33	36.64	28.76	42.58	32.30	33.78	32.20	19.55	37.80	43.90	43.94	43.99	44.03	44.07	44.12	44.16
Keith Utilization	90%	64%	47%	64%	68%	53%	79%	60%	63%	60%	36%	70%	81%	81%	81%	82%	82%	82%	82%

Keith TS (50/67/83.3 MVA) has interconnections to Walker I TS, Essex TS and Malden TS. Keith TS is shared between HONI and ENWIN. HONI allocates station capacity based on the moving

average of total feeder loads of each utility. This means ENWIN's allocation is dependent on the HONI load on other feeders and it is not a constant value. In this report, ENWIN assumes that allocated feeder capacity is based on the number of feeders. The Keith TS capacity utilization level is usually either medium or high and it has not yet reached the critical level.

During the 2017 peak, Keith TS was loaded by ENWIN's feeders to 37.8 MW—the 23M1, 23M2 and 23M6 feeder loads were 11.8, 9.9 and 16.1 MW, respectively (259 A, 219 A and 354 A).

The 23M2 feeder falls into the low utilization category as its utilization level at peak day is lower than 50% of its maximum capacity. The other two feeders, 23M1 and 23M6, were at a medium utilization level during the 2017 peak. Figure 46 shows Keith TS's feeder load and Table 44 is the corresponding table.

Figure 46 Keith TS Feeder Load

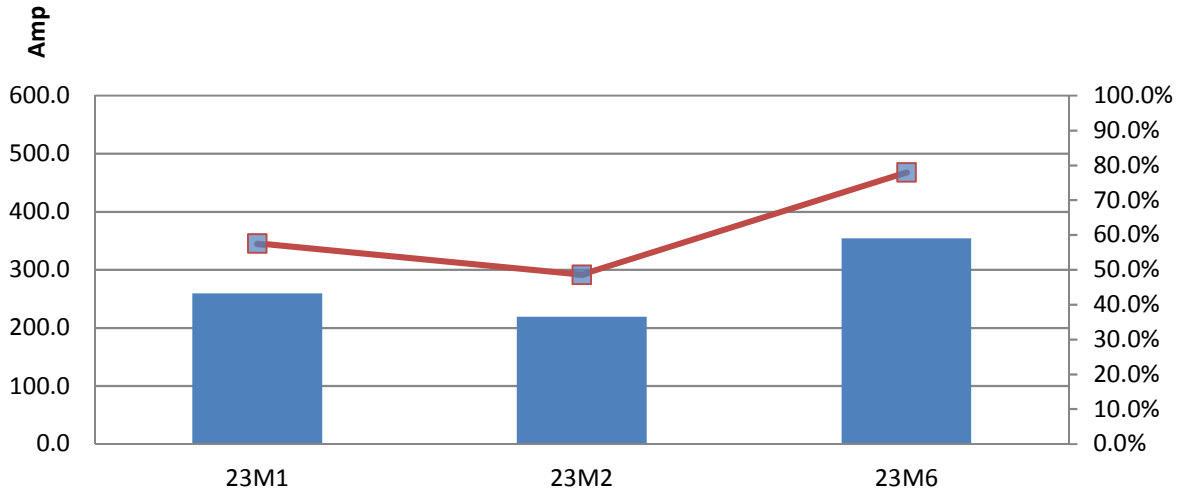
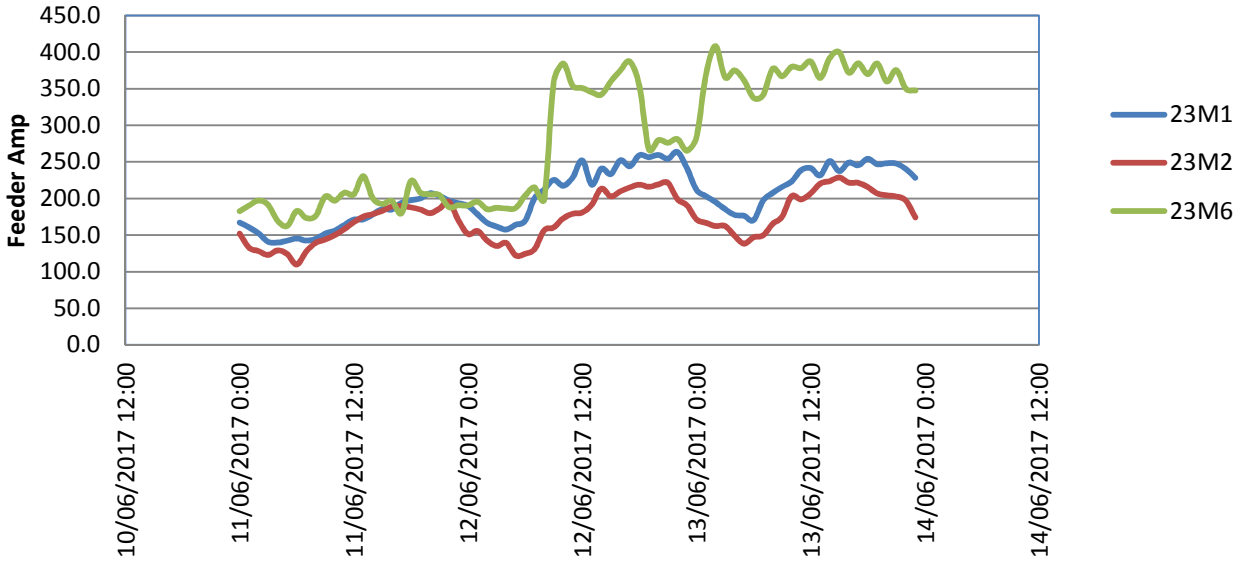


Table 44 Keith TS Feeder Load

Keith TS	**23M1**	**23M2**	**23M6**
Feeder Load (Peak time in 2017) A	259.2	218.9	354.0
Utilization %	57.6%	48.6%	78.0%
Utilization Level	Medium	Low	Medium

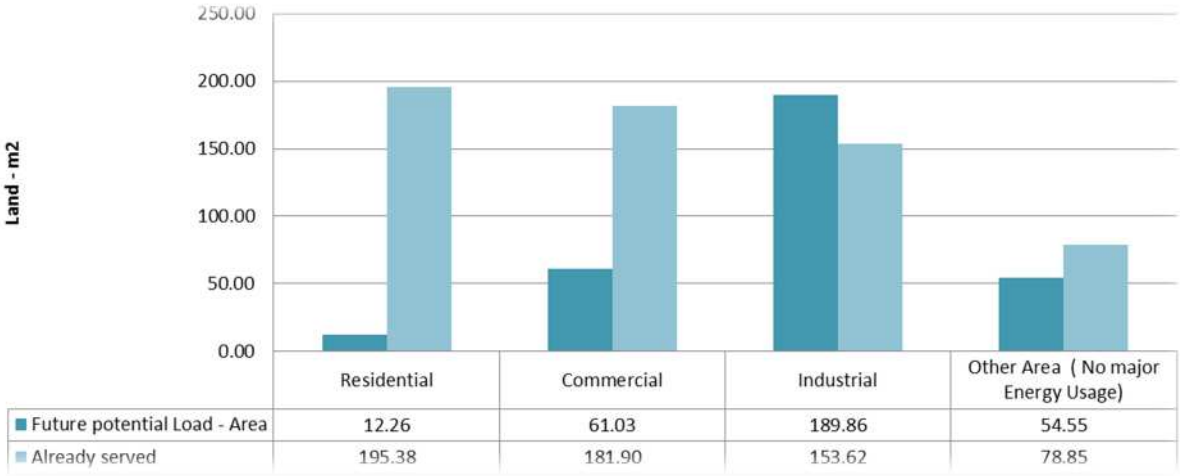
The Keith 23M21 feeder supplies power to an automotive manufacturer. Figure 47 below shows the feeder load. The 23M6 feeder provides back up capacity for 23M21 at all times. The chart below, which provides the 23M6 feeder load profile, shows that 23M6 has higher utilization due to the occasions when it is backing up the 23M21 feeder.

Figure 47 Feeder Load – Automotive Manufacturer



The Keith distribution area has high growth potential. City land zoning allocations indicate that the Keith TS area has more industrial land available for future investments. Land distribution of that area is as below in Figure 48.

Figure 48 Land Distribution



The Keith TS distribution area has more near-term development potential than any other TS in coming years, due to GHIB. Under the GHIB project, there will be direct additional load for a new duty free shopping complex, other administrative offices, and lighting. The Keith TS area has residential (12.26 Ha), commercial (61.03 Ha) and industrial (189.86 Ha) vacant land allocated by the City for more development in the medium/long term.

Land allocation of the Keith TS area shows that it has potential to grow at least 15 MW of additional load in the medium to long term development senarios based on the average energy consumption of each land category.

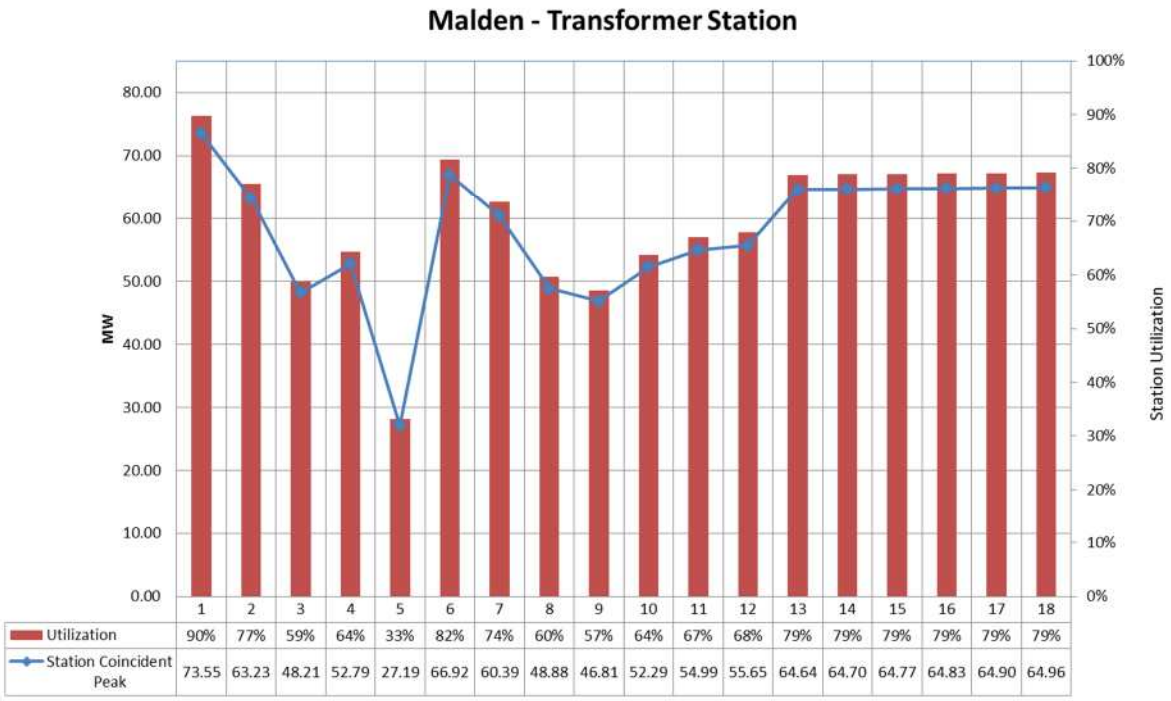
Malden TS Distribution Area

Malden TS located in the southwest end of the city. This is a "Bermondsey" style standard DESN station with two (T1, T2) 75/100/125 MVA, 230 kV/28 kV transformers. The 10-Day LTR limit of this station is 163 MVA at 35°C. The Malden TS feeders are shared between Essex, HONI and ENWIN. ENWIN owns six feeders, and Essex/HONI own six feeders. Table 45 provides an overview of the details of Malden TS. Figure 49 below is a graph showing station utilization for Malden TS.

Table 45 Overview of MaldenTS

Feeders	24M1, 24M2, 24M3, 24M4, 24M5, 24M6
Customers	9.238
Primary feeder	156,432 m
Secondary feeder	93,166 m
Service wires	308,782 m
Total Service Area (Sq.km)	16.2

Figure 49 Malden TS – Station Utilization



Malden TS (75/100/125 MVA) is interconnected with Walker 2 TS and Essex TS. This is a shared TS between HONI/Essex Power and ENWIN. HONI allocates station capacity based on the moving average of total feeder loads of each utility. This means ENWIN's allocation is dependent on the Essex/HONI load on other feeders—it is not a constant value. In this DSP, ENWIN assumed that LTR allocation is based on number of feeders. As shown in Figure 49 above, the Malden TS utilization level is in the medium category, but as per the near-term forecast, it is expected to be high in the future.

During the 2017 peak, this TS was loaded to 55.65 MW. The 24M1, 24M2, 24M3, 24M4, 24M5 and 24M6 feeder loads were 6.60 MW, 9.67 MW, 10.02 MW, 4.24MW, 5.44 MW and 15.49 MW, respectively (150.2 A , 220.0 A, 228.0 A, 96.4 A, 123.7 A and 352.5 A). As per the 2017 peak data, feeders 24M1, 24M2, 24M4 and 24M5 are low utilization feeders, while 24M3 and 24M6 are in the medium and high utilization categories, respectively.

The Malden TS distribution area has significant near term development potential in the coming years with the new GHIB work. The Malden TS distribution area has vacant residential (12.26 Ha), commercial (61.01 Ha) and industrial (189.6 Ha) land allocated by the City for development in the medium/long-term. Figure 50 below shows Malden TS's feeder load, and Table 46 provides the corresponding data.

Figure 50 Malden TS Feeder Load

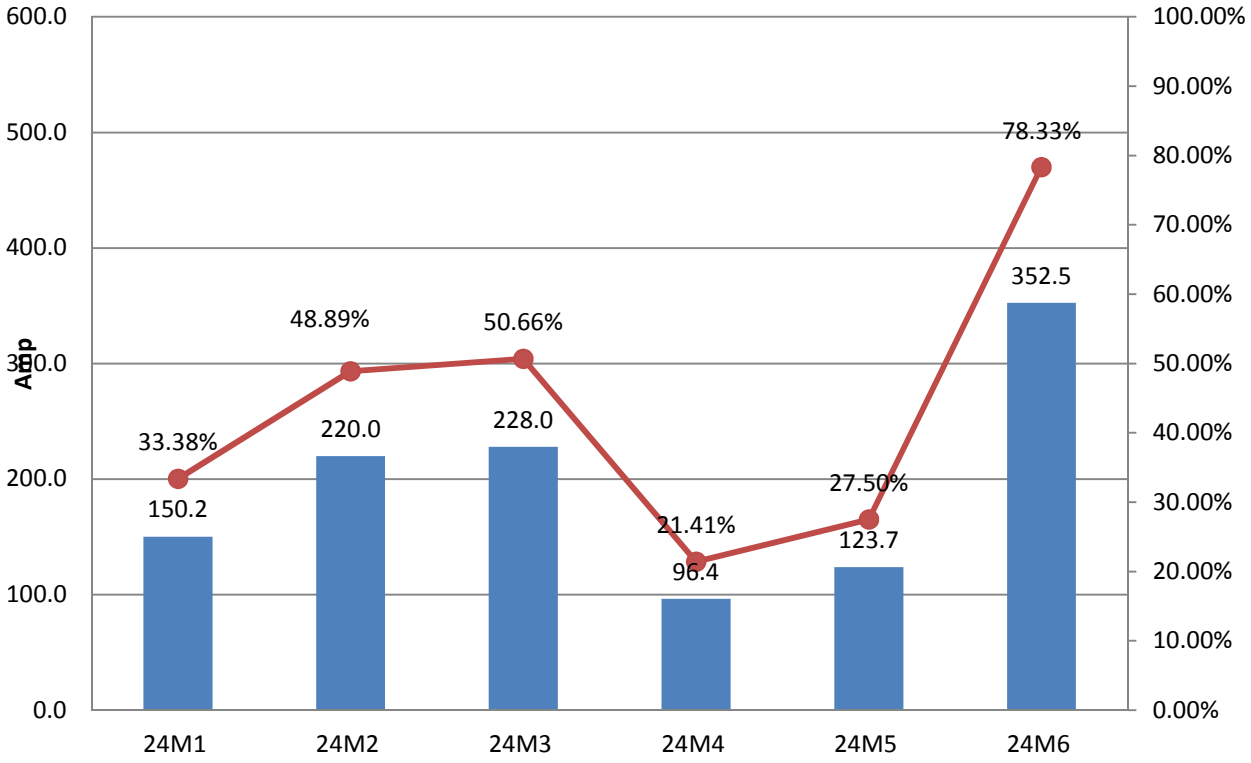
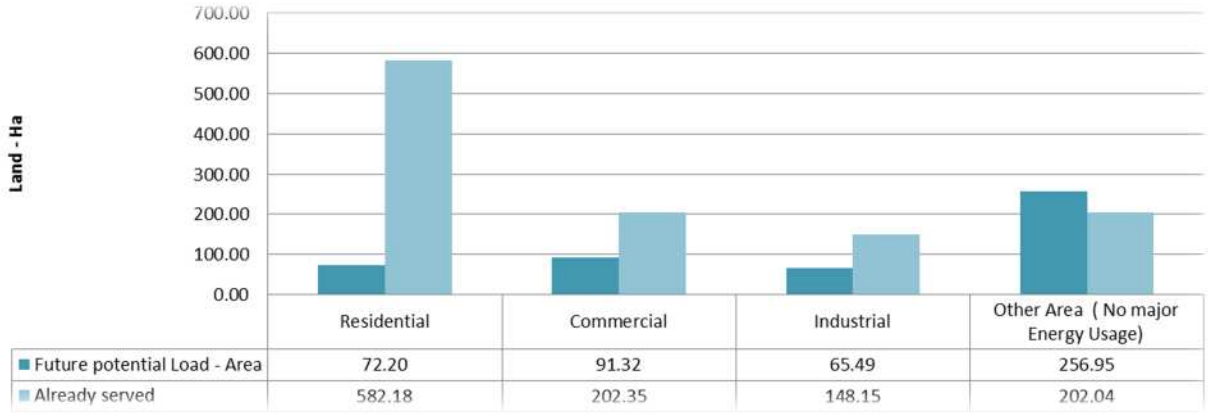


Table 46 Malden TS Feeder Load

Malden TS	24M1	24M2	24M3	24M4	24M5	24M6
Feeder Load (Peak time in 2017) A	155.5	196.2	256.2	117.6	142.3	388.7
Utilization %	34.6%	43.6%	56.9%	26.1%	31.6%	86.4%
Utilization Level	Low	Low	Medium	Low	Low	High

The Malden TS distribution area has a high potential to grow. City land allocaton indicate that it has available industrial land for future investments. Land distribution of that area is as shown in Figure 51 below.

Figure 51



Land allocation in the Malden TS area shows that it has a potential to grow at least 10 MW of additional of peak load in the medium and long term development senarios, based on the average energy consumption of each land category.

Crawford TS Distribution Area

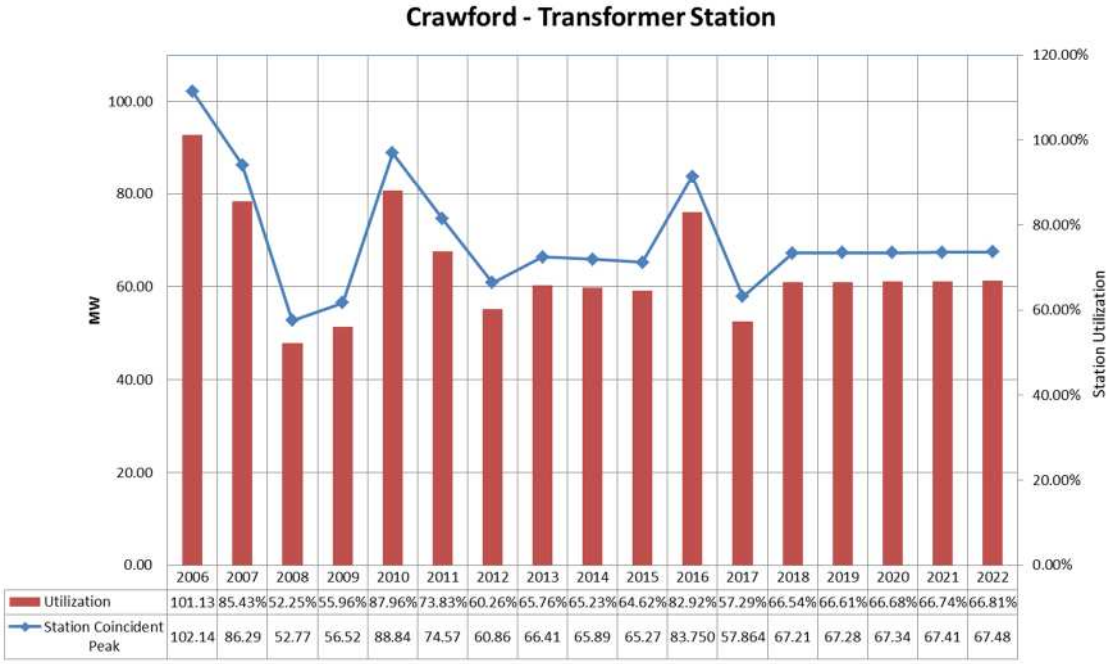
Crawford TS is located in the north part of Windsor, and west of downtown. This is a standard DESN station with two (T4, T3) 50/66.6/83.3 MVA 230 kV/28 kV transformers. The 10-Day LTR limit of this station is 101 MVA at 33°C. All Crawford TS feeders are ENWIN owned feeders. Table 47 provides an overview of the details of Crawford TS. Figure 52 below is a graph showing Crawford TS's station utilization.

Table 47 Overview of Crawford TS

Feeders	25M5, 25M6, 25M7, 25M8, 25M9, 25M10, 25M11, 25M12, 25M13, 25M14
Customers	12,754

Primary feeder	116.276 km
Secondary feeder	97.658 km
Service wires	289.857 km
Total Service Area Sq.km	7.27

Figure 52 Crawford Transformation Station – Station Utilization



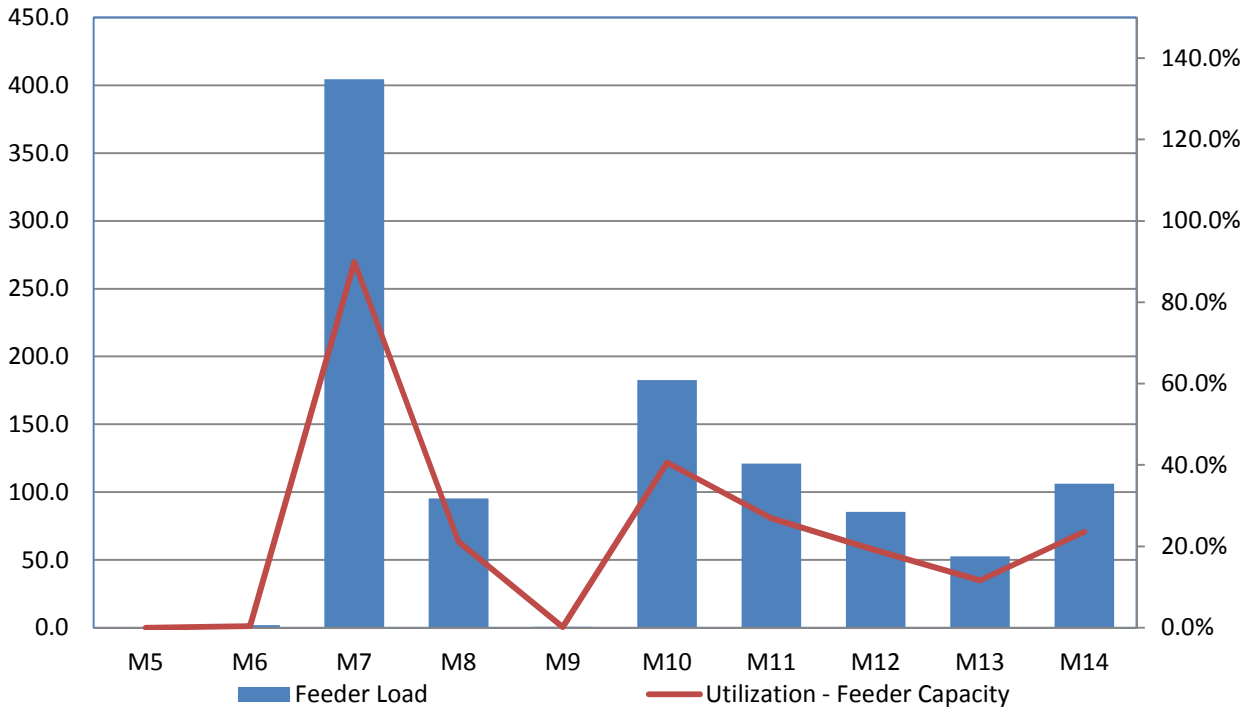
Crawford TS (50/66.6/83.3 MVA) has interconnection to Malden TS, Essex TS and Walker 1 & 2 TSs. This station is a standard HONI DESN station with 10 feeders. As shown in Figure 52 above, Crawford TS's present utilization level is in the medium category, and as per the near-term forecast, the station's utilization level expected to remain at this level. Early in 2006, ENWIN noticed that the Crawford TS load was increasing beyond the station LTR level. As a result of this situation ENWIN took measures to off-load Crawford TS during the summer peak time. The permanent solution for this was to connect Walker 1 TS and Essex TS to Crawford TS by a high capacity trunk along Tecumseh Road, running east to west. As a result, the 25M13 & 25M14 feeders can connect to 15M6 & 55M1, and transfer the whole feeder load to the Essex and Walker 1 stations during peak times without affecting quality of service.

During the peak loading in 2017, Crawford TS was loaded to 55.65 MW. Feeders 25M7, 25M8, 25M9, 25M10, 25M11, 25M12, 25M13 and 25M14 were loaded to 11.7 MW, 0.8 MW, 17.78 MW, 4.49 MW, 0.03 MW, 8.03 MW, 5.32 MW, 3.76 MW, 2.31 MW and 4.66 MW, respectively (266.2 A, 1.9 A, 404.5 A, 95.2 A, 0.8 A, 182.6 A,121.1 A, 85.5 A, 52.5 A, 106.1 A).

Four feeders from Crawford TS are underground, and configured in a companion feeder back up arrangement. The 25M8 feeder load is fully backed up by the 25M12 feeder and vice versa. The 25M6 and 25M9 feeders also have the same set up. The companion feeder setups have auto-transfer switches between all loads on the feeder so that if one of the feeders is interrupted, the whole load of the feeder automatically transfers to its companion feeder.

The Crawford TS distribution area is developed to near its potential level, but there is still a little vacant area in the downtown for high-energy consumption commercial development. Within the Crawford TS distribution area, there are unserved potential lands allocated by the City: residential (22.9 Ha), commercial (53.98 Ha) and industrial (17.9 Ha). Figure 53 below shows Crawford TS' feeder load.

Figure 53 Crawford TS Feeder Load

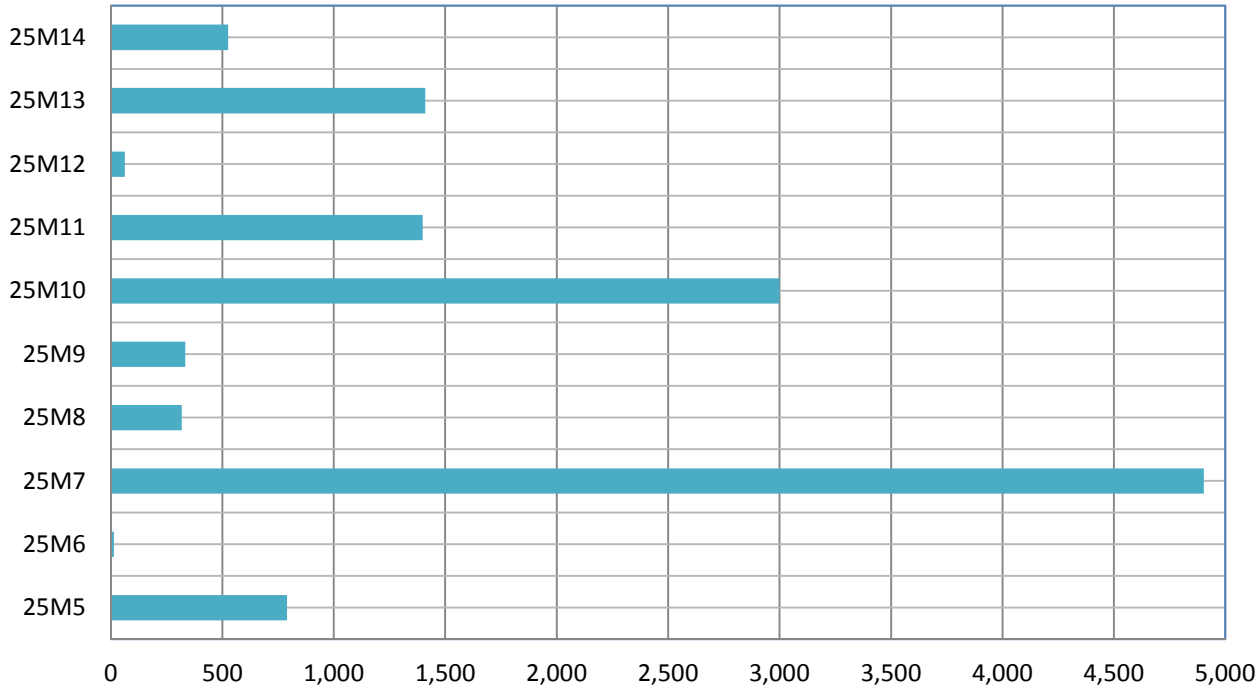


The customers served by these companion feeder arrangements enjoy the best possible reliability in ENWIN's distribution system. On the other hand, 25M7 has nearly 5,000 customers, and that feeder occupies the worst performing feeder list.

Note that the 25M6/9 feeders were transferred to a different station due to maintenance work. Usually these feeders carry 6 to 7 MW in total. Both 25M8/12 and 25M6/9 feeders are constructed with one 750 MCM XLPE cable, and do not have as much capacity as an overhead 556 MCM conductor. The summer ampacity limit is 350 A for both feeder arrangements. If more commercial load develops in the downtown core, ENWIN will need to double the feeder cables to provide sufficient capacity to the downtown networks.

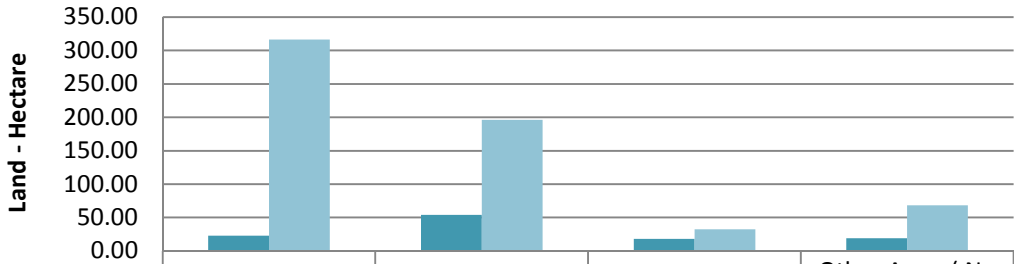
The 25M7 feeder utilization is high, while 25M11, M12, M13 and M14 show low utilization. Figure 54 below shows the number of customers by feeder.

Figure 54 Number of Customers by Feeder



As shown in Figure 55 below, the Crawford TS distribution area has very little land for future growth. The percentage of unserved land in this area is around 16%. However, ENWIN's estimated incremental potential load, based on average consumption per land usage type, indicates a potential addition of 4.2 MW to the current peak.

Figure 55 Land Usage



	Residential	Commercial	Industrial	Other Area (No major Energy Usage)
Future potential Load - Area	22.90	53.98	17.90	19.03
Already served	316.17	196.16	32.60	68.55

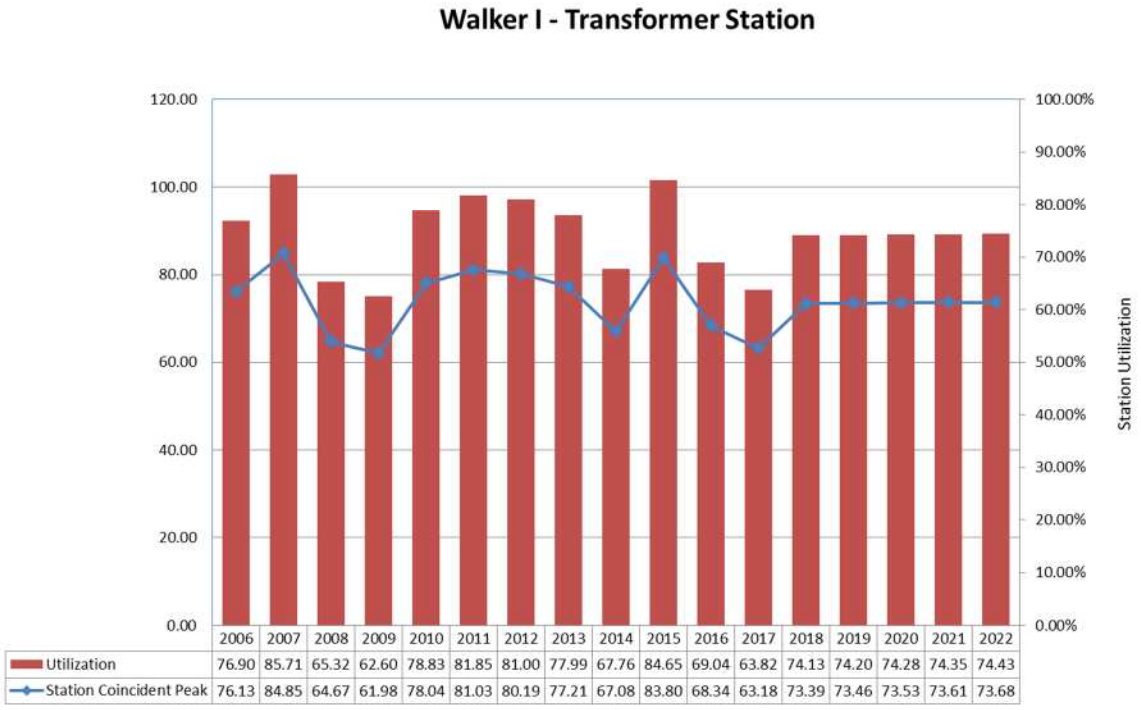
Walker 1 TS Distribution Area

Walker 1 TS located at Walker Road and Grand Marais Road, within the HONI Essex TS (HV) yard, along with Walker 2 and Essex TS. This is a standard DESN station with two (T1, T2) 50/66.6/83.3 MVA, 230 kV/28 kV transformers. The 10-Day LTR limit of this station is 99 MVA at 35°C. Walker 1 TS is not a shared TS—all feeders serve ENWIN load. Table 48 provides an overview of the details of Walker 1 TS. Figure 56 below is a graph showing Walker 1 TS's station utilization.

Table 48 Overview of Walker 1 TS

Feeders	55M1, 55M2, 55M3, 55M5, 55M6
Customers	11,229
Primary feeder	10.348 km
Secondary feeder	0.362 km
Service wires	336.892 km
Total Service Area Sq.km	10.7

Figure 56 Walker 1 TS – Station Utilization



Walker 1 TS is generally running at a 70-80% average utilization level all the time. This station has six 27.6 kV feeder bays, but one of the feeder bays is not used for distribution at this time.

This feeder bay may be available to serve nearby developable land in the Grand Marais industrial park or vacant land at the airport.

During the 2017 peak, the Walker 1 TS was loaded to 63.18 MW. Feeders 55M1, 55M2, 55M3, 55M5 and 55M6 were loaded to 15.5 MW,14.27 MW, 13.6 MW, 9.85 MW and 9.97 MW, respectively (352.5 A, 324.5 A, 309.4 A, 224.2 A and 226.8 A). Figure 57 below shows Walker 1 TS' feeder load, and Figure 58 below shows the number of customers by feeder.

Figure 57 Walker 1 TS Feeder Load

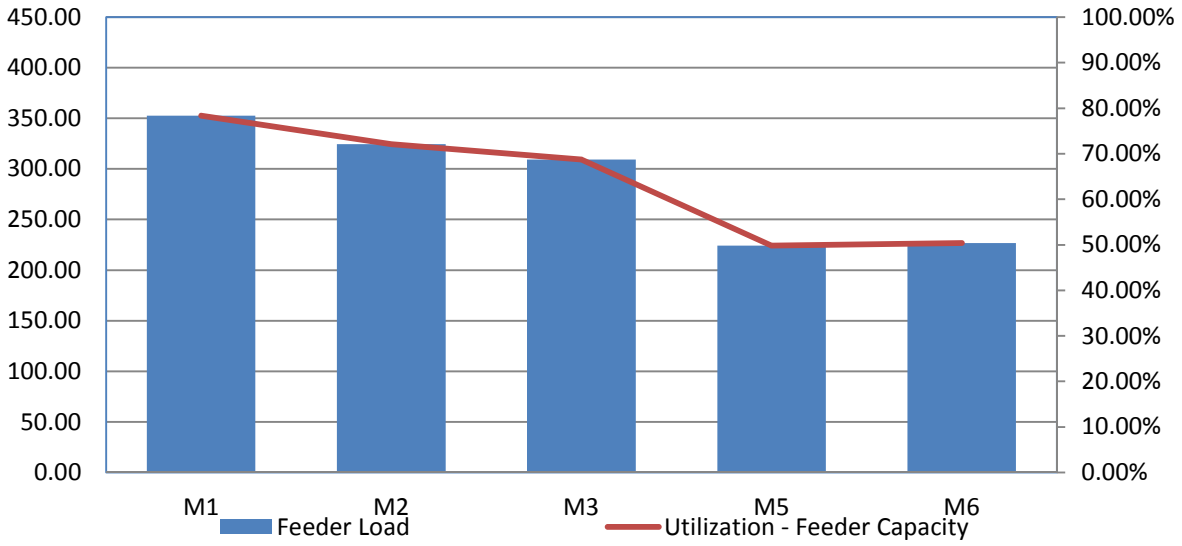
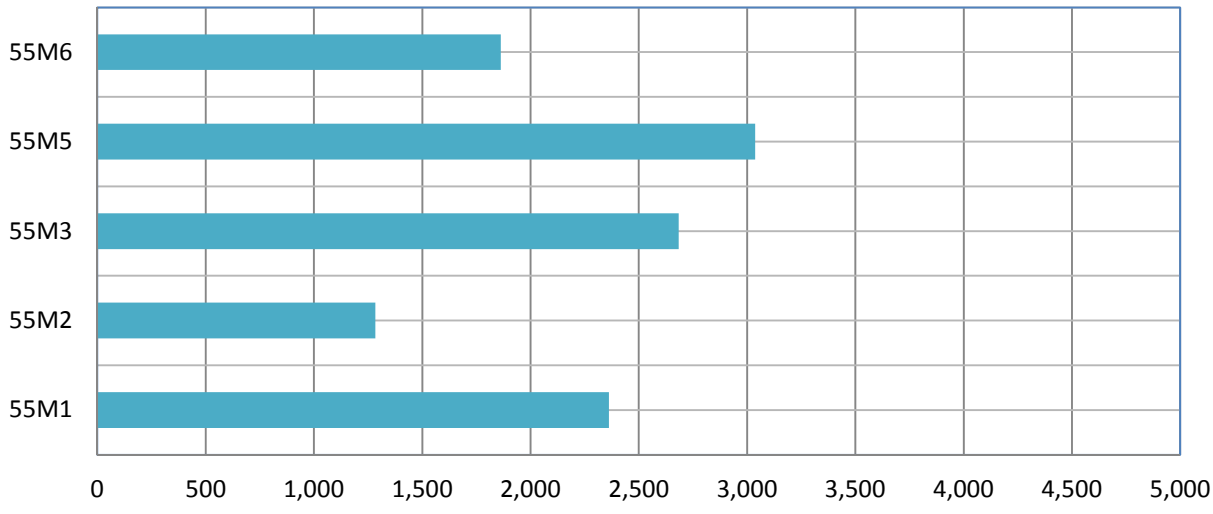


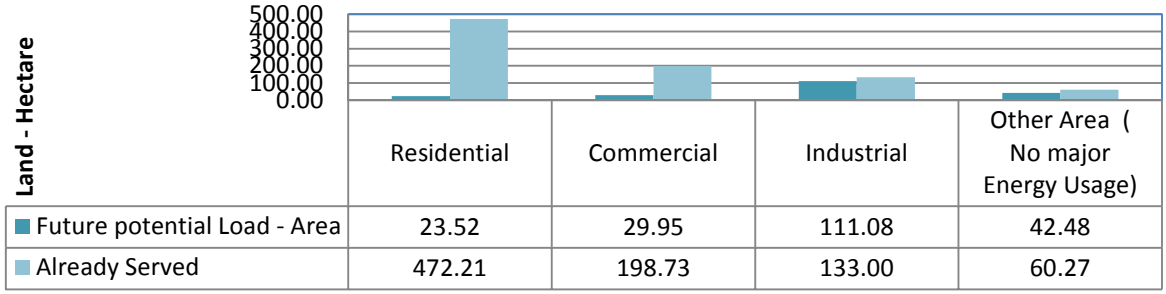
Figure 58 Number of Customers by Feeder



Walker 1 TS feeders are on or above a 50% utilization limit. These feeders served 11,229 customers as of September 2018, which is 12.4% of the total customer count of the service area. All feeders are loaded and the customer count of each feeder is greater than 1,000.

As shown below in Figure 59, the Walker 1 distribution area does not have much residential or commercial land allocation left for future growth, but it has vacant industrial land. Total unserved percentage of land in the Walker 1 distribution area is around 9%. ENWIN estimated that the potential additional peak load to serve this unserved land would be approximately 9 MW, based on the historical average energy consumption per land usage type.

Figure 59 Land Use



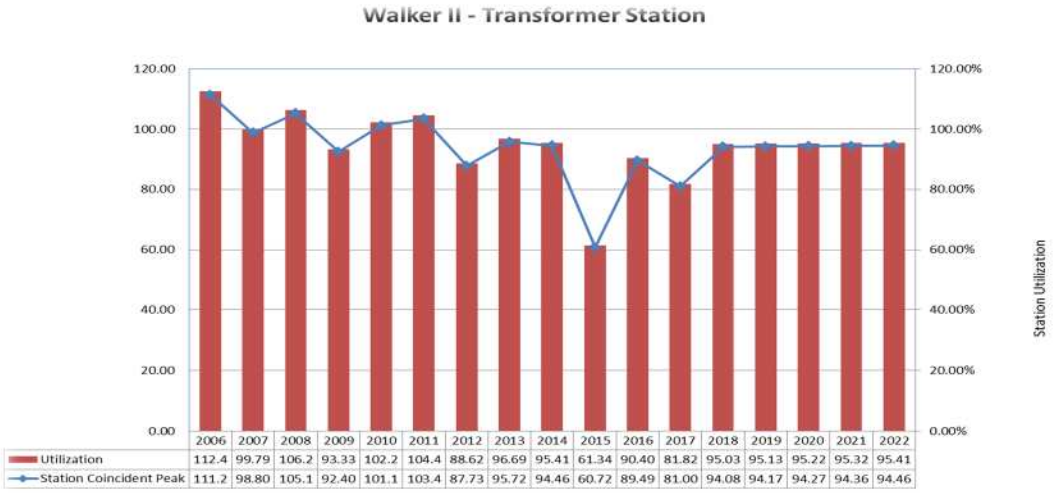
Walker 2 TS Distribution Area

Walker 2 TS also located at Walker Road and Grand Marais Road, within the HONI Essex TS (HV) yard, along with Walker 1 and Essex TS. This is a standard DESN station with two (T3, T4) 50/66.6/83.3 MVA, 230 kV/28 kV transformers. The 10-Day LTR limit of this station is 99 MVA at 35°C. Walker 2 TS is ENWIN-owned and all feeders serve ENWIN load. Table 49 is an overview of the details of Walker 2 TS. Figure 60 below is a graph showing Walker 2 TS' station utilization. Table 49 below provides and overview of data relevant to Walker 2 TS.

Table 49 Overview of Walker 2 TS

Feeders	55M21, 55M22, 55M23, 55M24, 55M25, 55M26
Customers	14380
Primary feeder	195.416 km
Secondary feeder	113.682 km
Service wires	553.896 km
Total Service Area Sq.km	16.6

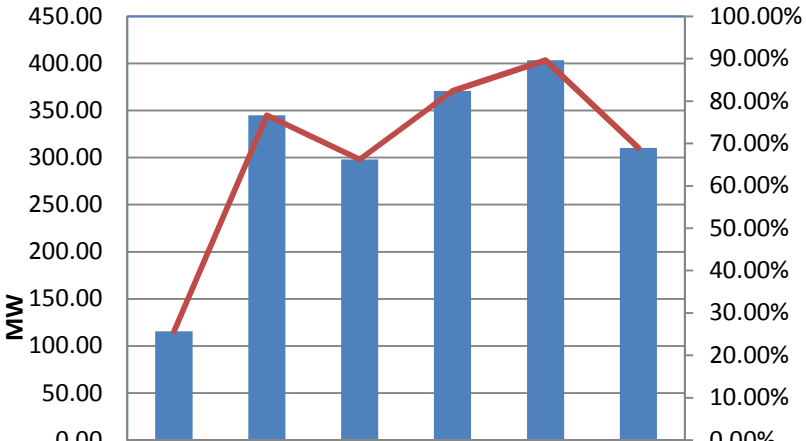
Figure 60 Walker 2 – TS – Station Utilization



Walker 2 TS is generally running an average 70-90% utilization level all the time.

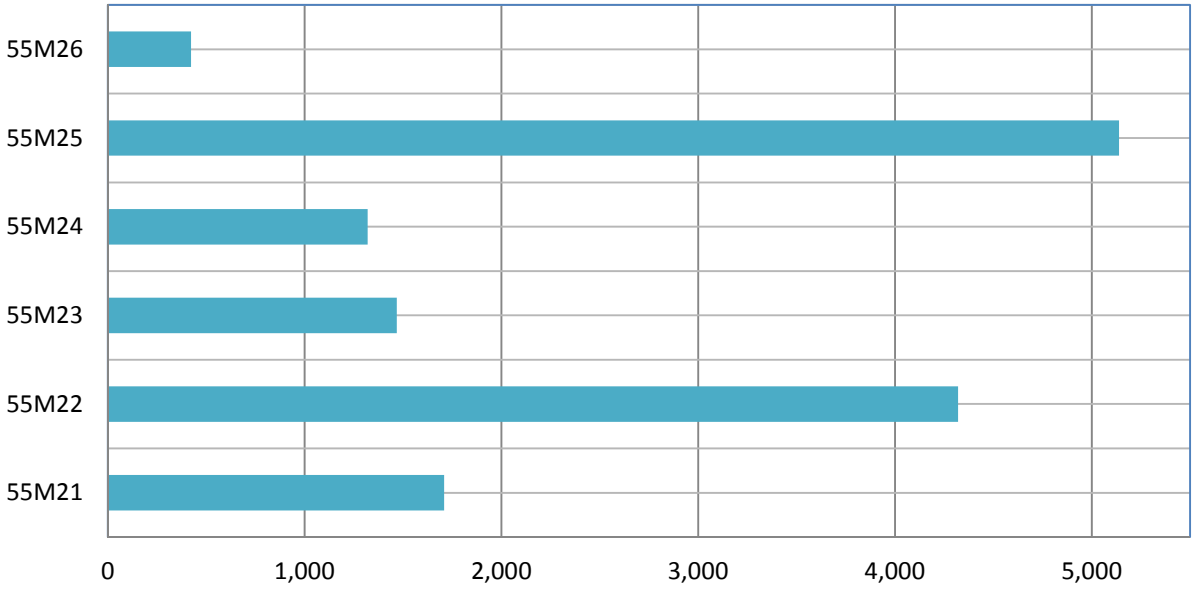
During the 2017 peak, the Walker 2 TS was loaded to 81 MW. Feeders 55M21, 55M22, 55M23, 55M24, 55M25 and 55M26 were loaded to 5.08 MW,15.16 MW, 13.10 MW,16.30, 17.73 MW and 13.64 MW, respectively (115.5 A, 334.9A, 297.9 A, 370.8 A, 403.2 A and 310.2A). Figure 61 shows the Walker 2 TS feeder load, and Figure 62 shows the number of customers by feeder.

Figure 61 Walker 2 TS Feeder Load



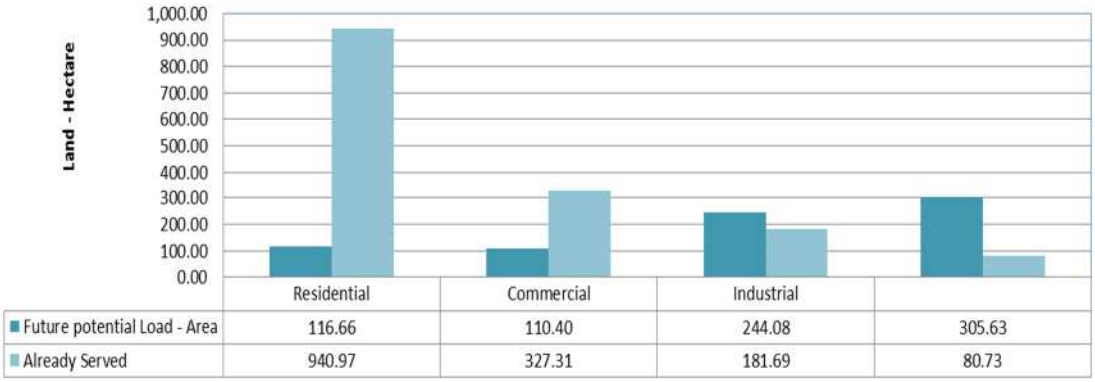
	55M21	55M22	55M23	55M24	55M25	55M26
Feeder Load	115.51	344.91	297.91	370.84	403.24	310.27
Utilization - Feeder Capacity	25.67%	76.65%	66.20%	82.41%	89.61%	68.95%

Figure 62 Number of Customers by Feeder



Walker 2 TS feeders are above the 50% utilization limit, except for the 55M21 feeder. These feeders serve 14,380 customers as of September 2018, which represents 15.8% of the total customer count of the service area. All feeders are well loaded, and the customer count of each feeder is more than 1,000, with the exception of 55M26. The 55M26 feeder supplies the industrial and commercial area, which is why it has fewer customers and a higher load.

Figure 63 Land Use



	Residential	Commercial	Industrial	
Future potential Load - Area	116.66	110.40	244.08	305.63
Already Served	940.97	327.31	181.69	80.73

As shown in the Figure 63 above, the Walker 2 distribution area does not have much residential, commercial or industrial unserved land allocated for future growth. Total unserved percentage of land in the Walker 2 distribution area is around 9%. ENWIN estimates the potential additional peak load that would be required to serve the unserved land would be

approximately 5 MW. The incremental peak load is estimated based on the historical average energy consumption for that land usage type.

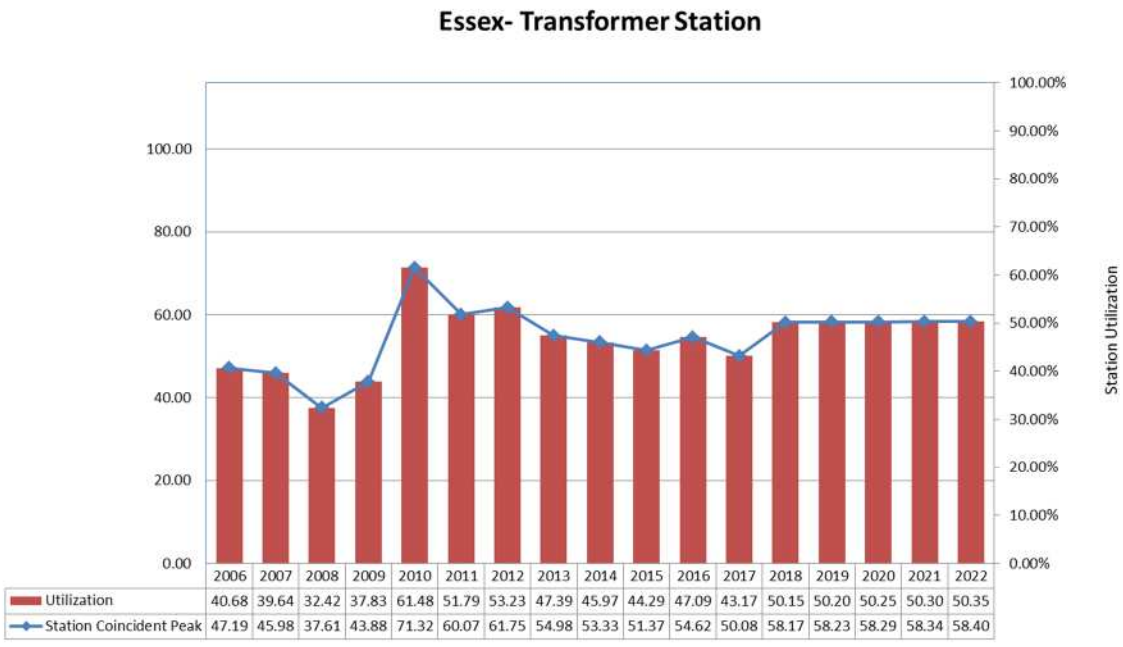
Essex TS Distribution Area

Essex TS also located at Walker Road and Grand Marais Road in the HONI Essex TS (HV) yard, along with Walker 1 & 2 TSs. This is a standard DESN station with two (T1, T2) 50/66.6/83.3 MVA, 230 kV/28 kV transformers. The 10-Day LTR limit of this station is 116 MVA at 35°C. Essex TS is owned by HONI, and all feeders serve ENWIN load. Table 50 provides an overview of the details of Essex TS. Figure 64 below is a graph showing Essex TS's station utilization.

Table 50 Overview of Essex TS

Feeders	15M5, 15M6, 15M7, 15M8, 15M10, 15M11
Customers	13,674
Primary feeder	146.293 km
Secondary feeder	96,207 km
Service wires	407.142 km
Total Service Area Sq.km	9.6

Figure 64 Essex TS – Station Utilization



Essex TS is generally running at an average 40-50% utilization level. This station had a very low LTR capacity until it was refurbished in 2009. Before it was refurbished, HONI restricted the Essex TS total load to 50 MW. As a result, ENWIN had to configure other feeders to take the Essex TS load.

Figure 65 below shows the Essex TS load during the 2017 peak.

Figure 65 Essex Feeder Load

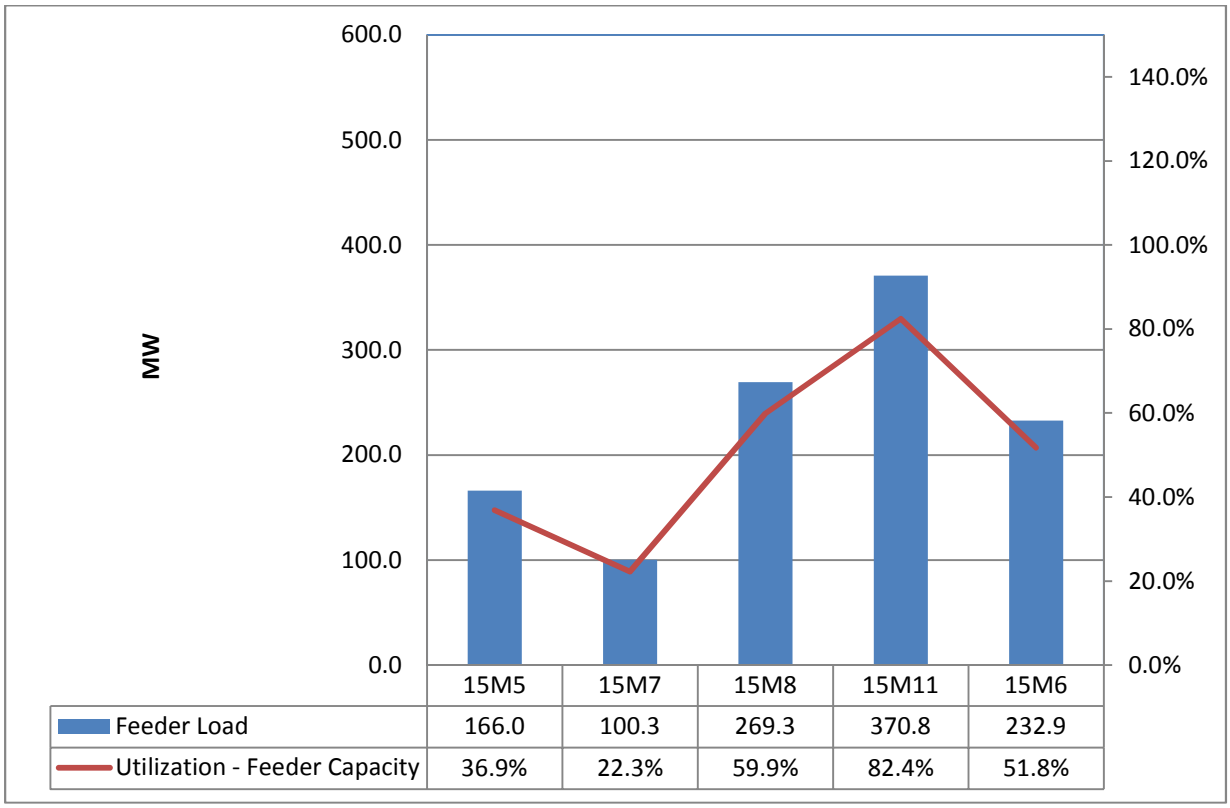
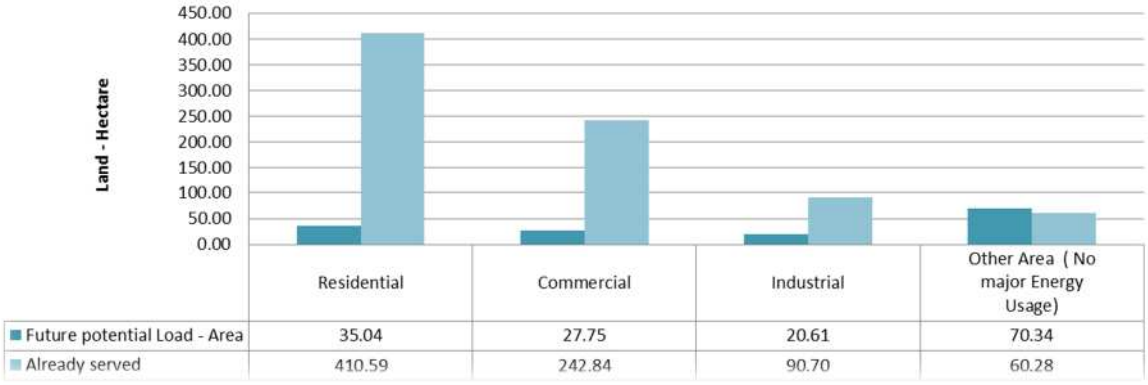


Figure 66 Land Use



As shown in Figure 66 above, the Essex TS distribution area does not have much residential, commercial or industrial unserved land allocation for future growth. Total unserved percentage

of land in the Essex TS distribution area is around 16%. ENWIN estimated that the possible additional peak load required to serve this unserved land would be around 3 MW. The peak load estimated based on the historical average energy consumption per land energy usage.

Lauzon TS Distribution Area

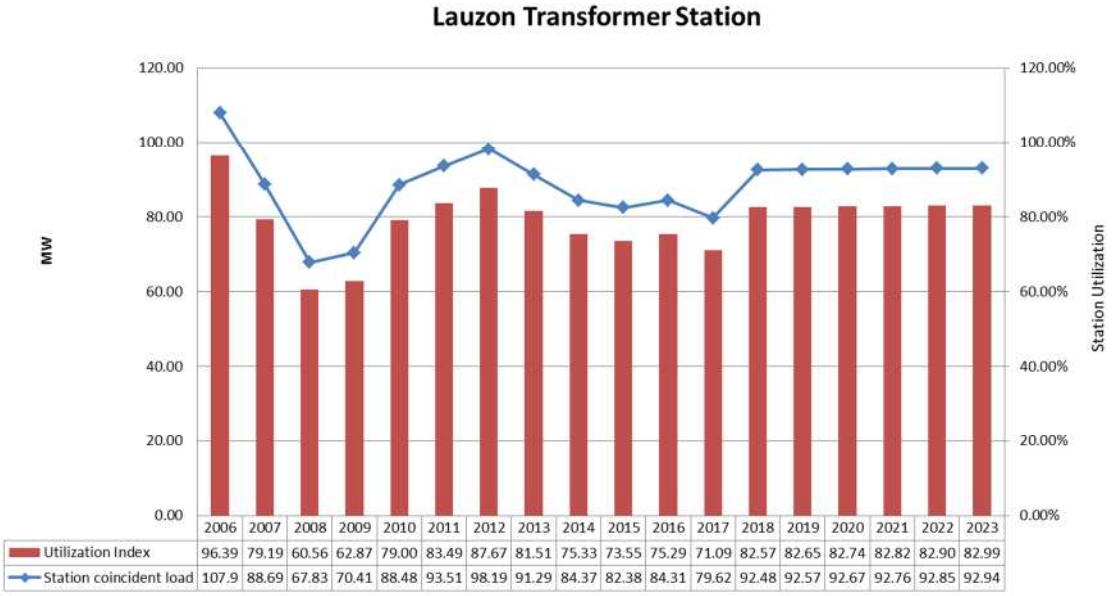
Lauzon TS located in the east end of the ENWIN distribution area. This is one of the heavily loaded TSs with a large footprint. Lauzon station reached its 10-Day LTR limit during the 2006 peak, the same year in which ENWIN identified some distribution limitations based on 2006 peak load. A plan is in place to address these limitations. Lauzon TS feeders have relatively less connectivity than other station feeders due to its geographical location.

Lauzon TS is a standard DESN station with two (T5, T6) 50/66.6/83.3 MVA, 230 kV/28 kV transformers. The 10-Day LTR limit of this station is 112 MVA at 35^{o}C. Lauzon TS is built with 8 feeders: one feeder serves HONI load and the rest serve ENWIN load. Table 51 provides an overview of the details of Lauzon TS. Figure 67 below is a graph showing Lauzon TS's station utilization.

Table 51 Overview of Lauzon TS

Feeders	56M1, 56M2, 56M3, 56M5, 56M6, 56M7, 56M8
Customers	19,187
Primary feeder(km)	300.5 km
Secondary feeder(km)	100.2 km
Service wires(km)	854.5 km
Total Service Area Sq.km	23

Figure 67 Lauzon TS – Station Utilization



This is a very important station for ENWIN. Lauzon TS is consistently running at a high utilization level and it serves 21% of ENWIN's customers. During the peak time, Lauzon TS was loaded 79.6 MW; however, there were some feeder transfers at the time of peak condition. Table 52 below shows the feeder load during peak time.

Table 52 Feeder Load During Peak Time

DATE - TIME	56M1	56M2	56M3	56M5	56M6	56M7	56M8
12/06/2017 6:00:00 PM (MW)	22.57	6.54	0.00	16.89	1.65	8.75	23.22
12/06/2017 6:00:00 PM (Amp) @ 0.9 pf and 28.2kV	513.50	148.75	0.00	384.28	37.56	199.09	528.15

Lauzon TS has a 50/67/83 MVA station transformer. The station was built with eight 27.6kV feeder bays. For comparison Walker 1 & 2 TSs and Essex TS have the same capacity station transformers, but the number of feeder bays is limited to six 27.6 kV bays. Technically, utilization levels of feeders in Lauzon TS and Essex/Walker 1 & 2 TSs should be different, because if all feeders were to be loaded equally to their 450 A rating level, Lauzon TS may not be able to handle the full load. ENWIN builds its standard feeder infrastructure to handle 450 A for all stations and feeders; therefore, utilization levels are comparable based on standard infrastructure capacity. Where a station limitation exists, that constraint will be handled as an operating limitation. Figure 68 shows Lauzon TS's feeder load, and Table 53 provides the corresponding data.

Figure 68 Lauzon TS Feeder Load

Table 53 Lauzon TS Feeder Load

Lauzon TS	56M1	56M2	56M3	56M5	56M6	56M7	56M8
Feeder Load (Peak time in 2017) A	513.5	148.8	0.0	384.3	37.6	199.1	528.2
Utiization %	114.1%	33.1%	0.0%	85.4%	8.3%	44.2%	117.4%
Utiization Level	High-High	Low	0	High	Low	Low	High-High

Some Lauzon feeders are heavily loaded, while some are lightly loaded due to customer count. Figure 69 shows the number of customers by feeder, and Table 54 provides the corresponding data.

Figure 69 Number of Customers by Feeder

Table 54 Number of Customers by Feeder

Lauzon TS	56M1	56M2	56M3	56M5	56M6	56M7	56M8
Number of Customers	2,760	1,965	1,450	1,765	731	2,803	7,713

The 56M8 feeder serves 40% of the total Lauzon TS customer count. This feeder is one of the worst performing feeders in the ENWIN system. To mitigate performance issues for 56M8, automated distribution equipment was installed at strategic locations, but the 56M8 feeder remained on the worst performing feeder list, mainly due to the number of customers.

The 56M8 feeder performance is one of the issues in the Lauzon distribution area. ENWIN identified other related distribution issues and decided, under a long-term plan, to develop feeders along Tecumseh Road from Essex/Walker 1 & 2 yard to the Lauzon TS. The objective of this project is to bring additional feeders to the Lauzon TS distribution area, and thereby reduce the Lauzon TS footprint while increasing connectivity to other stations with high capacity feeders.

Table 55 below shows long-term plan projects to develop new feeders to bring into the Lauzon distribution area.

Table 55 Long-Term Plan Projects

Walker / Essex TS yard to Lauzon TS High Capacity Corridor.	Length(m)	Total Cost	Capital Contribution	EnWin Expenditure
Tecumseh Rd to Lauzon TS O/H	1,758	1,142,700	0	1,142,700
Tecumseh Rd to Lauzon TS U/G	1,642	1,970,400	0	1,970,400
Central Ave to Ford Blvd on Tecumseh Rd	1,695	1,101,750	0	1,101,750
Clemenceau Blvd to Lauzon Rd on Tecumseh Rd	1,889	1,227,850	0	1,227,850
Essex/Walker to Tecumseh Rd	2,800	1,820,000	0	1,820,000
Total Estimated Cost ($)		7,262,700	0	7,262,700

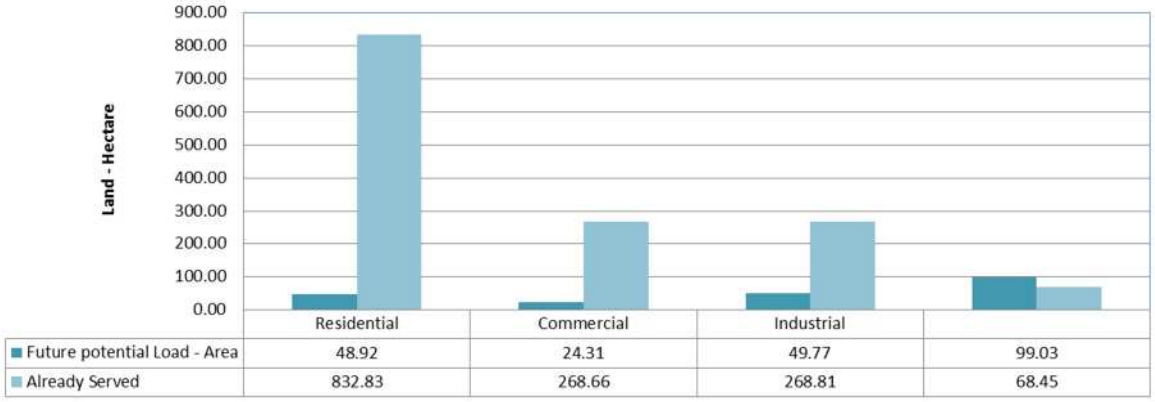
ENWIN expects to bundle these projects with other works such as City road development, EOL replacements, etc. to minimize the project cost. If any other opportunity arises due to other factors, ENWIN may take advantage of such opportunity to achieve its final objectives.

The above projects are not included in the Forecast Period, but are part of ENWIN's long-term plan.

Figure 70 ENWIN's Distribution Boundary

Lauzon TS feeder 56M8 is serving the eastern end of the of ENWIN distribution boundary. Figure 70 above shows ENWIN's distribution boundary. Under the long-term reliability improvement/grid modernization project, which is shown as a dotted line in Figure 70 above, this feeder will be built as a double-circuit line all the way to Banwell Road. After completion of this project, a section of 56M8 will be able to transfer to the new feeder.

Figure 71 Land Use



	Residential	Commercial	Industrial	
Future potential Load - Area	48.92	24.31	49.77	99.03
Already Served	832.83	268.66	268.81	68.45

As shown in Figure 71 above, the Lauzon TS distribution area has very little residential, commercial or industrial unserved land allocated for future growth. ENWIN estimates the possible additional peak load required to serve the unserved land would be around 5 MW. The peak load is estimated based on the historical average energy consumption per land energy usage.

Summary of Asset Utilization:

Table 56 below sumarizes ENWIN's station useage since 2006, and forecasted useage to 2024. Table 56 clearly indicate that Essex TS usage is either low or medium, which indicates that

utilization is around 50%. On the other hand, Walker 2 TS and Lauzon TS are at an 80-90% utilization level.

The main reason for Essex TS's low utilization is due to deliberately removing load and reconfigurating the Essex TS feeders to meet the Essex TS transformer condition prior to 2009 when it was overloaded. Until 2009, HONI had imposed a 50 MW upper limit to due to the poor condition of the Essex TS transfomers. After 2009, HONI built a new Essex TS with new transformers. The capacity of the new Essex TS was raised to its current 10-Day LTR level, but the reconfigured feeders did not go back to the original condition for various reasons.

Lauzon TS also shows a very high uilization level. The main causes for this are:

1. Lauzon TS serves 21% of the ENWIN customer base, and it has the largest foot print.
2. Its geographical location on the far east side of Windsor means that Lauzon TS needs a very high investment to off-load or provide a backup supply.

A plan is in place to use remaining Essex TS capacity for reliabilty. A high capacity connection is currently being built between Crawford TS and Essex TS to accept load from Crawford TS. Another new feeder, 15M10 from Essex TS, is being built to off-load Walker 2 TS's south Windsor load.

Feeder utilization is different than station utilization. Some feeders are built to accept higher capacity under contingency situations, but under normal condition, all feeders are assumed to be 450 A feeders with a 600 A maximum capacity. As explained before, some stations have more feeders than other stations, but with the same size supply transfomers. Thus, the same loading condition can not be expected throughout. However, this gives an indication of present usage for planning.

Table 56 Feeder Utilization

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Keith	**48.49**	**34.76**	**25.47**	**34.33**	**36.64**	**28.76**	**42.58**	**32.30**	**33.78**	**32.20**	**19.5508**	**37.7954**	43.90	43.94	43.99	44.03	44.07	44.12	44.16
Keith Utilization	90%	64%	47%	64%	68%	53%	79%	60%	63%	60%	36%	70%	81%	81%	81%	82%	82%	82%	82%

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Malden	**73.55**	**63.23**	**48.21**	**52.79**	**27.19**	**66.92**	**60.39**	**48.88**	**46.81**	**52.29**	**54.99**	**55.65**	**64.64**	**64.70**	**64.77**	**64.83**	**64.90**	**64.96**	**65.03**
Malden Utilization	90%	77%	59%	64%	33%	82%	74%	60%	57%	64%	67%	68%	79%	79%	79%	79%	79%	79%	79%

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Crawford	**102.14**	**86.29**	**52.77**	**56.52**	**88.84**	**74.57**	**60.86**	**66.41**	**65.89**	**65.27**	**83.7506**	**57.8643**	67.21	67.28	67.34	67.41	67.48	67.54	67.61
Crawford Utilization	101.13%	85.43%	52.25%	55.96%	87.96%	73.83%	60.26%	65.76%	65.23%	64.62%	82.92%	57.29%	66.54%	66.61%	66.68%	66.74%	66.81%	66.88%	66.94%

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Walker 1	**76.13**	**84.85**	**64.67**	**61.98**	**78.04**	**81.03**	**80.19**	**77.21**	**67.08**	**83.80**	**68.3472**	**63.1846**	73.39	73.46	73.53	73.61	73.68	73.76	73.83
Walker 1 Utilization	76.90%	85.71%	65.32%	62.60%	78.83%	81.85%	81.00%	77.99%	67.76%	84.65%	69.04%	63.82%	74.13%	74.20%	74.28%	74.35%	74.43%	74.43%	74.43%

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Walker 2	**111.29**	**98.80**	**105.18**	**92.40**	**101.19**	**103.43**	**87.73**	**95.72**	**94.46**	**60.72**	**89.4944**	**81.0008**	94.08	94.17	94.27	94.36	94.46	94.55	94.65
Walker II Utilization	112.41%	99.79%	106.25%	93.33%	102.21%	104.47%	88.62%	96.69%	95.41%	61.34%	90.40%	81.82%	95.03%	95.13%	95.22%	95.32%	95.41%	95.41%	95.41%

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Essex	**47.19**	**45.98**	**37.61**	**43.88**	**71.32**	**60.07**	**61.75**	**54.98**	**53.33**	**51.37**	**54.6298**	**50.0824**	58.17	58.23	58.29	58.34	58.40	58.46	58.52
Essex Utilization	40.68%	39.64%	32.42%	37.83%	61.48%	51.79%	53.23%	47.39%	45.97%	44.29%	47.09%	43.17%	50.15%	50.20%	50.25%	50.30%	50.35%	50.35%	50.35%

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Lauzon	**107.96**	**88.69**	**67.83**	**70.41**	**88.48**	**93.51**	**98.19**	**91.29**	**84.37**	**82.38**	**84.3197**	**79.6233**	92.48	92.57	92.67	92.76	92.85	92.94	93.04
Lauzon Utilization	96.39%	79.19%	60.56%	62.87%	79.00%	83.49%	87.67%	81.51%	75.33%	73.55%	75.29%	71.09%	82.57%	82.65%	82.74%	82.82%	82.90%	82.99%	82.99%

Figure 72 TS Distribution Area – Future Development

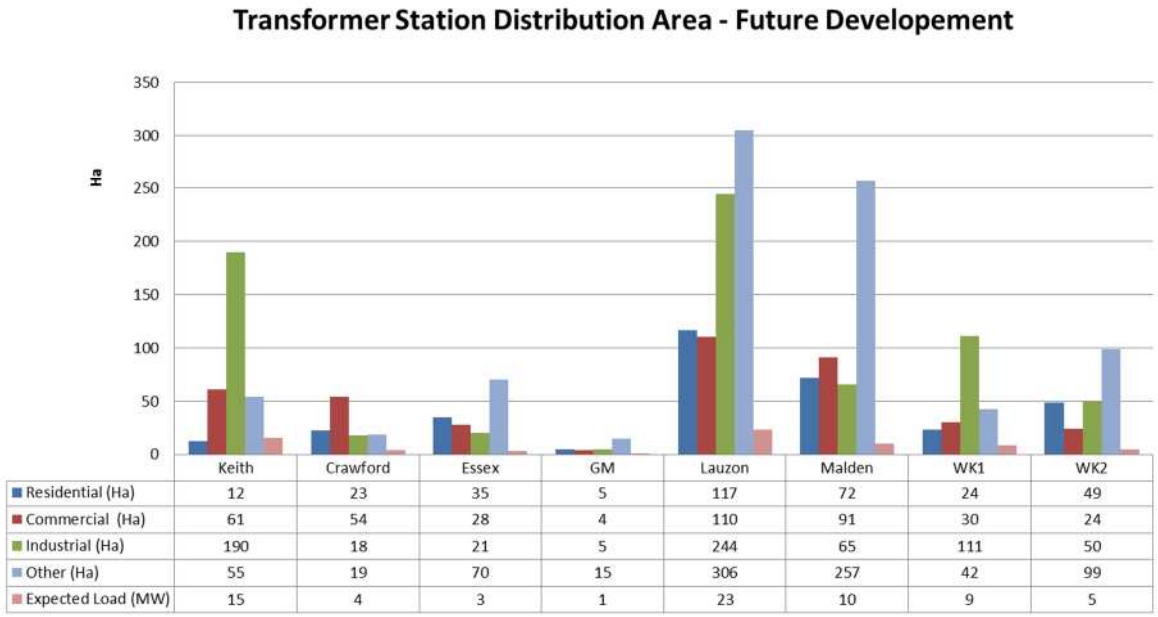


Figure 72 above shows the land availability for future development in each transformer distribution area, and the expected load growth assuming the lands were fully utilized. As shown in this chart, assuming average consumption per land category, approximately 70 MW of additional supply capability would be needed in the ENWIN system. This estimate does not

include the future EV load; the supply capacity for future EV penetration is not considered as part of the general load growth scenario.

Most of the additional load goes to the already highly utilized Lauzon TS area. This issue is identified, and a plan is in place to build high-capacity feeders from Essex/Walker I & II TS to the Lauzon TS area to reduce the Lauzon TS feeder footprint and feeder load. As indicated under the Lauzon TS subsection above, a long term plan is in place to reconfigure some of the Lauzon TS feeders to bring the 56M8 loading and customer count down to an acceptable level.

As indicated above, asset utilization is not equal throughout the ENWIN system, but there are currently no critical asset utilization issues related to station or feeder usage. Plans are in place to balance utilization of assets throughout the distribution system, and to make the distribution system more reliable.

System Capacity expectations in the Forecast Period;

Within the DSP Forecast Period there are capital projects related to infrastructure. Some of these projects provide additional incremental investments to increase the line capacity for contingency requirements, but none of the projects are directly related to projected load capacity increases.

5.3.3 Asset lifecycle optimization policies and practices

An understanding of a distributor's asset lifecycle optimization policies and practices will support the regulatory assessment of system renewal investments and decisions to refurbish rather than replace system assets. Information provided should be sufficient to show the trade-off between spending on new capital (i.e. replacement) and life extending refurbishment, and should include but need not be limited to:

a) A description of asset lifecycle optimization policies and practices, including but not necessarily limited to:

• A description of asset replacement and refurbishment policies, including an explanation of how (e.g. processes, tools) system renewal program spending is optimized

• A description of routine system operations and maintenance (system operating and maintenance (O&M)) activities carried out to sustain required distribution system performance to the end of the subject asset's service life. Including but not limited to preventative inspection and maintenance policies, practices and programs (can include references to the Distribution System Code (DSC))

• A description of how asset replacements are prioritized and scheduled to align with budget envelopes and how the impact of system renewal investments on routine system O&M is assessed

• A description of maintenance planning criteria and assumptions

b) A description of asset life cycle risk management policies and practices, assessment methods and approaches to mitigation, including but not necessarily limited to the methods used, types of information inputs and outputs, and how conclusions of risk analyses are used to select and prioritize capital expenditures

5.3.3 Asset Lifecycle Optimization Policies and Practices

In managing its assets, ENWIN applies sound technical, social, financial and economic policies and practices that consider present and future needs. To guide the AMPRO, the following policy statements have been developed:

1. ENWIN will continuously refine its AMPRO to meet system capacity, reliability, security and operating requirements while ensuring long term affordability and responsible stewardship of the distribution system.

2. ENWIN will continue to meet and maintain regulatory and service requirements, employing good utility practices, while balancing customer expectations and lifecycle costs.

3. ENWIN will maintain compliance to health and safety policies, environmental regulations, and electricity rates and filing requirements.

4. ENWIN will optimize capital and maintenance costs throughout the lifecycle of the asset, and corporate value will be enhanced through timely asset renewal.

5. ENWIN will drive asset investment decisions through condition-based system analysis with a goal to extend asset useful life, as appropriate.

6. ENWIN will continually assess evolving technologies for consideration and potential application.

7. ENWIN will incorporate the requirements of Ontario's LTEP into its plans for accommodating system growth, asset replacement, and renewal, as appropriate.

5.3.3 (a) Description of Asset Lifecycle Optimization Policies and Practices

Asset Replacement and Refurbishment Considerations

ENWIN utilizes a combination of patrols and maintenance activities to complete inspection requirements, and records information regarding the condition of distribution assets. A minimum of one-third of each major asset is either patrolled or has maintenance performed each year. This ensures that all assets are inspected a minimum of once every three years. During a patrol, minor maintenance or critical items that may be immediately addressed are resolved and reported. Major maintenance that requires more complex coordination is subsequently scheduled for completion within the year or planned for future years.

ENWIN analyzes the information gathered during the inspection and maintenance routines as part of condition-based asset assessments. Decisions to replace assets, as opposed to proceeding with ongoing maintenance to extend the life of the asset, are determined based on business case assessments. Attributes that are considered in the repair/replace decision include: the cost of repair/maintenance vs. replacement (including all costs such as staffing, training, stocking, etc.); the expected increase in service life; the ability to detect failure; consequence of failure; likelihood of failure; obsolescence of the unit; efficiency of the old vs. new unit; and the value of other features that a newer unit may provide.

Specific Asset Philosophies

Distribution System Assets

Pole Sustainment Philosophy: The alternatives for maintenance of pole assets are either run-to-failure or proactively maintain the poles to extend their life and replace them prior to failure. Given the dependence of ENWIN's customers on their electrical service and that the reliability of that service depends upon the health of the pole assets, ENWIN chooses to manage the pole infrastructure proactively through its pole sustainment program. ENWIN treats its poles with boron rods mid-life in order to extend the useful life of the pole.

Feeder Cable Sustainment Philosophy: The alternatives for maintenance of feeder cable assets are either run-to-failure or proactively maintain the cables to extend their life and replace them prior to failure. Given the dependence of ENWIN's customers on their electrical service and that the reliability of that service depends upon the health of the cable assets, ENWIN chooses to manage the cable infrastructure proactively through its feeder cable sustainment program. In some cases, it may be economic to undertake a cable injection to reinstate the cable insulation rather than replace the cable. The determination as to which alternative to cable sustainment is chosen is determined through consideration of the technical feasibility and economic advantage of each alternative.

Subdivision Cable Sustainment Philosophy: The alternatives for maintenance of subdivision cable assets are either run-to-failure or proactively maintain the cables to extend their life and replace them prior to failure. Repair and replacement of subdivision cable assets, particularly those that are direct buried, typically requires a great deal of effort and time. Given the dependence of ENWIN's customers on their electrical service, and that the reliability of that service depends upon the health of the cable assets, ENWIN chooses to manage the cable infrastructure proactively through its subdivision cable sustainment program. In some cases, it may be economic to undertake a cable injection to reinstate the cable insulation rather than replace the cable. The determination as to which alternative to cable sustainment is chosen is determined through consideration of the technical feasibility and economic advantage of each alternative.

Polyphase Padmount Transformer Sustainment Philosophy: The sustainment alternatives for padmount transformers are to either proactively maintain and replace the transformers or run them to failure. Padmount transformers, except for single phase residential style padmount (mini-pad) transformers, are generally used to serve larger commercial customers. Such customers are judged to suffer a greater degree of hardship due to loss of power than a residential customer. Consequently, to best serve those customers, ENWIN proactively maintains and replaces these transformers to avoid an in-service failure.

For small residential padmount transformers, ENWIN believes an in-service failure or a planned replacement will result in nearly the same level of inconvenience for customers, so ENWIN follows a "run to failure" philosophy for these types of transformers.

The exception is residential submersible transformers, as discussed below.

Submersible Transformer Sustainment Philosophy: The sustainment alternatives for transformers are to either proactively maintain and replace the transformers, or run them to failure. Submersible transformers are generally used to serve residential customers. Due to high failure rates of submersible transformers, it was decided to proactively replace submersible transformers with minipad transformers, where possible. To best serve customers, ENWIN proactively maintains and replaces submersible transformers in order to avoid an in-service failure. Should a submersible transformer fail in winter, there is a possibility that they may be frozen in place in an underground pit. This would then make their replacement extremely lengthy and, having regard for the potential for significant inconvenience of customers, ENWIN has chosen a sustainment philosophy of proactive replacement.

Minipad Transformer Sustainment Philosophy: The sustainment alternatives for padmount transformers are to either proactively maintain and replace the transformers or run them to failure. For small residential padmount transformers (minipads), ENWIN believes an in-service failure or a planned replacement will result in nearly the same level of inconvenience for customers, so ENWIN follows a “run to failure” philosophy for these types of transformers; this approach maximizes the service life of the equipment and minimizes costs.

Three-Phase Overhead Transformer Sustainment Philosophy: The sustainment alternatives for overhead transformers are to either proactively maintain and replace the transformers, or run them to failure. Three phase overhead transformer banks (and 3-in-1s) are generally used to serve larger commercial customers. Such customers are judged to suffer a greater degree of hardship due to loss of power relative to residential or small commercial customers. Consequently, to best serve these customers, ENWIN proactively maintains and replaces these transformers in order to avoid an in-service failure.

For small residential and commercial single phase overhead transformers, ENWIN believes an in-service failure or a planned replacement will result in nearly the same level of inconvenience, so ENWIN follows a “run to failure” philosophy for these types of transformers.

Single Phase Overhead Transformer Sustainment Philosophy: The sustainment alternatives for single phase transformers are to either proactively maintain and replace the transformers, or run them to failure. Single phase transformer customers are believed to suffer a lesser degree of hardship due to loss of power than commercial customers served by large three-phase transformers. Consequently, to best serve these customers, ENWIN reactively maintains and replaces three-phase transformers in order to maximize in-service life and minimize costs to the customer. For small residential and commercial single phase overhead transformers, ENWIN believes an in-service failure or a planned replacement will result in nearly the same level of inconvenience, so ENWIN follows a “run to failure” philosophy for these types of transformers.

Padmount Switching Unit Sustainment Philosophy: Switches are an important part of the distribution system and their proper operation is integral to the ability to manage other upset conditions on the distribution system. The in-service failure of a switch when it is being relied upon to isolate and/or connect distribution segments can significantly prolong an outage, and cause it to become more widespread. Consequently, it is imperative that switches be as or more reliable than other components of the distribution system.

ENWIN's philosophy is to repair or replace switches on a proactive basis to minimize the risk of in-service failure and, thus, enable the ability to restore power and minimize interruption of service to customers. Unit replacement is generally predicated on the condition of the housing, which is subject to corrosion. Once the shell is breached, the switch will be accessible to insects and animals, which can cause a fault.

Replacement due to component condition is predicated on the economic comparison between replacement and repair costs. ENWIN will generally refurbish a switching unit provided the shell is judged to be in reasonable shape and capable of being salvaged. When units are refurbished, they are fitted with vent kits in order to vent the interior so that moisture build-up and flashover will not occur. ENWIN regularly dry-ice blast cleans its live-front switching units every 5 years.

Manhole Sustainment Philosophy: Cable chambers/manholes are integral parts of the underground distribution infrastructure. Often, they are built in roadways and are regularly traversed by heavy vehicles. The sudden failure of a roadway manhole can result in vehicle damage, cable damage, and life-threatening endangerment of the vehicle driver. As such, ENWIN has an obligation to ensure that the cable chambers it places in roadways and other areas are properly maintained and remain in good structural condition. ENWIN's philosophy is to regularly inspect cable chambers/manholes and, where appropriate, remediate any deterioration prior to safety factors being compromised. ENWIN utilizes independent, expert third-party professional engineering firms to inspect the cable chambers/manholes, issue recommendations, and repair/replace cable chambers/manholes, as appropriate.

<u>General Plant Assets</u>

Fleet and Site

ENWIN uses a five year rolling capital replacement plan for both its Site and Fleet operations. This budget is based on the equipment life cycle, which is determined by utilizing seven years of equipment history and condition. The budget forecast amounts are adjusted over time for inflation, as required.

At times, an unexpected failure may occur, and the resulting repair expense far exceeds the value of the asset. When this occurs, ENWIN funds the replacement through the existing capital budgets. This is achieved by reassessing planned equipment replacements, and deferring lower priority replacement expenses or projects, as appropriate.

ENWIN uses a blend of in-sourced and out-sourced maintenance services for its fleet services operations. ENWIN employs only the required number of staff to safely maintain the fleet vehicles. External resources are contracted to provide services for light duty drive clean, tire service, spring work, body work, and drivability (including warranty repairs, engine and transmission issues, etc.).

ENWIN's Site department maintains a minimum level of internal staff resources to attend to the day-to-day building and property maintenance duties. Other services such HVAC, electrical, plumbing, and construction work are out-sourced to external contractors. The blending of in-sourced and out-sourced services allows for optimal staffing levels for day-to-day operations, while providing additional resources and expertise for peak periods. By utilizing the expertise of professional inspection services to assess the condition of equipment / buildings, ENWIN is able to determine the necessary repairs required to extend the lifecycle of the assets and the appropriate replacement timeline. The utilization of an engineering service to assist with consultation and design of replacement equipment helps to ensure that ENWIN procures the best energy efficient design and equipment for the required application.

The ENWIN Fleet department continues to explore different technologies in order to reduce the operating cost of the fleet. ENWIN will continue to monitor the evolution and viability of electric fleet vehicles and, when economically justified, will adjust the multi-year fleet replenishment plans accordingly.

Tests are underway to assess the feasibility of:

1. introducing an electrically operated power take off (PTO) system for an aerial device (bucket truck);
2. the reduction of truck engine sizes from V8 to V6 with 8 speed transmissions, where possible;
3. the installation of anti-idle devices; and
4. the installation of cab heaters in trucks to reduce fuel consumption and carbon footprint.

Rather than time-based or mileage-based oil changing, oil sampling and analysis is undertaken, and lab reports prepared, which recommend the ideal time for oil replacement in vehicles. This has resulted in a reduction in costs and the amount of used oil products going into the waste stream.

Information Technology ("IT")

Each IT asset is assigned an estimated asset life, which is based on the criticality of the asset, industry best practice, and vendor specifications. Although ENWIN relies on this information to make investment decisions, it also relies on the following key data: vendor, contract, and license information; security risks; interdependencies with other IT assets; capacity planning; and utilisation reviews.

The objective of ENWIN's IT investment planning process is to maintain the IT assets to satisfy optimal system reliability and availability. This is intended to provide satisfactory levels of service for ENWIN and its customers, and to mitigate IT-related business and operational risks in a cost efficient manner.

Capital and Maintenance Sustainability Review and Budgeting

This activity involves the consideration of capital and maintenance sustainability. Specifically, project selections are made and budgets drawn based on consideration of the priority of competing projects and the availability of capital and human resources. To the extent possible and appropriate, large variations in capital spend are smoothed out to avoid large rate impacts and improve rate predictability for customers. Similarly, large variations in human resources are, to the extent possible and appropriate, smoothed out to ensure realistic activity targets, avoid increased costs associated with significant increases in labour outsourcing, and improve rate predictability for customers. In some cases, programs are identified to continue for a number of years, and those programs may be justified and approved to take up resources in the capital and operating plans for the specified period. This activity informs the corporate effort to fulfill the resource requirements needed to sustain the assets. The outputs of this activity are capital and operating and maintenance budgets for the upcoming year, and projections for the subsequent 4 years.

Long-term analysis of the age and health indices of major asset classes inform whether current investment levels will remain appropriate, or will be required to increase or decrease. Forecasts for investment in other investment categories are made and inform the determination of a capital and O&M investment envelope, within which individual initiatives are prioritized.

In general, System Access expenditures are considered mandatory and hence top priority.

System Renewal initiatives generally take the next priority. However, General Plant initiatives my take precedence over System Renewal investments in cases where customers have expressed a strong preference to complete the former over the latter.

The prioritization of initiatives is more fully discussed in section 5.4.1 (b).

Impacts of System Renewal Investments on System O&M

System Renewal investments typically involve the replacement of existing assets on a like-for-like basis. Capital investments in the System Renewal category are primarily driven by the results of ENWIN's AMP with verification by the ACA. Overall, ENWIN's investment in System Renewal has been relatively consistent year over year and is projected to remain so through the DSP prospective years.

System O&M investments primarily consist of inspection of assets and, in the case of wood poles, the application of a decay preventative measures. The rate of inspections is dictated by the DSC; thus, the work and cost of inspections is generally unaffected by System Renewal investments. See section 5.4.3.1 (b) for a full discussion on the impacts of System Renewal investments on O&M costs.

Maintenance Planning Criteria and Assumptions

ENWIN optimizes asset lifecycles by performing inspections to monitor the health of distribution system assets, performing preventative and corrective maintenance where necessary and determined to be financially prudent, and proactively replacing critical assets at or near their EOL.

ENWIN performs maintenance activities on the more expensive assets to retain their value and functionality. Maintenance activities generally fall into three (3) categories: predictive maintenance, preventative maintenance, and condition-based maintenance.

1. Predictive maintenance primarily consists of asset inspections and testing. Inspections are scheduled to be conducted on one-third of the distribution system each year, so as to maintain accordance with the minimum inspection requirements outlined in Appendix C of the DSC.

2. Preventative maintenance consists of activities that are undertaken proactively to extend the trouble-free operation of an asset, and ensure the continued reliable operation of such asset. Preventative maintenance is performed on a cyclical basis, and typically coincides with ENWIN's inspection cycle.

3. Condition-based maintenance activities are undertaken on a reactive basis once an asset is identified as requiring corrective action to restore full functionality.

Inspection of assets is critical for the prioritization of operations and maintenance spending, as well as capital spending. The results of inspections are used to identify and prioritize system rehabilitation projects. The outcome of that process is a replace, repair, or do-nothing decision, which allows ENWIN to optimize System Renewal investment impact. Assets for which replacement of the asset or reconstruction of the surrounding system is identified as the ideal solution are prioritized and replaced under specific projects.

For assets where replacement is not deemed to be the ideal approach, ENWIN's O&M programs include minor repair and maintenance work that is designed to economically extend asset lives. In both cases, planned replacement projects or planned operations and maintenance activities are selected to align with budget envelopes by optimizing the scope and timing of work during project prioritization and selection processes.

Maintenance and Inspection Policies, Practices and Programs

ENWIN undertakes a variety of distribution plant maintenance programs, including an extensive inspection and maintenance program for its station assets. The distribution maintenance programs are described below:

Pole Testing and Maintenance – ENWIN inspects its pole assets on a three-year rotating cycle in accordance with the DSC. Poles are inspected to determine residual pole strength. Wood poles are drilled either when showing signs of deterioration or at an in-service milestone depending on treatment. When a pole is showing external signs of deterioration, the pole is drilled to determine if there has been any centre rot and, if so, the extent of the rot. The pole is treated with boron rods to act as a preservative for the wood and extend the life of the pole.

ENWIN began drilling poles on their in-service anniversary in order to try to inject preservative into the pole prior to rot beginning inside the pole. A consultation was done with other utilities regarding their practices, and it was determined that western red cedar butt treated poles would be drilled at their 20-year in-service anniversary, and red pine poles with full length treatment will be drilled at their 30-year anniversary. It is expected that, in time, this practise will lead to the achievement of the full expected useful life of a wood pole, as recommended by Kinectrics in their *Asset Depreciation Study for the Ontario Energy Board* report, or longer.

ENWIN has observed that the deterioration of concrete poles is precipitated by oxidation of the steel re-bar within the poles. Once this re-bar begins to oxidize, that oxidization will cause the re-bar to swell and spall the concrete cover on the re-bar. Once spalling starts, the deterioration proceeds rapidly, and once solid contact between the re-bar and the concrete is lost, the strength of the pole is jeopardized.

For new concrete poles, ENWIN implemented in 2018 the addition of anti-corrosion inhibitor in the concrete mixture. This measure is intended to extend the life of the pole for a very small additional acquisition cost. For existing poles, ENWIN has been investigating the use of reinforced concrete preservative treatments that are currently marketed. These treatments are applied topically to the poles and the preservative migrates through the concrete, binds to the steel re-bar, and acts to inhibit the formation of iron oxide or the rusting of the re-bar.

ENWIN has begun treatment of its concrete poles as a pilot using students to paint the poles in the summer. Most of the deterioration seen is between ground line and about 2 meters up. It is thought that this area is within the “splash zone” for salty water during the frequent winter thaws that are common in the Windsor area. Thus, painting the areas that a student can reach by hand is thought to be sufficient.

Topical treatment is expected to be required only every 5-10 years. ENWIN is also investigating pole patching products and techniques to apply on poles that are already on initial stages of spalling. Two pilot projects were implemented in 2018 to evaluate the effectiveness of this

procedure in delaying the deterioration of concrete poles and consequently extending the asset life.

Infrared Inspection – ENWIN's above-ground distribution system is inspected using an infrared camera on a three-year cycle in accordance with the DSC. The infrared camera will detect hot spots in the distribution equipment, which may indicate a defective connection, overloading, or insufficiently sized conductors. Where hot spots are detected, work orders are created to further investigate and remedy the hot spot.

Drone Inspection – ENWIN has begun aerial equipment inspections using a high-resolution camera attached to a drone. This provides ENWIN the opportunity to see the equipment up close to examine it for deterioration and to make photographs of the equipment. In the past, this needed to be done by two people – a qualified powerline maintainer in a bucket truck with a ground spotter. Now, the inspection is able to be accomplished with a single, trained staff member that is on modified duties due to health issues. This has enabled ENWIN to accomplish these inspections in a much more cost-effective manner than in the past. Unfortunately, new legislation is proposed which may eliminate the use of drones as an effective inspection tool. The new legislation would require drones to stay 30 m away from any structure, and to be operated by licensed pilots.

Manhole Inspection and Maintenance – ENWIN has its manholes inspected on a cycle that is recommended by third-party professional engineers, who are contracted to undertake the inspection. The engineers also indicate any areas that require remediation, which are then engineered and queued for execution in the following year, unless the situation is urgent. The engineers will specify a re-inspection date that will either be 3, 5 or 10 years from the date of the current inspection. ENWIN also inspects annually its underground vaults that are provided by customers, generally to house the transformers feeding the customer's building.

Vegetation Management – ENWIN performs tree trimming once every three years over its service territory. In 2017, ENWIN's Board of Directors approved changes to ENWIN's approach to tree trimming with the intention of bringing ENWIN in conformance with industry best practices, and to provide a cost neutral improvement in service reliability to customers. The primary conductor tree clearance was increased to match industry best practises at 10 ft, and a targeted tree trimming and tree removal program was developed and implemented.

Padmount Switching Unit Inspection and Maintenance – ENWIN inspects its padmounted switchgear every three years. On a five-year cycle, ENWIN hires a third party to dry ice blast clean its switchgear. Thermographic inspections are performed before and after the cleaning to identify any hot spots or tracking, and to ensure that they have been adequately remediated.

Overhead Recloser and Switch Inspection and Maintenance – ENWIN inspects and operates its overhead reclosers and switches on an annual basis to ensure they are readily operable. Where units are operated during the course of the year, they will not be inspected again. If a unit is able to be operated remotely, then the switch movement is done remotely with field staff in

attendance and monitoring the operation. This also tests the functionality of the SCADA and communication systems at the same time. If the inspection indicates that maintenance is required, such maintenance will be scheduled.

Cold Spray Technology – ENWIN implemented a pilot project to explore "Cold Spray" technology to perform repairs of transformer and switchgear enclosures, and to provide an effective corrosion protection of the repaired areas to extend the asset life. Preliminary analysis of the field repairs shows that the maintenance cost can be substantially reduced by the application of this technology, as it helps extend the equipment maintenance intervals. ENWIN is planning to continue to apply the technology in units that start to show signs of enclosure corrosion, and will continue to assess the effectiveness of the technology.

Fleet Inspection and Maintenance – All fleet equipment is subject to a preventive maintenance and inspection program, and all data from these inspections is captured on an SAP work order, and stored in ENWIN's SAP asset maintenance system. Fleet vehicles are scheduled four times per year for lubricant and safety inspection. At this time, each vehicle is assessed, and any component that is deemed unsafe, or worn to a point where it will likely not continue to function properly until the next inspection, is repaired or replaced.

Vehicles over 4545 kg undergo an MTO annual safety inspection, as required under the *Highway Traffic Act* (Ontario). If any safety-related issues are detected, the relevant components are repaired or replaced. When fleet vehicles are required to undergo emission ("Drive Clean") inspections, any deficiencies found during these inspections are also repaired.

All driveline components are inspected and maintained as per the manufacturers' specifications, and aerial devices are scheduled for preventative maintenance service and inspection four times per year in accordance with manufacturers' requirements. An annual lifting inspection and dielectric test/inspection is also performed as required by the Ministry of Labour and in accordance with CSA (and ANSI) standards.

Building Inspection and Maintenance – All HVAC equipment is subject to a preventive maintenance and inspection program, which are designed to follow the manufacturers' recommendations and performance measurements. These preventative maintenance services and inspections are completed by a contract service that supplies the qualified service personnel for each particular type of equipment (e.g. refrigeration mechanic, boiler technician, etc.). Elevators, fire suppression systems, and emergency generators are all scheduled for monthly inspections to ensure their safety and performance. These types of equipment are scheduled for either quarterly or annual preventative maintenance and inspections, in accordance with the relevant regulatory requirements and manufacturers' recommendations.

IT Assets – IT assets are covered in section 5.4.3.1 (a).

5.3.3 (b) Asset Lifecycle Risk Management Policies and Practices

Methods Used, Inputs and Outputs

Asset lifecycle optimization policies and practices are thoroughly described in the Kinectrics ACA report (*Appendix A – Kinectrics Asset Condition Assessment*) and summarized below.

Managing Asset Lifecycle Risk Using a Probabilistic Approach

For assets that have low consequences of failure or that are run to failure, a probabilistic approach is taken to estimate the number of units that are flagged for action in a given year. For such asset types, the number of units expected to be replaced in a given year are determined based on the asset's removal rates. Note that in this study, the "age" used is in fact "effective age", or condition-based age, if available, as opposed to the chronological age of the asset.

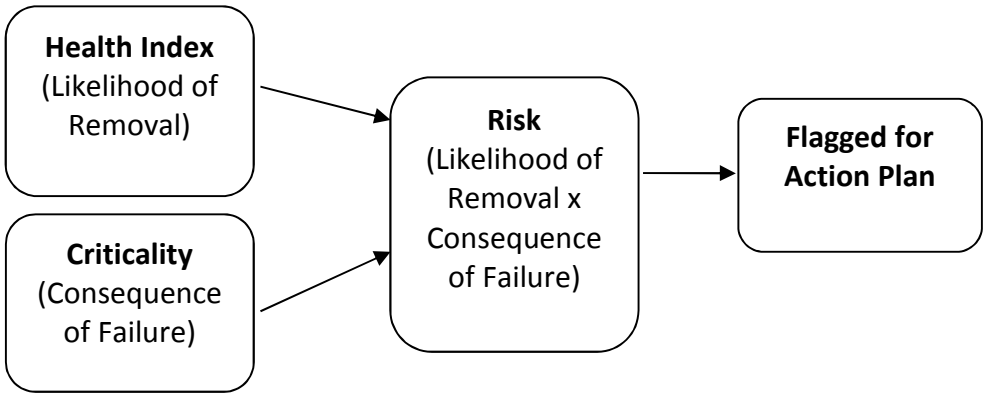
For the asset categories below, the probabilistic approach is used to estimate the FFA plan in the ACA report. The FFA gives the estimated number of assets per year that need to be addressed. The asset categories are:

1. Instrument transformers
2. Relays
3. PLC systems
4. Reclosers
5. Overhead switches
6. Poles
7. Distribution transformers
8. Pad mounted switchgear
9. Primary underground cables
10. Manholes

Managing Asset Lifecycle Risk Using a Prioritized Approach

For certain asset classes, costs of replacement and/or consequences of failure are more significant than others. As such, planning for replacement requires more consideration. For these assets, a risk-based approach is taken when developing the FFA plan. This risk-based methodology considers both the asset likelihood of removal (as related to health index), and its consequence of failure (criticality). The product of likelihood of removal and consequence of failure determines asset risk. Figure 73 below shows a flow chart for managing asset lifecycle risk.

Figure 73 Managing Asset Lifecycle Risk



To develop an FFA plan, the risk of removal of each unit must be quantified. Risk is the product of a unit's likelihood of removal and its consequence of failure. An asset unit is FFA when the calculated risk value exceeds a pre-set threshold.

For the asset categories listed below, the risk-based approach is used to estimate the FFA plan.

1. Power transformers (main tank + LTC)
2. Station service transformers
3. Grounding transformers
4. Station breakers
5. Station switches
6. Station batteries

It is important to note that, with this approach, in addition to the estimated number of assets per year that need to be addressed, the "FFA Year" (i.e. the years that a particular unit is flagged for action) is calculated for each asset unit.

Risk Analysis to Select and Prioritize Expenditures

ENWIN uses a risk matrix approach to select and prioritize capital expenditures. The risk matrix combines consequences and likelihood of asset failure to estimate the risk to a given business value. The combination of the consequence and likelihood calculates the corresponding risk score for each business value. ENWIN's Corporate Risk Matrix is shown in section 5.4.1 (b) of this DSP.

ENWIN calculates the "Total Risk Score" before a project is implemented, and a Total Risk Score after the project is completed to calculate the "Change in Risk Score".

Projects are prioritized and ranked by taking the total cost of the project and dividing it by the total Change in Risk Score, which equals the "Risk Reduction Factor". The project prioritization tool (PROSORT) includes a provision to add incremental benefits that impact the Total Risk Score if investments are prioritized for such projects. For example, projects that provide

benefits such as adding more capacity to areas that are projected for future load growth, or projects that increase the overall reliability of the system, are captured by the tool. This approach ensures that investments are taking place for each category in the most effective manner.

The project rankings are reviewed by ENWIN's senior management team and discussed with all impacted groups including Engineering and Operations to ensure buy-in to the plan, a consistent corporate approach to distribution investments, and alignment with customer feedback.

More information on how conclusions of risk analyses are used to select and prioritize capital expenditures can be found in Section 5.4.3.2 (Material Investments).

5.3.4 System capability assessment for renewable energy generation

A distributor's investments to accommodate and connect REG (including connection assets, expansions and/or renewable enabling improvements) are integral to its DSP. This includes all costs to connect renewable generation facilities that will be the responsibility of the distributor under the DSC, and are therefore eligible for recovery through the provincial cost recovery mechanism set out in section 79.1 of the OEB Act. REG investments can be stand-alone or integrated into a project/program; and are to be categorized for the purposes of section 5.4 in the same way as any other investment.

This section provides information on the capability of a distributor's distribution system to accommodate REG, including a summary of the distributor's load and renewable energy generation connection forecast by feeder/substation (where applicable); and information identifying specific network locations where constraints are expected to emerge due to forecast changes in load and/or connected renewable generation capacity.

In relation to renewable or other distributed energy generation connections, the information that must be considered by a distributor and documented in an application (where applicable) includes:

a) Applications from renewable generators over 10 kW for connection in the distributor's service area

b) The number and the capacity (in MW) of renewable generation connections anticipated over the forecast period based on existing connection applications, information available from the IESO and any other information the distributor has about the potential for renewable generation in its service area (where a distributor has a large service area, or two or more non-contiguous regions included in its service area, a regional breakdown must be provided)

c) The capacity (MW) of the distributor's distribution system to connect renewable energy generation located within the distributor's service area

d) Constraints related to the connection of renewable generation, either within the distributor's system or upstream system (host distributor and/or transmitter)

e) Constraints for an embedded distributor that may result from the connections

5.3.4 (a) Application History

ENWIN has connected 801 generators with a total capacity of 47,735 kW, including 71 FIT (5,887 kW), 716 mFit (15,807 kW), 5 net metering (30 kW), 3 CHP (4,600 kW) and 6 load displacement (21,411 kW) generators.

A summary of renewable energy generator connection history can be found in Tables 57 and 58 below.

Table 57 Summary of Renewable Energy Generator Connection History

Type	Pre-2000	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
CHP	none	none	none	none	none	none	none	none	1	2	3
FIT	none	none	1	5	10	24	7	18	5	1	71
LD	4	1	none	1	none	none	none	none	none	none	6
mFIT	none	23	56	89	82	27	117	128	94	100	716
NET	none	none	none	none	none	none	4	none	none	1	5
Total	**4**	**24**	**57**	**95**	**92**	**51**	**128**	**146**	**100**	**103**	**801**

Existing Number of Generator Connections by Year and Type

Table 58 Summary of Renewable Energy Generator Connection History

Type	Pre-2000	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
CHP	none	none	none	none	none	none	none	none	400	4200	4600
FIT	none	none	38	1250	2219	5058	1555	3773	1434	480	15807
LD	21400	1	none	10	none	none	none	none	none	none	21411
mFIT	none	153	402	667	644	208	1062	1242	746	763	5887
NET	none	none	none	none	none	none	20	none	none	10	30
Total	**21400**	**154**	**440**	**1927**	**2863**	**5266**	**2637**	**5015**	**2580**	**4973**	**47735**

Existing Generator Connected Load (kW) by Year and Type

5.3.4 (b) – Forecast REG Connections

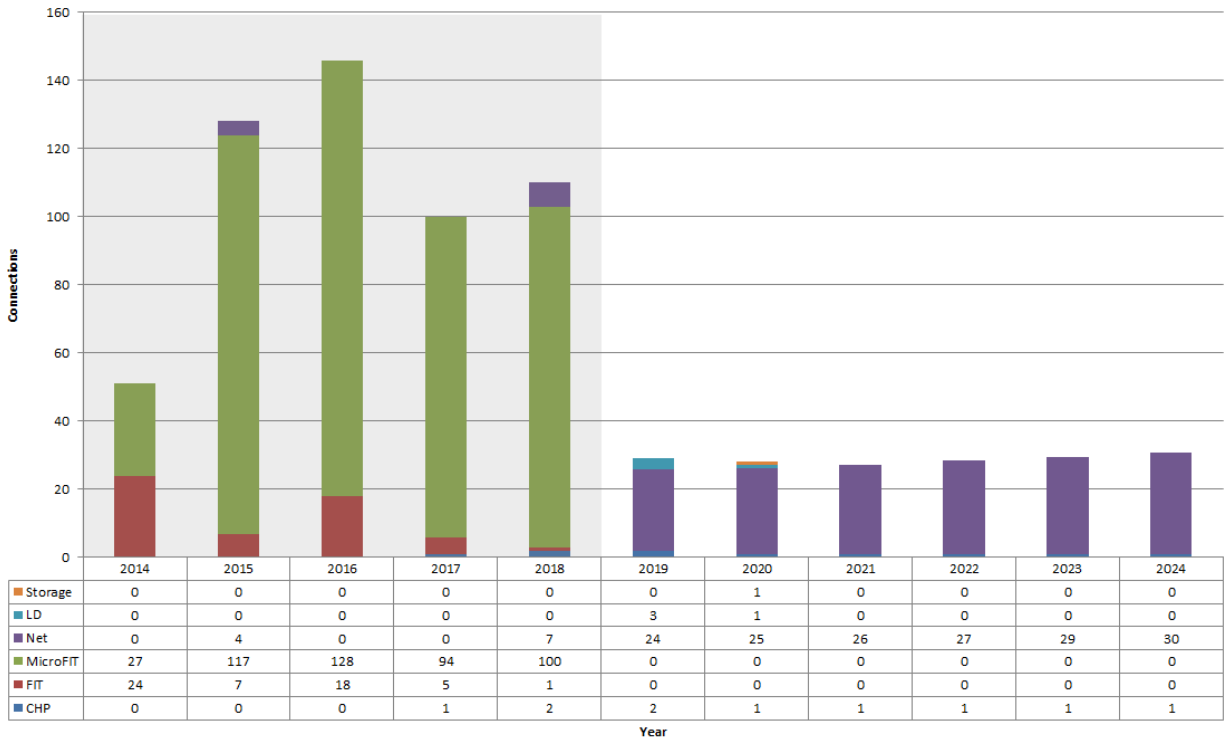
With the elimination of the FIT and mFIT programs, ENWIN has already seen a large decrease in the number of distributed generation projects. Projects have shifted to net metering, load displacement and CHP/co-generation projects.

Based on connection and application activity over the months since the mFIT program has ended, ENWIN anticipates distributed generation connections in 2019 to drop to roughly 30% of the 2018 numbers. 2020 should see a large rise in generation connected due to a 9.2 MW project that is scheduled to be connected, a 6.0 MW load displacement project, and a 4.2 MW energy storage project that has recently applied for connection.

ENWIN's forecast over the Forecast Period is shown in Figure 74 below. This forecast is based on the projects in which applications have been submitted, and a National Energy Board report

titled Canada's Energy Market 2018.[2] In this report, it is implied that Canada's solar generation installed capacity will increase from 2.3 GW to 6.3 GW from 2017 to 2040. This implies a growth rate of 4.5% per year. Figures 74 and 75 below show the forecast REG connections and their capacities.

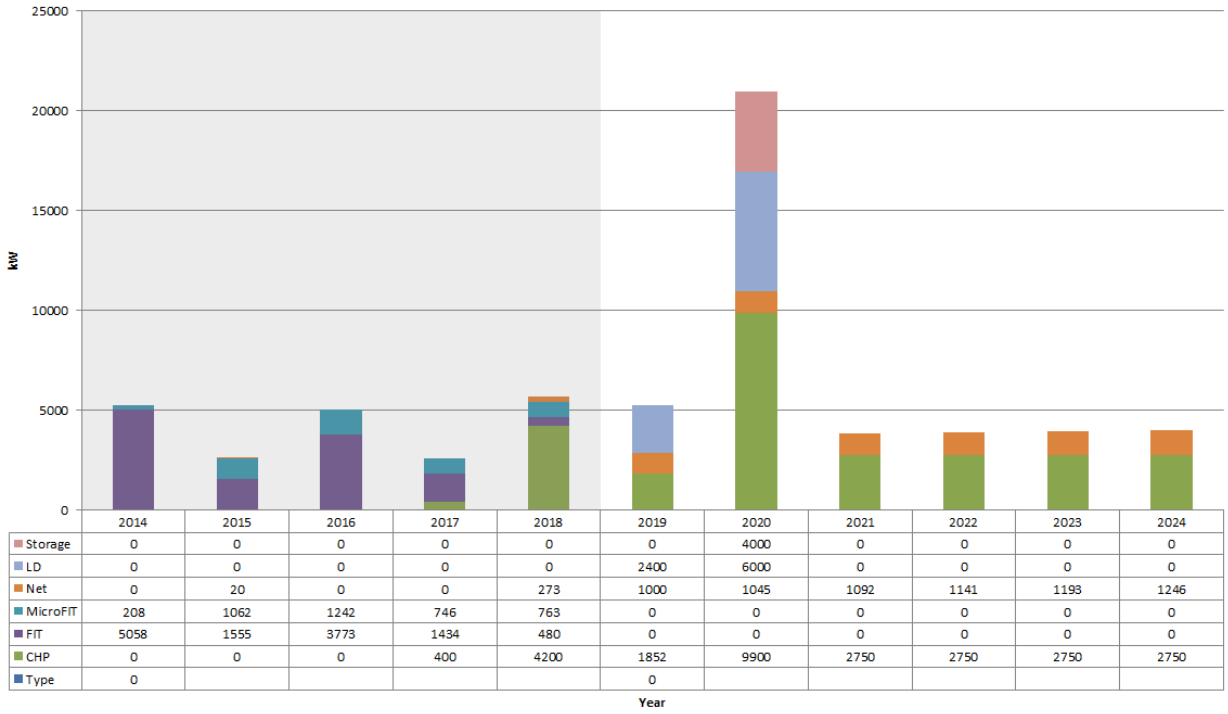
Figure 74 Forecast REG Connections



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Storage	0	0	0	0	0	0	1	0	0	0	0
LD	0	0	0	0	0	3	1	0	0	0	0
Net	0	4	0	0	7	24	25	26	27	29	30
MicroFIT	27	117	128	94	100	0	0	0	0	0	0
FIT	24	7	18	5	1	0	0	0	0	0	0
CHP	0	0	0	1	2	2	1	1	1	1	1

Figure 75 Forecast REG Connection Capacities

[2] https://www.neb-one.gc.ca/nrg/ntgrtd/ftr/2018/2018nrgftr-eng.pdf



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Storage	0	0	0	0	0	0	4000	0	0	0	0
LD	0	0	0	0	0	2400	6000	0	0	0	0
Net	0	20	0	0	273	1000	1045	1092	1141	1193	1246
MicroFIT	208	1062	1242	746	763	0	0	0	0	0	0
FIT	5058	1555	3773	1434	480	0	0	0	0	0	0
CHP	0	0	0	400	4200	1852	9900	2750	2750	2750	2750
Type	0					0					

5.3.4 (c) System Capability Assessment for Generation

ENWIN's distribution system provides services to approximately 90,000 customers through 43 distribution feeders and 8 TSs. The latest addition to the list of distribution stations in ENWIN's non-automotive distribution system is the reconfigured old GM MTS. The Chrysler, Ford Powerhouse and Ford Annex TSs are each dedicated for automotive manufacturers, and are not available for REG connections from other general customers.

Table 59 Details of Distribution Stations

Station Name	Owner	HV(kV)	LV(kV)	Transformer Rating (MVA)	Number of Feeders
Crawford TS	HONI	115	27.6 kV	50/67/83	10
Keith TS	HONI	230	27.6 kV	50/67/83	3
Malden TS	HONI	230	27.6 kV	75/100/125	6
Lauzon TS	HONI	230	27.6 kV	50/200	7
Essex TS	HONI	115	27.6 kV	50/67/83	6
Walker 1 TS	HONI	115	27.6 kV	50/67/83	5
Walker 2 TS	ENWIN	115	27.6 kV	50/67/83	6
GM MTS	ENWIN	115	27.6 kV	20/27/33	2
Chrysler MTS	ENWIN	115	27.6 kV	30/40/50	4
Ford Powerhouse MTS	ENWIN	115	27.6 kV	30/40/50	2

Ford Annex MTS	ENWIN	115	13.8 kV	18/24/33	4

As shown above in Table 59, of the eight normal distribution stations, six of them are owned by HONI. HONI has already constructed short circuit limiting inductors for the Keith TS and Walker 1 TS to increase their short circuit capability to accept generation. It is ENWIN's responsibility to maintain and manage the acceptability of REG in ENWIN-owned TSs. Table 60, below, shows the available capacity of HONI and ENWIN-owned TSs to accept photovoltaic ("PV") inverter based generation as of October 2018.

The "Thermal Capacity" metric represents the estimated total name plate amount of generation that can be connected to the distribution system that is supplied by the subject bus or station. The "Short Circuit Capacity" represents the estimated total acceptable short circuit contribution by generators connected to the distribution system that is supplied by the subject bus or station.

HONI's calculation of the capacity of their stations to accept generation takes into account that 5% of the short circuit capacity is reserved for system changes or other transmission reconfiguration possibilities.

Table 60 Total Available Generation Capacity of TSs (PV)

Hydro One Distribution Generation List of Station Capacity October 31, 2018 HONI_LSC.pdf

Station Name	Bus Name	Feeder Name	Voltage (kV)	Minimum Load (MW)	Short Circuit Capacity (MVA)	Thermal Capacity (MW)	Renewable Generation (PV) MW
ESSEX TS	JQ	M5, M6, M7, M8, M10, M11	27.6	14.33	104.6	54.3	54.3
CRAWFORD TS	EY	M5, M6, M7, M8, M8, M9, M10, M11, M12, M13, M14	27.6	25.11	54.9	65.1	45.8
MALDEN TS	B	M1, M3, M5, M7, M9, M11	27.6	25.43	89.1	50.4	50.4
MALDEN TS	Y	M2, M4, M6, M8, M10, M12	27.6	16.21	84.5	41.2	41.2
LAUZON TS DESN1	BQ	M1, M2, M3, M4, M5, M6, M7, M8	27.6	24.10	210.0	64.1	64.1
WALKER TS #1	QE	M1,M2,M3,M5,M6	27.6	35.30	198.6	75.3	75.3
WALKER TS #2	QE	M21,M22,M23,M25,M26	27.6	17.00	44.7	86.0	37.3
KEITH TS DESN1	BY	M1, M2, M3, M4, M5, M6	27.6	20.17	152.8	60.2	60.2
GM MTS	BY	M1,M2	27.6	5.38	171.6	37.9	37.9

Hydro One Distribution Generation List of Station Capacity October 31, 2018 HONI_LSC.pdf							
Station Name	**Bus Name**	**Feeder Name**	**Voltage (kV)**	**Minimum Load (MW)**	**Short Circuit Capacity (MVA)**	**Thermal Capacity (MW)**	**Generation (Syn) MW**
ESSEX TS	JQ	M5, M6, M7, M8, M10, M11	27.6	14.33	104.6	54.3	20.9
CRAWFORD TS	EY	M5, M6, M7, M8, M8, M9, M10, M11, M12, M13, M14	27.6	25.11	54.9	65.1	11.0
MALDEN TS	B	M1, M3, M5, M7, M9, M11	27.6	25.43	89.1	50.4	17.8
MALDEN TS	Y	M2, M4, M6, M8, M10, M12	27.6	16.21	84.5	41.2	16.9
LAUZON TS DESN1	BQ	M1, M2, M3, M4, M5, M6, M7, M8	27.6	24.10	210.0	64.1	42.0
WALKER TS #1	QE	M1,M2,M3,M5,M6	27.6	35.30	198.6	75.3	39.7
WALKER TS #2	QE	M21,M22,M23,M25,M26	27.6	17.00	44.7	86.0	8.9
KEITH TS DESN1	BY	M1, M2, M3, M4, M5, M6	27.6	20.17	152.8	60.2	30.6
GM MTS	BY	M1,M2	27.6	5.38	171.6	37.9	34.3

Table 60 above shows the total available generation capacity of each TS. The Malden, Keith and Lauzon TSs are shared with HONI. However, in a shared TS, generation capacity is not shared equally between each party. The generation capacity is allocated based on a first-come, first-serve basis. To facilitate the capacity allocation process, HONI provides a capacity calculator to determine the capacity of each feeder. The calculator data updates monthly, based on the applications for capacity that are processed.

Table 61 Present Status of ENWIN Feeder in Shared TS

Present status of EnWin feeder in shared TS (As per HydroOne Calculator)					
Station	**Feeder**	**Pending (kW)**	**Connected (kW)**	**Total (kW)**	**Remaining Capacity (kW)**
Keith	23M1	0.00	4,351.00	4,351	12,100
	23M2	100.00	407.00	507	13,585
	23M6	0.00	0.00	-	13,588
	23M21	0.00	0.00	-	-
Malden	24M1	0.00	750.00	750	635
	24M2	9,200.00	0.00	9,200	10
	24M3	0.00	105.00	105	634
	24M4	0.00	271.00	271	634
	24M5	5.00	514.00	519	10
	24M6	0.00	884.00	884	634
Lauzon	56M1	0.00	194.00	194	19,000
	56M2	0.00	161.00	161	19,000
	56M3	650.00	985.00	1,635	11,350
	56M5	230.00	2,342.00	2,572	19,000
	56M6	0.00	31.00	31	19,000
	56M7	0.00	2,031.00	2,031	18,050
	56M8	400.00	819.00	1,218	19,000

As indicated in Table 61 above, at time of writing this DSP, there is available capacity to accept additional REG on the ENWIN distribution system.

The Chrysler, Ford Powerhouse and Ford Annex TSs are each dedicated for automotive manufacturers, and those stations are not available to accept generation unless the automotive manufacturers themselves elect to undertake a generation project. Therefore, those stations are not considered in the determination of the ENWIN system capacity to accept generation.

Table 62 below shows generation capacity by station, indicating the applied, already connected, and available capacity for both REG and CHP type generation.

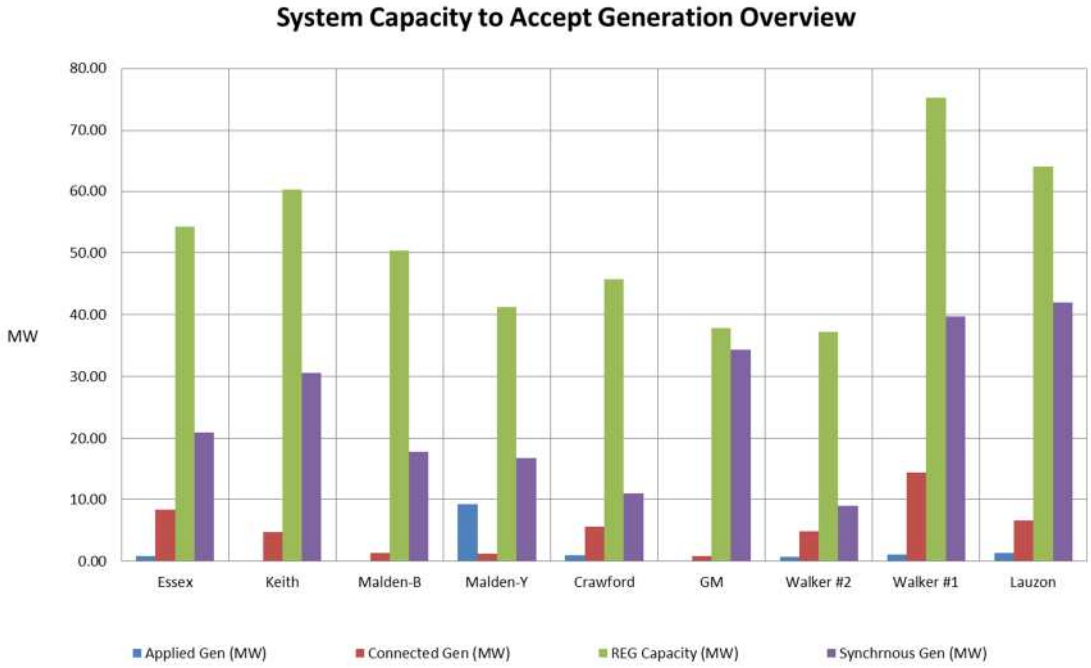
Table 62 Generation Capacity by Station

	Application Status		Generation Capacity Availability @ Oct_2018 (MW)	
Station	Applied	Connected	REG	SYN
Essex	0.87	8.37	54.3	20.9
Keith	0.10	4.76	60.2	30.6
Malden-B	0.01	1.37	50.4	17.8
Malden-Y	9.20	1.16	41.2	16.9
Crawford	0.93	5.56	45.8	11.0
GM	0.00	0.81	37.9	34.3
Walker #2	0.68	4.88	37.3	8.9
Walker #1	1.02	14.28	75.3	39.7
Lauzon	1.28	6.56	64.1	42.0
Total	14.09	47.75	466.4	222.2

There is a difference between the short circuit capacity that 10 MW inverter based generators (e.g. solar), and 10 MW synchronous generators (such as a natural gas turbine generator), will provide. In general, inverter based generators will provide available short circuit capacity at approximately 1.2 times their nameplate generation capacity. Synchronous generators, however, provide available short circuit capacity at approximately 5 times their nameplate generation capacity. Hence, a 10 MW synchronous generator will require approximately 50 MW of available capacity at the station.

Generation capacity could be limited due to the TS limitations, feeder performance, or feeder thermal capacity limitations. Station capacity is generally limited by either the thermal capacity of the transformers, or the short circuit capacity of the station. The limitations on feeders to accept generation are based on either thermal capacity of the feeder conductors, or performance/protection issues of the feeder due to power flow direction. Table 62 above indicates the limitation of the total generation connected by respective station.

Figure 76 System capacity to Accept Generation Overview



As shown in Figure 76, above, ENWIN has total of 48 MW of distributed generation connected, and there is an additional 14 MW of generation for which applications have been received. Malden TS has a large 9.2 MW synchronous generation project for which the project capacity has already been allocated by HONI. Based on the published HONI information, the present application list will consume less than 10% of the available capacity to connect generation, in the worst-case scenario.

Table 63 below shows the generation connection capacity that has been allocated, and that which is pending, by feeder. The highest generation connected feeders are 55M6, 55M1, 25M5 and 15M6. One large CHP project will connect to the 24M2 feeder in 2020.

Table 63 Generation Connection Capacity by Feeder

Present status of EnWin feeder				
Station	**Feeder**	**Pending (kW)**	**Connected (kW)**	**Total (kW)**
Essex	15M10	0.00	121.00	121
	15M11	123.00	823.00	946
	15M5	0.00	131.00	131
	15M6	0.00	6,444.00	6,444
	15M7	0.00	88.00	88
	15M8	750.00	766.00	1,516
Keith	23M1	0.00	4,351.00	4,351
	23M2	100.00	407.00	507
	23M6	0.00	0.00	-
	23M21	0.00	0.00	-
Malden	24M1	0.00	750.00	750
	24M2	9,200.00	0.00	9,200
	24M3	0.00	105.00	105
	24M4	0.00	271.00	271
	24M5	5.00	514.00	519
	24M6	0.00	884.00	884
Crawford	25M10	10.00	146.00	156
	25M11	912.00	386.00	1,298
	25M12	0.00	0.00	-
	25M13	10.00	68.00	78
	25M14	0.00	625.00	625
	25M5	0.00	78.00	78
	25M6	0.00	0.00	-
	25M7	0.00	4,248.00	4,248
	25M8	0.00	0.00	-
	25M9	0.00	10.00	10
GM	4M1	0.00	723.00	723
	4M2	0.00	86.00	86
Walker #2	55M21	10.00	121.00	131
	55M22	7.00	683.00	690
	55M23	0.00	26.00	26
	55M24	220.00	106.00	326
	55M25	0.00	1,410.00	1,410
	55M26	440.00	2,530.00	2,969
Walker #1	55M1	10.00	109.00	119
	55M2	0.00	73.00	73
	55M3	1,014.00	1,682.00	2,696
	55M5	0.00	197.00	197
	55M6	0.00	12,220.00	12,220
Lauzon	56M1	0.00	194.00	194
	56M2	0.00	161.00	161
	56M3	650.00	985.00	1,635
	56M5	230.00	2,342.00	2,572
	56M6	0.00	31.00	31
	56M7	0.00	2,031.00	2,031
	56M8	400.00	819.00	1,218
Total		**14,090.00**	**47,743.00**	**61,833**

At present, ENWIN does not have any feeder restrictions to accept generation. ENWIN follows HONI's Technical Interconnection Requirements ("TIR") for the connection of generation on the distribution system. Where generation exceeds 50% of a feeder's minimum load, a transfer trip is required. In those cases, generation proponents may have to provide transfer trip to due to low minimum load on some feeder sections. This equipment is needed to provide required system protection and to maintain power quality.

Transfer trip equipment and communication costs are very expensive and may make generator connections prohibitively expensive. Where possible, ENWIN considers feeder reconfiguration to increase the minimum load on a feeder in order to avoid proponents having to provide transfer trip capability to connect their generators. ENWIN is also planning to pilot a point-to-multipoint transfer trip system in 2020 to find a more cost-effective means for generators to connect when transfer trip is required.

ENWIN's distribution system currently has capacity to connect both renewable and non-renewable generation. There has been significant interest amongst ENWIN's customers regarding CHP synchronous generators, and a number of customers have installed or are in the process of installing such units. These units tend to be large and take up significant amounts of the available capacity to accept generation at the stations. These projects tend to be "lumpy" and there is not typically a smooth steady take-up of available capacity, but rather an abrupt take-up of large portions of available capacity. ENWIN predicts that it will be necessary to install a bus tie reactor at its Walker 2 TS at some point in time in the future.

5.3.4 (d) System Constraints Related to the Connection of Renewable Generation

As noted in 5.3.4 (c), ENWIN's distribution system currently has capacity to connect renewable generation. Additionally, the TSs that supply the distribution grid also have capacity to connect generation.

5.3.4 (e) Embedded Distributor Constraints

ENWIN does not have any embedded distributors within its service territory.

5.4 Capital Expenditure Plan

The capital expenditure plan should set out and robustly justify a distributor's proposed expenditures on its distribution system and (non-system) general plant over a five-year planning period, including investment and asset-related operating and maintenance expenditures.

A distributor's DSP details the program of system investment decisions developed on the basis of information derived from its asset management and capital expenditure planning process. It is critical that investments, whether identified by category or by specific project, be justified in whole or in part by reference to specific aspects of that process.

As noted above, a DSP must include information on prospective investments over a minimum five-year forecast period, beginning with the Test year (or initial Test year for certain Custom IR filings), as well as information on investments - planned and actual - over the five-year historical period prior to the initial year of the forecast period.

Distributors must provide a brief overview of the following:

a) A description of customer engagement activities to obtain information on their preferences and how the results of assessing this information are reflected in the capital expenditure plan

b) A description of how the distributor expects its system to develop over the next five years, including in relation to load and customer growth, climate change adaptation, grid modernization and/or the accommodation of forecasted REG projects

5.4 Capital Expenditure Plan

This section describes ENWIN's five-year capital expenditure plan over the Forecast Period, including a summary of the plan, an overview of ENWIN's capital expenditure planning process, an assessment of ENWIN's system to connect REG, a summary of capital expenditures, and justification of capital expenditures.

5.4 (a) Customer Engagement Activities

ENWIN is consistently engaging customers for the purpose of identifying their needs, priorities, and preferences through various tools such as surveys, customer feedback, inquiries, complaints and other mechanisms. Residential customers are typically engaged through customer feedback, inquiries complaints and surveys. The commercial and industrial customers are engaged through similar fashion with addition of tracking their power quality complaints and addressing these issues through system analysis. The largest commercial and industrial customers are met with in focus groups to specifically target their needs. This information is

collected and analyzed to create meaningful projects which are added to the budget if they align with the corporate goals.

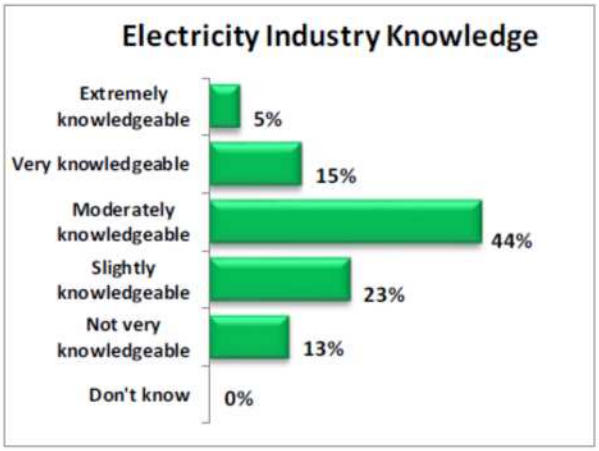
ENWIN engaged IRG in October 2017 for a comprehensive customer engagement process for the development of the DSP. This is a key element of ENWIN's CoS in 2019 for 2020 rates. The purpose was to identify customer needs and preferences so that they can be reflected in the decisions the utility makes over the following five years.

In addition, the survey complete by UtilityPULSE was conducted from October 10 to 25, 2017. It is based on 601 one-on-one telephone interviews with residential and small commercial customers. The highlights of the UtilityPULSE survey are in Figure 77 below. (See *Appendix B – Customer Engagement* for copies of the IRG and UtilityPULSE engagement reports).

UtilityPULSE asked respondents to self-assess their knowledge level about the electricity industry. Respondents who said they were 'extremely or very knowledgeable' had a satisfaction score of 79%, while those who said they were 'slightly or not very knowledgeable' had a satisfaction score of 84%. This suggests that being more knowledgeable does not necessarily translate to higher satisfaction.

ENWIN continues to target its customers and works toward increasing its customers' knowledge through various community outreach events as outlined in Table 70. The "Windsor Spitfires ENWIN Power Play" is a method that started in September 2018 to raise safety awareness to its customers.

Figure 77 Customer Electricity Industry Knowledge



These community outreach events and the positive brand ENWIN has in the community have resulted in above average "customer commitment" and "customer advocacy" scores for ENWIN, based on the survey results as shown in Tables 64 and 65 below.

Table 64 Survey Results - Customer Commitment

Customer Commitment

Electricity customers' loyalty – … Is a company that you would like to continue to do business with			
	EnWin Utilities	National	Ontario
Top 2 Boxes: 'Definitely + Probably' would continue	82%	78%	73%

Table 65 Survey Results - Customer Advocacy

Customer Advocacy

Electricity customers' loyalty – … is a company that you would recommend to a friend or colleague			
	EnWin Utilities	National	Ontario
Top 2 boxes: 'Definitely + Probably' would recommend	75%	71%	63%

Customer service is a top priority for ENWIN, and ENWIN continues to be higher than average in the key categories noted below in Table 66, as a result of knowledgeable and experienced staff in key positions.

Table 66 Survey Results - Customer Service

Customer Service

Satisfaction with Customer Service			
Top 2 Boxes: 'very + fairly satisfied'	EnWin Utilities	National	Ontario
The time it took to contact someone	80%	67%	66%
The time it took someone to deal with your problem	67%	63%	57%
The helpfulness of the staff who dealt with you	79%	67%	66%
The knowledge of the staff who dealt with you	76%	64%	74%
The level of courtesy of the staff who dealt with you	88%	74%	79%
The quality of information provided by the staff who dealt with you	78%	67%	76%

As stated in the UtilityPULSE survey, customers have increased their expectations as they relate to getting information about outages. What makes the dissemination of information challenging for ENWIN is the need to provide the information via multiple media channels, and in a timely manner, while trying to get the power restored. The perception of competency and value of ENWIN are certainly linked to the frequency and duration of power outages, and, increasingly, to the information that ENWIN provides to customers during the outage restoration process.

Being seen as effective during an outage situation from the point of view of a customer requires that utilities:

1. provide timely information on outages;
2. understand that even a short-duration outages are impactful;

3. proactively provide tips on how to prepare for extended outages during large-scale events;
4. keep customers informed about what is going on during an outage (as this makes customers feel valued); and
5. provide outage maps for greater access to the information, which customers need to help their utility restore their power quickly in the event of an outage. An outage map also provides information to help customers manage their lives and reduce or mitigate any inconvenience.

56% of customers said they would likely access ENWIN's website to view an outage map. Base: total respondents: Top 2 Boxes: 'Very + somewhat likely'

92% of customers felt it was important to be able to verify that ENWIN was aware of an outage event. Base: total respondents: Top 2 Boxes: 'Very + somewhat important'

90% of customers felt it was important for ENWIN to provide an estimate of time for power restoration on their website. Base: total respondents: Top 2 Boxes: 'Very + somewhat important'

As a result of these findings, ENWIN upgraded its website, integrated Twitter functionality into the outage map and the website, and provided valuable information back to the customer. ENWIN is further looking to satisfy the customer needs by upgrading the outage map to provide even more detail than it does today.

The following quote shows the importance of pro-active communication, which is an essential part of the business model that ENWIN continues to maintain:

> *"ENWIN Utilities is what is known as an influential brand company - a company that is part of people's daily lives and routines as well as being able to make life better, more interesting and meaningful. A status the vast majority of companies would love to have. Remaining relevant as an influential brand starts with recognizing that LDCs do have an impact on daily life. It also means constant reinforcement of the key drivers of influence: credibility, trust, future-oriented, true caring for customers, professionalism, high-standards, and corporate citizenship. Pro-active communications while enhancing the psychological value of its brand are important activities to help customers feel confident their LDC can meet both today's & tomorrows challenges." (UtilityPULSE page 29).*

This quote is shown in the ENWIN's various social media outlets, which ENWIN uses to connect with its customers on a regular basis, and strengthening its positive brand.

The upgrade of ENWIN's customer portal and CIS is a result of the customer engagement findings, as well as ENWIN's desire to lead the way in providing exceptional value and services to customers and shareholders.

Further, the following UtilityPULSE quote shows the importance of the website upgrade project, which ENWIN completed to continue to meet customer's needs today and in the future.

> *"Customers want their questions answered and their problems solved quickly. Phone calls are no longer the only option to reach a support team. Company websites if developed properly allow you to provide online support to your customers without requiring any interaction with a representative from your company. Many of your customers are prepared to find the answers they need themselves by going online and accessing your utility's website.*
>
> *However, a website can only be effective if it is easy to use. To achieve this, your customer service knowledge base and FAQs need to be easily accessible and up to date. Announcements or notices should be clearly visible. Customers should be able to access your website via desktop, tablet and mobile devices.*
>
> *If a customer can find information quickly, this can reduce the number of calls or emails your support team receives and lead to a greater customer experience."*

Finally, the following quote demonstrates customers' sensitivity to electricity prices:

> *"One of the strongest influencers on customer satisfaction scores for their utility is the customer's ability to pay"* (UtilityPulse pg.3).

ENWIN management is aware of the price-sensitivity of the customer base, and strives to ensure that internal controls are strong to ensure compliance with all regulations. ENWIN has an internal audit department which performs operational audits. ENWIN is also subject to numerous external audits. The results of these audits are all brought to the Board of Directors Audit and Finance Committee, and ultimately to the Board of Directors. To ensure transparency, ENWIN is one of a few utilities that have opened their Board of Directors meetings to the public.

Table 67 UtilityPULSE Summary

EnWin Utilities' UtilityPULSE Report Card®				
Performance				
	CATEGORY	EnWin Utilities	National	Ontario
1	**Customer Care**	**B**	**B**	**C+**
	Price and Value	C+	B	C
	Customer Service	B+	B+	B
2	**Company Image**	**A**	**B+**	**B**
	Company Leadership	B+	B+	B
	Corporate Stewardship	A	B+	B
3	**Management Operations**	**A**	**A**	**A**
	Operational Effectiveness	A	A	A
	Power Quality and Reliability	A	A	A
	OVERALL	**A**	**B+**	**B**

The UtilityPULSE summary in Table 67 above shows that ENWIN is ahead of its Ontario competitors overall with an A-score compared to B in Ontario and B+ for national utilities. The customer care piece clearly required some improvement, which will be accomplished through the new customer portal and CIS upgrade. ENWIN's image is strong as a result of its social media efforts and community involvement. ENWIN's management operations are strong as a result of the investment in system enhancements and sustainment programs in the capital budget.

The analysis of the customer engagement by the IRG provides further insight from ENWIN's customers, as shown in Table 68 below. The customer priorities across residential and small business is clear—price, reliability and safety.

Table 68 Analysis of Customer Engagement

Top 3 Customer Priorities	Online	Telephone	
	Residential	Residential	Small Business
1st	Price	Price	Price
2nd	Reliability	Reliability	Reliability
3rd	Safety	Safety	Safety

When the IRG surveyed ENWIN's small volume customers, it was evident that for them, "cost was top of mind". Customers felt that time-of-use ("TOU") pricing was not working for their businesses, and they wanted more information on how to save money on their bills. Rising electricity prices was an issue of competitiveness and participants felt that an increase is an increase, regardless of whether it comes from ENWIN's portion of the bill or from the remainder.

When the subject of additional customer service offerings was discussed (i.e. Twitter/Facebook, mobile apps), participants expected that these types of interfaces would be there, but participants were unwilling to pay more for them. When discussing additional cost required just to maintain the current level of service, about half of the participants acknowledged the necessity of an increase to their rates, albeit with some hesitation. Others were resistant to any cost increases, even if justified.

ENWIN addresses customer's concerns regarding the cost of electricity by trying to smooth out its capital investments year over year so that capital investments are as consistent as possible, and do not result in large swings in capital requirements and, hence, rates.

Since price is of critical importance to its customers, ENWIN has responded by pacing and deferring investments. In some cases, projects that were originally intended to be completed in the DSP were not pursued due to the cost of the project and the benefit. This is similar to how PROSORT would help prioritize projects, but it was done before PROSORT was available. For example, ENWIN completed an extensive "Hydro Infrastructure Communications Study" that proposed to build a proprietary communications backhaul for system operable devices that require communication functionality. This multi-million dollar investment was cancelled in 2018, as ENWIN continued to be price conscious and realized the cost of cellular communications had gone down significantly from around $50 to $5 per month per device. Therefore, ENWIN pursued cellular data plans and unlicensed 900 MHz radios for field equipment, since this was the most economical alternative. This was done to align with customer's expectations.

Other projects, such as Fibre Connections between TSs, were also planned in the DSP but cancelled subsequently due to the cost. ENWIN also continues to demonstrate its pursuit of cost-conscious behavior, reducing staff and embracing technology such as tablets to achieve efficiencies in the field.

When the IRG discussed reliability with its low volume customers, the majority were satisfied with system reliability and felt ENWIN should continue the current level of reliability now and into the future. The importance of notifications regarding outages was identified by many. Some said that just because the impact of outages may be limited for some, it does not mean reliability is not an important priority. The impact of outages is higher in this cohort—even momentary outages have an impact on many customers, as they caused significant downtime and cost. Customers felt ENWIN's services and the associated costs played an important role in attracting and keeping businesses in the Windsor area. The overall sentiment was that ENWIN

should invest in what it takes to maintain system reliability, even if that increases their monthly bills by a few dollars over the next few years.

This shows that ENWIN needs to be aware of the price its customers are paying. This principle is captured in ENWIN's tagline—"to deliver electricity at a reasonable price". However, the tradeoff is clear in the customers' mind as, "Customers expect ENWIN to maintain a proactive capital investment program that either improves or maintains system reliability. "
ENWIN has been proactive in system enhancement investments to meet this expectation. These projects include: Sectionalizing Load Break Switches, Underground Switching Units, Feeder Ties and other similar projects.

On the System Renewal side, there are several EOL asset replacement projects planned for poles, overhead and underground transformers, manholes and other asset replacements. The assets will be replaced in a controlled manner, which provides the right balance of cost and reliability to the customer, while maintaining safety for ENWIN staff and the public.

Specifically, for System Service investments, customers want ENWIN to invest in technology to modernize the grid, which is exactly what the Sectionalizing Load Break Switches investment will accomplish. The following quote shows that ENWIN's customer base understands that increased spending on technology will benefit them through reliability and price in the long run:

> *"Technologies, such as automated switches, that can improve reliability and manage outages more efficiently, are seen to have comparatively the most value in terms of investment. In the telephone survey about 7-in-10 respondents (residential: 69%; small business: 73%) feel that it is important to invest now in modernizing the grid. This sentiment was shared by 47% of residential online respondents, who felt that technology will save money in the long run."*

System Renewal investments are needed to proactively replace aging infrastructure. The customer engagement feedback was:

> *"When it comes to replacing aging infrastructure, respondents are divided with a slight lean in favour of investing what it takes to maintain system reliability; even if this increases customer monthly bills."*

Table 69 below provides a summary of the telephone survey respondents by other residential and small business (<50kW). It is important to note that the customers, regardless of these two groupings, have similar preferences. The results clearly demonstrate trust in ENWIN to manage their spending wisely, while either maintaining or improving the reliability levels to which they have become accustomed.

Table 69 Summary of Telephone Survey Results

Telephone Survey Respondents	Residential	Small Business
Addressing the *Frequency* of unexpected power interruptions		
Spend what is needed to **reduce** # of power outages	23%	25%
Spend what is needed to **maintain** current levels	51%	49%
Accept more power outages in order to help costs from rising	14%	14%
Addressing the *Length* of unexpected power interruptions		
Spend what is needed to **reduce** length of power outages	25%	23%
Spend what is needed to **maintain** current levels	47%	50%
Accept longer power outages in order to help costs from rising	19%	17%
General Plant Investments (fleet, tools, IT systems)		
Be wise with spending, but important staff have needed equipment	58% ✓	50% ✓
Find ways to make do with existing equipment	35%	39%
System Renewal Investments (aging/end-of-life replacement of infrastructure)		
Invest in replacing aging infrastructure	45%	49%
Lower investment to lessen bill impact, even if reliability decreases	44%	37%
System Service Investments (new technology investments)		
Technology will save money in the long run	69% ✓	73% ✓
New technologies are more of a luxury	21%	19%

Majority of low-volume customers want EnWin to spend what is needed to either *maintain* or *improve* reliability

Safety was given the third highest priority by ENWIN's customers. In ENWIN's view, safety was likely only the third highest priority because customers have become accustomed to a high level of safety related to the distribution system. In other words, safety is a "given" from customers' point of view. Electrical contact incidents are few and far between, as are incidents where poles fail in service and fall into roadways or private property. Consequently, safety is important but not top of mind for customers. It is noted that safety and reliability go hand-in-hand. Rarely does an in-service failure that results in an unsafe condition not also involve an outage.

While cognizant of customers' concern over cost, ENWIN's management views safety as a top priority. In ENWIN's view, absent a good safety record, safety would usurp reliability and cost as priorities for customers. This is evidenced by the experience of PG&E, as discussed in 5.3.1(a), above.

IRG also discussed ENWIN's conservation and demand management (CDM) program for low volume customers. Customers expressed interest in obtaining more information regarding CDM programs and welcomed support from ENWIN in communicating CDM strategies. Participants want more proactive communication and assistance with managing and reducing their consumption and felt that finding ways to conserve was a high priority, and they would like better communication and notification from ENWIN of available programs. Participants stated the importance of having a representative who is familiar with their individual operations - and advice on programs that would suit their specific needs.

Customers are also appear to hold realistic views with regards to General Plant investments, which are needed to run the business:

> *"Around half of telephone survey respondents acknowledge the importance of ENWIN staff having the tools, equipment and IT systems they need to operate the system, and therefore feel the ENWIN should be wise with its spending in this area. Residential respondents (58%) were slightly more supportive of this approach than their small business (50%) counterparts."*

The customer engagement exercise was beneficial to the ENWIN residential customers in providing them with further understanding of how the electrical system works, what part of the ENWIN bill actually goes to ENWIN, and recognition that ENWIN can only control items within their control. One quote stated:

> "ENWIN *should be proactive in telling people how the system works. The more we know, the more we are able to contribute. And personally, me and my family, we just pay our bills. I think it's important that people know how the system works."*

ENWIN has continued use Twitter, YouTube and the Windsor Spitfires Power Play to further the knowledge of their customers.

However, the job is far from complete, as customers believe outages are acceptable but only for 20 minutes (which what customers' classify as a reasonable time). While this may be possible for the majority of customers as a result of the system enhancement discussed in this DSP, it is not realistic that all customers will be restored in 20 minutes if equipment has been damaged and requires field crews to repair it. This is reflected in the following customer quote:

> *"Personally, I don't see any disruption. Obviously when there's a storm, the lights will go out, and to me that's understandable, considering the weather conditions you're experiencing at that time. I don't expect my power to stay on when there's severe weather. That's just the way it goes. But I do expect that the power will back within a reasonable time. To me, reasonable is within 20 minutes, maybe that's expecting too much from them."*

ENWIN has invited public input through biennial surveys related to customer satisfaction and electrical safety. ENWIN has also conducted customer engagement related specifically to CoS applications on two occasions, once in 2017 and once in 2019. In 2017 and 2018, ENWIN reached out to customers in numerous additional ways using educational materials, public events, social media, media, website, bill inserts, advertising and video publication on YouTube to invite public scrutiny and comment. Table 70 below show some of the additional ways in which we have connected with our customers over a two-year period.

Table 70 Public Engagement Initiatives

2017 Community Outreach		
Date	**Event**	**Description**
March 16	Fair Hydro Plan - ENWIN Echo	ENWIN was asked to hold an event for an MoE introduction of its Fair Hydro Plan to the local public and media. This was an opportunity to combine customer education outreach with one-on-one feedback from customers.
March 25	Earth Hour	ENWIN celebrated conservation with the City of Windsor and general public, and provided education and feedback about electricity conservation.
March 31	CEO's Windsor Documentary debut	ENWIN's CEO participated in a video discussing diversity and women's roles in the Windsor community. Communications staff attended the launch, as an opportunity to obtain further public input on importance of diversity in the workplace (females in energy sector non-traditional roles).
May 9	Memorial Garden Dedication	ENWIN partnered with the City of Windsor to celebrate veterans' role in our community by dedicating a memorial garden to our veterans. ENWIN was recognized for its contribution and had the opportunity to speak one-on-one with customers across various segments of the general public about topics related to its business.
June 5	Presentation to Council	ENWIN's CEO presented the Windsor Canada Utilities Annual Report at a public Windsor City Council session. In doing so, she offered the public an opportunity for public input and comments.
June 17	Meet-a-Machine	ENWIN staff attended this public and family event and provided bucket rides for children and their parents. This was an opportunity for in-person feedback from families and local charities.
July 9	Dragon Boats	ENWIN staff attended this public and family event This was an opportunity for in-person feedback from families and local charities.
August 11	Hiram Walker Statue Unveiling	ENWIN's CEO accepted recognition for ENWIN's contribution to an arts project, at an event attended by the public, media and the business community. This was an opportunity for in-person feedback from

		local businesses and the public who are ENWIN customers.
August 19	Maryvale Night Run	ENWIN's Manager of Corporate Communications spoke at this public event, which was also attended by 17 ENWIN employees. This provided an opportunity for participation in public and family event. It also provided one-on-one feedback from families and the general public.
Sept 9	GreenStar Award - FAC	ENWIN's President and CEO, along with Conservation team staff, presented ENWIN's conservation award to FCA Chrysler Canada at a public media event, to celebrate achievements in conservation. This provided an opportunity to discuss electricity sector and conservation one-on-one with customers in business, industrial and technology sectors.
Sept 9	Play McGivney Superheroes	ENWIN staff attended this public and family event. This was an opportunity for in-person feedback from families and local charities.
Sept 12 - Oct 26	Public Ward Meetings: City of Windsor Wards 1 - 10	Over six-week period, our Operations, Customer Service and Conservation teams manned a "booth" at 10 City of Windsor public Ward meetings and spoke one-on-one with customers about customer service, the electricity bill, and preferred modes of payment.
Sept 17	Open Streets Windsor	ENWIN staff attended this public and family event. This was an opportunity for in-person feedback from families and the general public.
Sept 22	My Safe Work	This educational and media event at St. Clair College offered. ENWIN employees had the opportunity to engage students in a dialogue about safety.
Oct 12-14	Fire Prevention Safety Week	Over a period of three days, ENWIN staff attended this public and family event, and maintained a booth dedicated to public education and obtaining feedback regarding outage and electrical safety.
Oct 18	Ontario Chamber Conservation	ENWIN's CDM team attended this public event sponsored by local and provincial chambers of commerce. This was an opportunity for in-person feedback on CDM initiative from business.

2018 Community Outreach

Date	**Event**	**Description**

January 8	Rotary Centennial Kickoff	ENWIN attended and was recognized at a public event for the Centennial of Rotary in Windsor. This was an opportunity to gain public input on our work and community involvement from customers.
March 1	Student Employee Presentation	This event offered an ENWIN co-op student and Communications staff the opportunity to engage in meaningful dialogue about electricity, safety and the role of the LDC.
March 19	ENWIN Geode Ground breaking	Celebrated local electricity in community programming with City of Windsor, Rotary and general public at a ground breaking for an electricity-focussed art project. This offered the opportunity to solicit feedback from the public, one-on-one and through Rotary Club of Windsor 1918.
March 24	Earth Hour	ENWIN celebrated conservation with City of Windsor and general public, and provided education and feedback about electricity conservation.
April 10-20	Earth Day Travelling Road Show	ENWIN partnered with ERCA to launch and promote a conservation and safety program to educate 5,000 children and educators at local schools. This offered an opportunity to address the public through personal presentations, through ERCA, and through local media, inviting feedback on both safety and conservation programs.
April 19	GreenSTAR Award - UWindsor	ENWIN's CEO, along with the Conservation team, presented ENWIN's conservation award to University of Windsor at a public media event, to celebrate achievements in conservation. This provided an opportunity to obtain conservation feedback from customers in business, industrial, education and technology sectors.
May 12	Rotary Gala	ENWIN attended and was recognized at a public gala for the Centennial of Rotary in Windsor. This was an opportunity to speak one-on-one with members of the Rotary community who are ENWIN customers.
May 14	UWindsor IDIR Launch	ENWIN CEO addressed the public and media at an event to celebrate and launch a partnership between University of Windsor Institute for Diagnostic Imaging Research, Bombardier, Ford

		Canada, Canadian ElectroCoating Ltd./Narmco, ENWIN, and the Consortium for Aerospace Research and Innovation in Canada. This resulted in new, adaptable diagnostic and repair solutions. This event offered one-on-one opportunities to speak with, and invite input from some of the forerunners of technology and innovation in our area.
May 24	HR Presentation: Herman Secondary School	ENWIN's HR Director addressed youth at Herman Secondary School and sought input into the needs of future generations regarding hiring and education practices at ENWIN.
June 4	Presentation to City Council	ENWIN's CEO presented the Windsor Canada Utilities Annual Report at a public Windsor City Council session. In doing so she offered the public an opportunity for public input and comments.
June 9	McGivney Super Hero	ENWIN staff attended this public and family event. This was an opportunity for in-person feedback from families and local charities.
June 23	Meet-a-Machine	ENWIN staff attended this public and family event. This was an opportunity for in-person feedback from families and local charities.
June 26	Library Rain Garden Ground-breaking	ENWIN's Manager Corporate Communications spoke at this public educational event to launch a rain garden envisioned by the students and supported by ENWIN. This was also an opportunity for education and public input on both electricity and water services.
July 18	The Safety Village Summer Opening	ENWIN's Manager Corporate Communications spoke at this public event, which was also attended by staff, who maintained a one-on-one conversation with customers throughout the event.
August 8	Riverside Miracle Park Ground breaking	ENWIN attended this event for the launch of a new accessible playground in Windsor. This was an opportunity for one-on-one feedback from more than 400 attendants.
August 18	Maryvale Night Run	ENWIN's Manager of Corporate Communications spoke at this public charity event, and invited feedback from more than 500 attendants. The event also attended by staff, who maintained a one-on-one conversation with customers throughout the evening.

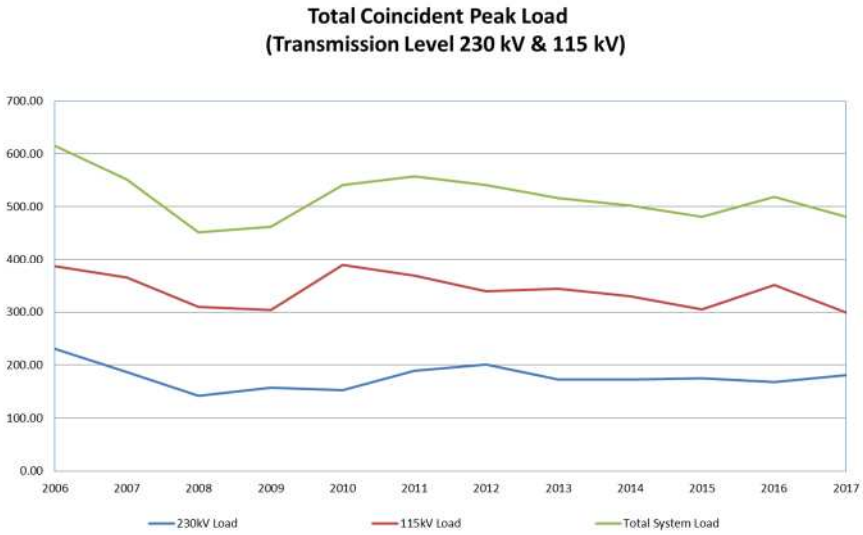
Oct 11 - 13	Fire Prevention Week	Over a period of three days, ENWIN staff attended this public and family safety event, and maintained a booth dedicated to public education and obtaining feedback regarding outage and electrical safety.
November 8	Build A Dream	ENWIN's CEO sat on the expert panel at this public, educational event, and also spoke one-on-one with customers.
November 14	Junior Achievement World of Choices	ENWIN's Manager of Corporate Communications spoke at this public event, inviting input from customers in education sector, and students.
December 12	Veterans Scholarship Award	ENWIN awarded a scholarship to a returning vet, and connected with both veterans and members of the public who were ENWIN customers.

In summary, the aspects that were particularly affected by the input from the customers include the outage map, which led to timely information for our customers to be informed of short or long outages, an upgraded website for a better user experience, and the integration of Twitter to the outage map to keep the customer base notified about the status of outages. The capital investments in the aging infrastructure is reflected in System Renewal investments, while system enhancements are required to maintain or improve system reliability as indicated by the customers. Overall, customers value price, followed by reliability, and then safety last. Therefore, ENWIN continues to balance the price and reliability impact of the System Renewal and System Service projects by using PROSORT to prioritize the most impactful projects which align with the customer's expectations.

5.4 (b) System Development Expectations

As shown in Figure 78 below, ENWIN's system demand was at its recorded peak in 2006. Thereafter, the peak load gradually declined and finally collapsed during the 2008 recession. After 2008, the load gradually picked up, and the present status of the load shows a slight growth. However, due to other "demand side management" initiatives, growth is not visible in ENWIN's system.

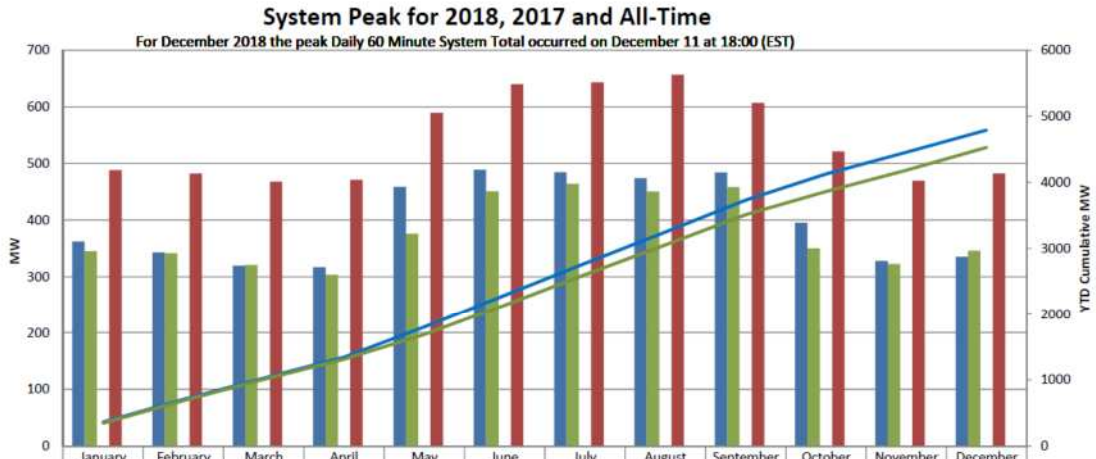
Figure 78 Total Coincident Peak Load



Previous mFIT, FIT, CHP incentive programs have effectively reduced about 15 MW off the coincident peak demand in the ENWIN system. In addition to REG, programs like light emitting diode (LED) lighting retrofits and other energy efficiency programs have also had an impact, reducing the overall load growth figures.

There is a slight peak demand increase starting after 2008 and peaking in 2011, before starting another decline. ENWIN does not expect the load to return to the recorded levels in the near future.

Figure 79 System Peak for 2018, 2017 and All-Time



	January	February	March	April	May	June	July	August	September	October	November	December
2018	362	342.8	319.7	316.7	458.6	488.9	484.6	474.1	484	395.3	328	335.2
2017	345.1	341.5	320.8	303.4	376.1	450.8	464.2	450.4	458.2	350.2	322.8	345.8
Percentage Change	4.9%	0.4%	-0.3%	4.4%	21.9%	8.5%	4.4%	5.3%	5.6%	12.9%	1.6%	-3.1%
All Time Monthly Peak	488.5	482.2	468.1	471.4	589.3	640.2	643.5	656.7	607.1	521.2	469.8	482.2
Year	2004	2004	2002	2002	2006	2005	2006	2006	2002	2005	2000	2003
2018 MW YTD	362.0	704.8	1,024.5	1,341.2	1,799.8	2,288.7	2,773.3	3,247.4	3,731.4	4,126.7	4,454.7	4,789.9
2017 MW YTD	345.1	686.6	1,007.4	1,310.8	1,686.9	2,137.7	2,601.9	3,052.3	3,510.5	3,860.7	4,183.5	4,529.3

Figure 79 above shows the system peak for 2018, 2017 and all-time.

While the present growth is low or minimal, ENWIN's distribution area has potential for future development. These areas may not see load growth in the near term, but eventually these loads will appear at the existing TSs, and ENWIN will have to serve those customers. ENWIN studied the City land allocation maps as published by the City planning department.

ENWIN identified the unserved land locations, and assigned those unserved lands to the appropriate stations to see the potential load if served in the future. Table 71 below shows the additional potential load expected under a normal growth scenario. The normal growth scenario does not consider the potential for EV loading, as it is a completely different growth element. EV growth is difficult to forecast and will likely vary depending on public policy incentives that may be introduced.

Table 71 Available Undeveloped Land Area by Station and Zoning

Vacant land Allocation	Keith	Crawford	Essex	GM	Lauzon	Malden	WK1	WK2
Residential (Ha)	12	23	35	5	117	72	24	49
Commercial (Ha)	61	54	28	4	110	91	30	24
Industrial (Ha)	190	18	21	5	244	65	111	50
Other (Ha)	55	19	70	15	306	257	42	99
Expected Load (MW)	15	4	3	1	23	10	9	5
Total (Ha)	318	114	154	29	777	486	207	222

Note: "Other (Ha)" includes Community Parks, Generating station lands, power distribution stations etc.

The above analysis shows that Malden TS, Lauzon TS, and Keith TS have the most potential for growth. All of these stations are located in the outer perimeter of the distribution system. Crawford TS is located north of the city distribution, and the remaining land for development is relatively low in this area.

Lauzon TS is a highly utilized TS, and with potential additional loading, the utilization level will increase beyond acceptable levels. ENWIN's long-term plan coupled with the "power transfer corridor development" has an expectation of bringing feeders to the Lauzon TS area, thereby reducing the footprint of the Lauzon TS distribution network. Finally, completion of the project will move existing Lauzon TS load to other TSs.

ENWIN notes that more attention should be paid to the Lauzon area development, as this area has more potential to develop. For example, the 56M8 feeder has more than 7,700 customers and has less connectivity to other TSs. ENWIN Operations already have issues affecting peak time load transfers when Lauzon TS is down, or needed for planned work. It is not common to lose a whole station. However, in September of 2017, HONI caused Lauzon TS to go down two times, a few weeks apart. In 2018, HONI further experienced an extended loss of supply at their Keith TS and Malden TS, twice within a week.

Another uncontrollable factor affecting the load forecast is changes to the policies driving the Ontario LTEP. It appears that the energy policy of the planners changed recently. The incentives given to the PV, CHP and EV customers were terminated. This affects the demand side management of load and may precipitate a decline in REG and EV penetration. An EV customer could add 8 to 10 kW for residential charging, and up to 15 kW for a quick charge application. Residential padmount distribution transformers are not designed to supply a load of this size for multiple residential customers.

ENWIN expects that EVs are coming with or without incentives. The incentives only affect how soon EV loads may appear on the distribution system. As of now, ENWIN does not expect to increase 120/240V level transformer capacity to accommodate EV load. ENWIN plans to manage the EV load with high capacity feeders, fast feeder reconfiguration and eventually, communication assisted control of EV charging. At present, ENWIN does not expect sufficient uptake of EVs through the Forecast Period to warrant plans for upgrading its distribution infrastructure.

Another goal that is important to ENWIN's customers is to achieve distribution reliability. When replacing EOL infrastructure, ENWIN is providing additional capability to enable remote operation. When ENWIN replaced its 4 kV infrastructure, it put a plan in place to provide additional 27.6 kV feeder tie lines with remote configurability of 27.6 kV feeders. ENWIN's objective is to achieve a self-healing network in the future, and is "laying the groundwork" for this now.

ENWIN already has four self-healing underground feeders. The feeders 25M8/25M12 and 25M6/25M9 are fully self-healed underground feeders that have been functioning successfully for many years. ENWIN's expectation is to extend self-healing functionality to the overhead feeders. ENWIN feeders have been upgraded to include three or more sections with remote operable switches. The ultimate expectation is to isolate only the faulted section and energize all the other sections within one minute.

System Development Expectations in the Forecast Period

ENWIN considered the LTEP projections, REG penetration, CHP type generation, BESS systems and EVs when considering grid modernization objectives. Grid upgrades to face future challenges are planned with a long term planning perspective, with the intention of achieving long term system goals in conjunction with other projects and drivers in order to ensure cost effectiveness.

(a) Load and Customer Growth

Load growth is discussed in Section 5.4(b) of the DSP, above. Under the present circumstances ENWIN does not drive any of the investments due to load growth or customer growth.

(b) Climate Change Adaptation

Climate change adaptation was discussed in 5.2.1(h) of the DSP. ENWIN does not have any direct investments for climate change adaptations. ENWIN views that its grid modernization work would indirectly provide climate change adaptation as it will make ENWIN's distribution grid more resilient, and, hence better able to withstand the increased frequency and severity of storms resulting from climate change.

(c) Grid Modernization

ENWIN upgraded its old 4 kV distribution system to a 27.6 kV system (as discussed in Section 5.2.1 (h) of the DSP). This upgrade increased the number of customers on a feeder, which resulted in worse reliability despite the newer infrastructure, as it increased the number of customers that are affected by a single event. As a result, ENWIN developed a longer term grid modernization plan to remediate the current reliability issues and to lay the groundwork to address future challenges with DER, and possible climate change consequences.

The projects discussed in this section, below, were previously detailed in Section 5.2.1 (h) of the DSP.

<u>Conductor Upgrades:</u>

ENWIN has identified the need for a number of conductor upgrade projects. This work was initiated due to previous design standards which utilized a single-ended radial feed concept. Since radial feeders were not expected to connect to other feeders nor support the loads of other feeders, the conductor size was often reduced to a size needed to just support the feeder end load. Consequently, the conductor capacities of feeders vary along the main feeder trunk. There are many cases where the end of the old feeders were built with 4/0 or 336 MCM conductors (normal conductor size is 556 MCM). Today, these feeders are expected to carry a full additional feeder section, which means the conductors used at feeder ends are undersized.

The conductor upgrade projects for the 25M8/M12, 25M6/M9 feeders and the 25M7-feeder ring project are not scheduled with other mandatory works. The 25M8/12 and 25M6/9 are downtown Windsor feeders. The capacity of the downtown network is constrained due to the initial feeder section capacity. This project will double the number of cables to remove the capacity constraint.

These downtown capacity projects are driven by reliability concerns, but the upgrade will also provide capacity for future growth, including EV load management without the need to increase capacity at the TS level.

<u>Sectionalizing Load Break Switches:</u>

The main driver of this program is to restore some of the reliability that was lost after the removal of 4 kV substations and circuit breakers. This project aligns with ENWIN's other grid modernization objectives. The planned completion date is 2020.

After completion of the project, ENWIN expects to reduce the impact of feeder contingencies to one-third of a feeder section at time, and to remotely reconfigure adjacent feeders within 5 minutes of a contingency to help restore power to as many customers as possible. In the future, with communication infrastructure and other projects implemented, the duration of outages is expected to be reduced to less than 1 minute.

Underground Switching Units:

By implementing this project, ENWIN expects to achieve the following objectives within the Forecast Period:

1. Removal of PMH series live front switches in critical main feeder trunks
2. Replacement of EOL switches with refurbished switches
3. Automatic transfer of subdivision power to alternate feeders

Feeder Reliability Improvement Projects:

Reliability is the main driver of this project.

ENWIN is planning to maintain the distribution infrastructure for an "N-1" full station contingency. Such contingencies have occurred in other place in the Province, such as the recent tornado in the Ottawa Marivale TS, or the fire at the HONI's Finch TS in Toronto. These are considered long-term contingencies, meaning that the time to effect restoration after the contingency is in the order of weeks to months. Based on the reasonable risk of a complete loss of a supply station, ENWIN developed a long-term plan to build high capacity power transfer corridors between stations that will be constructed in coordination with ENWIN's EOL replacement pole projects and City infrastructure re-development projects. By bundling these feeder reliability improvements with planned EOL and City works projects, ENWIN will be able to deliver improved reliability for an incremental cost amounting to around 2-3% of the cost of the underlying projects.

In the end state for the distribution system, ENWIN expects to complete reliability connections between Crawford TS and Malden TS, and between Malden TS and the Essex/Walker TSs.

The Crawford TS and Essex/Walker TS connection will be completed in 2019, and part of Essex/Walker TS to Lauzon TS connection will be completed simultaneously with a 55M21/22 EOL & relocation project. ENWIN will not be able to complete the most important connection to Lauzon TS during the Forecast Period.

With completion of this reliability connection ENWIN will be able to maintain its system without being exposed to permanent outages or power quality concerns in the event that either Keith TS, Malden TS or Crawford TS are out of service for an extended time due to an unexpected contingency. In addition, a contingency capacity increase in these stations helps with the self-healing network implementation. Finally, ENWIN will be able to manage future EV load more reliably with other communication infrastructure development.

Radial Branch Backups:

ENWIN will complete all radial feed removals with large customer pockets (>500 customers) during its present planning cycle. This helps to increase the reliability of the system, and the supply reliability to the customers.

Communication Development Strategy:

ENWIN follows a long-term strategy to implement communication infrastructure, but ENWIN is not investing money to build the complete communication infrastructure over this Forecast Period. Instead, ENWIN is utilizing wireless Ethernet radios where possible, and cell modems in other locations. By implementing these measures, ENWIN will gain the full visibility of the distribution system through FCI installation and communicating with remote operable switches.

Further, the implementation of an FLISR system will enable ENWIN to automate restorations following an outage, rather than relying on operators to make decisions and execute switching. This has the potential to provide a significant improvement in reliability for customers.

(d) Accommodation of Forecasted REG Projects

DER related Investments:
There are two proposed projects related to DER in the Forecast Period. The first one is a cost-effective remote trip pilot, which is intended to achieve the following:

1. Reduced cost of implementation of remote trip to the customer, which will enable more DER to connect to the system.
2. Eliminate the need for ENWIN to maintain multiple remote trip devices (i.e. ENWIN would only need to maintain equipment at the Walker 2 station), which would further reduce costs.
3. Shift the responsibility to monitor the signal from the station, isolate, and protect the DER customer's equipment, from ENWIN to the DER customer.

If this pilot is successful, it may be implemented in other stations.

The second project is the addition of a reactor to facilitate the connection of more generation for customers connected to the Walker 2 TS. This will facilitate the acceptance of additional

CHP type generators, each of which may require up to 40 to 50MVA of short circuit capacity. To date, ENWIN has not received any applications for such a large capacity CHP connected to Walker 2 TS. Rather, the proposed project is budgeted as a means to accept more DER in order to meet the goals of the 2017 LTEP.

(e) Other System Development Expectations

Sustainment programs play an important role in maintaining a healthy distribution system. At the same time, sustainment is planned with consideration of the requirements for system growth. Sustainment programs are driven by equipment inspection results, and may not represent a simple like-for-like replacement.

ENWIN manages the sustainment plans by taking into account grid modernization objectives.

The switching unit fleet provides a good example. ENWIN will replace live front units located at critical points within the distribution system with dead front, automated units after using the full life of the dead front assets. If possible, ENWIN will refurbish and reuse those live front units as replacements to EOL live front units at non-critical system locations.

Additionally, ENWIN's vacuum switches (i.e. switches located in the downtown YMCA) are close to EOL, and there is no one-to-one replacement available in the market. Consequently, replacement of these switches involves considerable modifications to the connecting infrastructure to accommodate a switch with different physical characteristics and dimensions. Some of the critical locations where these vacuum switches exist need to be replaced within a short time to avoid long customer outages. ENWIN plans to remove one critical switch under a planned project, and to keep that switch as a spare. This way full use of the asset is achieved while maintaining reliability.

5.4.1 Capital expenditure planning process overview

The information a distributor must provide includes, but need not be restricted to:

a) A detailed description of the analytical tools and methods used for risk management and its correlation to the capital expenditure plan. A distributor is responsible for managing its business risk in a manner to achieve its objectives through a comprehensive risk portfolio. These risks could include, but not limited to, system reliability, cyber-security, and climate change adaptation.

b) A description of the process(es), tools and methods (including relevant linkages to the distributor's asset management process) used to identify, select, prioritize and pace the execution of projects/programs in each investment category (e.g. analysis of impact of planned capital expenditures on customer bills)

c) If different from that described above, the method and criteria used to prioritize REG investments in accordance with the planned development of the system, including the impact, if any, of the distributor's plans to connect distributor-owned renewable generation project(s)

d) The distributor's approach to assessing non-distribution system alternatives to relieving system capacity or operational constraints, including the role of Regional Planning Processes in identifying and assessing alternatives

e) A distributor's strategy in taking advantage of opportunities that arise during system planning to implement cost-effective modernization of the distribution system such that it becomes more efficient, reliable, and provide more customer choice. This could include, but not limited to, the following:

• The options a distributor has considered for facilitating customer access to consumption data in an electronic format

• The mechanisms that facilitate real-time data access and behind the meter services and applications that a distributor has considered for the purpose of providing customers with the ability to make decisions about their electricity costs

• The investments necessary to facilitate the integration of distributed generation, distributed energy resources and more complex loads (e.g., customers with self-generation and/or storage capability)

• The technology-enabling opportunities a distributor has considered to increase operational efficiencies, improve asset management or enhance services to customers

• The distributor's adoption of innovative processes, services, business models, and technologies

f) Consideration of distribution rate funded COM programs, that are not funded by the Global Adjustment Mechanism, to defer distribution infrastructure as described below

5.4.1 Capital Expenditure Planning Process Overview

This section describes ENWIN's capital expenditure planning and approval process. The purpose of capital expenditure planning is to ensure that capital budgets provide prudent investments which satisfy ENWIN's vision, mission and values, and to enable ENWIN to continue to provide value to its customers, shareholder, and other stakeholders. Capital expenditure planning is intended to provide consideration and balance to a number of planning

objectives including ENWIN's values and strategic objectives and to ensure compliance with the objective of the OEB's Renewed Regulatory Framework.

ENWIN's planning objectives were discussed in Section 5.3.1 (b) of the DSP. There are a number of inputs the ENWIN considered to support the capital expenditure objectives and the overall level of investment. These inputs include:

1. Participation in Regional Planning activities
2. Consultation with the City with regard to their infrastructure projects
3. Consultation with WEEDC
4. Consultation with other utilities with whom ENWIN shares pole infrastructure
5. Continual asset condition assessments
6. Customer engagement activities and surveys including any comments or complaints from customers
7. Periodic network analysis
8. Information received from various government agencies such as the OEB, IESO, ESA, Ministry of Energy, Ministry of the Environment, etc.
9. Consultation with ENWIN's Board of Directors
10. Consultation with City councillors at their town hall public meetings
11. Feedback from local social media
12. Consultation with local emergency responders (police and fire services)
13. Consultation with local BIAs
14. Consultation with utility cooperative groups to which ENWIN belongs including the Cooperative, USF, EDA, CEATI

5.4.1 (a) Corporate Risk Management

ENWIN has undertaken an extensive review of the risks that threaten its ability to successfully execute its business plan. A review was conducted in 2017 by ENWIN's executive management where the risks were identified. In that process, a total of 47 individual risks were identified. These risks are different in many cases to the risks that impact ENWIN's electrical distribution system, and are considered to be "higher level" risks. Nevertheless, many of the risks identified through the process did overlap with some of the risks identified that apply to ENWIN's AMPRO. These are discussed in the next section.

Risks were scored on a five-point scale, from least impact/likelihood to highest impact/likelihood. The probability and consequence scores were multiplied and the risks were then ranked from highest to lowest. Then the risk scores were modified (reduced) if there were controls already in place that would lower the probability of the event occurring and/or reduce the consequence after the event occurred. After these modifications, the list was re-ranked from highest to lowest.

The top 10 corporate risks were then committed for risk mitigation activities as shown in Table 72 below. Objectives were formed around those top 10 risks in terms of development of

mitigations of the risks and were assigned as objectives amongst the executive group. The top 9 corporate risks for the organization are listed below (the 10th risk was with regard to ENWIN's Water division only).

Table 72 Risk Ranking Chart

Rank	Strategic Objective Category	Risk Category	Risk	Detailed Risk Description
1	Customer Focus	Service failure (System Reliability)	Age of Infrastructure	Infrastructure is deteriorating causing field failures
2	Organizational Sustainability	Resources	Lack of Resources-New Ventures	Lack of resources (human/IT or organizational fit) for growth in new business opportunities
3	Customer Focus	Weather (Climate Change Adaption)	Limited Resources for Weather Events	Frequency of severe weather events is increasing, challenging our ability to respond with limited resources.
4	Organizational Sustainability	Distributed Generation	Customers Leaving Grid	Customers self-generating power and leaving the grid may eventually result in significant loss of revenue for utilities, inability to maintain operations, loss of reputation, additional regulatory oversight, etc.
5	People & Culture (Safety)	Succession	Management Retirements, Knowledge Gap	Abbreviated succession planning resulting in insufficient overlap and transfer of institutional knowledge for management personnel have left a knowledge and experience gap that may precipitate or exacerbate an event resulting in injury to utility personnel, general public, property damage, elongated outages, reputational damage, potential for insurance and legal claims, fines to management/board, and increased WSIB costs

6	People & Culture (Safety)	Labour - Succession	Field Retirements, Knowledge Gap	Abbreviated succession planning resulting in insufficient overlap and transfer of institutional knowledge for safety department, field supervisors, and control room personnel have left a knowledge and experience gap that may precipitate or exacerbate an event resulting in Injury to utility personnel, general public, property damage, elongated outages, reputational damage, potential for insurance and legal claims, fines to management/board, and increased WSIB costs.
7	Community & Partnership	Regulatory	Adverse or Delayed CoS Application	Negative or delayed CoS application resulting in weak EWU performance, debt rating reductions, etc.
8	Organizational Sustainability	External Threat (i.e. cyber-attack)	Weaknesses in Internal Control	Preventable weakness leads to public relations disaster and potentially financial losses
9	People & Culture (Safety)	Labour	Workforce Overloaded-Quality Impacted	Number and complexity of projects is exceeding the organization's ability to deliver on them. Projects are rushed and consequently may not fully meet deliverables. Staff move on to the next big project rather than refining the project just delivered. The risk that increased workload per person may lead to quality drop in individual projects, loss of service to customers, increased costs to customers and loss of reputation.

The identified risks have been considered, and mitigations have been developed and incorporated into ENWIN's business plans and this CoS application. A discussion of the measures follows:

1. Age of Infrastructure/Infrastructure is deteriorating causing field failures: ENWIN's capital and operating plans seek to identify deteriorating infrastructure and repair/replace that infrastructure. Failure of infrastructure can lead to issues of safety, reliability and cost to customers. ENWIN's asset management system is intended to mitigate this risk. A substantial portion (55%) of ENWIN's Test Year, discretionary (non-System Access) capital budget is dedicated to replacement of EOL infrastructure.

2. Lack of Resources-New Ventures/Lack of resources (human/IT or organizational fit) for growth in new business opportunities: ENWIN has made a conscious effort to manage with fewer staff in order to minimize costs, while maintaining the same level of service for customers. Where opportunities manifest, it is often difficult to partake of those opportunities due to lack of capacity in the organization. ENWIN has plans to work with partners to explore those opportunities. This may result in opportunities through its unregulated affiliate, ENWIN Energy, and through joint alliances with other utilities in order to share knowledge and reduce costs.

   Through its membership in the EDA, the USF, the Cooperative and CEATI, ENWIN leverages the power of the groups to tackle common issues and explore new opportunities. ENWIN is relatively new to the Cooperative and is participating in joint procurement initiatives for distribution system materials. The larger buying power of the group should ultimately result in lower increases in cost of materials than ENWIN would otherwise experience by relying solely on its own buying power. Since material price fluctuations are a much stronger function of world commodity costs (i.e. copper, aluminum, steel, etc.), ENWIN's capital investment plan does not reflect any reductions from an increased joint buying power.

3. Limited Resources for Weather Events/Frequency of severe weather events is increasing, challenging our ability to respond with limited resources: ENWIN recognizes that weather events are becoming more frequent and severe due to climate change. In both 2016 and 2017, the City of Windsor suffered "100-year storm" events that resulted in extensive basement flooding in many areas of the city. Customers have approached ENWIN with their City councillor to tell ENWIN how important it is that their electricity service survive through storm events so that their sump pumps continue to work. Many of the residents have had flood insurance cancelled or limited, so the consequence to them of an interruption of service during a storm, is financially significant.

   ENWIN accepts the notion that climate change has occurred and will continue to occur in the future. As a consequence, ENWIN considers that climate change adaptation is a driver which gives rise to considerations affecting its distribution system designs. Climate change adaption also manifests as one of the drivers of System Service investments in ENWIN's capital plans.

   ENWIN has been building automation into its distribution system so that feeders can be segmented and restored remotely and quickly during storm situations. ENWIN also

plans to build higher capacity feeders to span between the major supply stations so that power can be routed around the city when there have been major supply outages. In 2017 alone, the HONI Lauzon TS supply was lost due to factors beyond ENWIN's control.

Of note, in 2018, the City of Windsor developed a plan to commit an additional almost $90 million on top of their roadworks budgets, over the next 10 years, for incremental sewer mitigations to help alleviate the flooding experienced in a number of neighbourhoods. While the individual projects have not yet been developed, ENWIN expects that there will be additional System Access projects required as a result of this initiative by the City. ENWIN has consequently included a modest increase in its System Access roadworks budgets to accommodate the expected incremental works by the City.

4. Customers Leaving Grid/Customers self-generating power and leaving the grid may eventually result in significant loss of revenue for utilities, inability to maintain operations, loss of reputation, additional regulatory oversight, etc.: ENWIN's service territory is in Canada's southernmost city and one of the best areas in the Province for solar generation. As such, ENWIN has experienced a significant uptake on the Province's FIT and mFIT programs. This is resulting in changes in power flow directions on ENWIN's distribution system. ENWIN's capital investment plan includes systems to monitor and manage these connections, and to provide metering and billing for these connections.

   ENWIN has concerns regarding loss of revenues from behind the meter generation, and currently has a number of large CHP generators in process of connecting. ENWIN is closely monitoring OEB consultations related to enabling LDCs to "remain whole" despite customers installing generation behind the meter. Absent an appropriate mitigating mechanism, the costs for building and maintaining the distribution system will fall to those customers that do not have generators. ENWIN's unregulated affiliate, ENWIN Energy, is exploring opportunities with industry partners to provide services to customers that may offset some of the revenue lost through generation by ENWIN.

5. Management Retirements, Knowledge Gap/ Abbreviated succession planning resulting in insufficient overlap and transfer of institutional knowledge resulting in injury to utility personnel, general public, property damage, elongated outages, reputational damage, etc.: Like other utilities, ENWIN is experiencing high levels of retirements of senior personnel in both managerial and field staff ranks. Fully 104 or 33% of staff have or are expected to retire over the period from 2016 to 2020. ENWIN recognizes the risks that these retirements present, and has developed a succession plan for staff within the organization. Additionally, ENWIN actively moves engineers and other professional staff through various roles in the organization so that they obtain the experience they will need to manage the organization in the future. ENWIN's operating budgets include amounts for apprentice field staff who will replace staff planning to retire. Costs for overlap of management and field staff have not been apparent in ENWIN's budgets; however, through an abundance of concern for the costs of operation that reflect in

rates paid by customers, ENWIN's actual experience has been to replace staff only after current staff confirm retirements or resignations in writing.

6. Field Retirements, Knowledge Gap/ Abbreviated succession planning resulting in insufficient overlap and transfer of institutional knowledge resulting in injury to utility personnel, general public, property damage, elongated outages, reputational damage, etc.: Similar to the issue with management staff, ENWIN is dealing with retirement of experienced field staff. ENWIN has established a cooperation with St. Clair College, which offers a lines trade program. ENWIN supports the college by donating surplus materials such as retired transformers, poles and hardware and by occasionally speaking to classes.

   ENWIN also hires students in the program to support some of ENWIN's simpler work activities such as pole inspection. This provides an opportunity to the student to further their understanding of the trade and make money to pay for their education. It also allows ENWIN the opportunity to observe the students for possible future employment.

   In this manner, ENWIN hopes to have staff become proficient is a shorter period of time. Additionally, ENWIN has introduced a new lines classification known as a "Powerline Splicer". This classification combines the skills of both overhead and underground specialties that were differentiated in the past (the distinction still exists today). Staff with these classifications can do both overhead work and cable splicing. This results in sending fewer staff to certain projects and enables ENWIN to function with a lower staff complement. These practises have been reflected through lower increases in ENWIN's operating budgets.

7. Adverse or Delayed CoS Application/Negative or delayed CoS application resulting in weak EWU performance, debt rating reductions, etc.: ENWIN views this CoS as a key element of its future business planning. ENWIN's last CoS application was in 2008 for 2009 rates and there have been many changes in the industry, regulations, and at ENWIN since that time. This application is an opportunity to "reset" with both our regulator and our customers and re-establish the base upon which to go forward and serve our customers. The outcome of the CoS will determine the level of service with which we will be able to provide our customers, the contributions we will be able to make to our shareholder, and the future of the company in general.

8. Weaknesses in internal control/preventable weakness leads to public relations disaster and potentially financial losses: ENWIN operates in a location that has faced a longer economic downturn compared to the rest of the Province. This was characterized by high unemployment and a consequent political climate that is sensitive to the cost of electricity.

   One of the strongest influencers on customer satisfaction scores pertains to the customer's ability to pay for power. ENWIN management is aware of the sensitivity of

the customer base and strives to ensure that internal controls are strong in order to ensure compliance with all regulations. One of the recurring complaints heard from a vocal minority of customers is that ENWIN should be audited (even though ENWIN already engages in internal and external audits). ENWIN's audit practices are detailed in Section 5.4(a) of the DSP.

Another area where ENWIN seeks to mitigate risk is cyber security. ENWIN is aware that other utilities in the Province have been subjected to ransomware attacks and ENWIN is taking steps to ensure that it's IT and SCADA networks are as secure as possible from cyber-attack. ENWIN is in the process of ensuring conformance with the OEB's Cyber Security Framework. ENWIN's capital and operating budgets contain incremental investments specifically for cyber security.

9. Workforce Overloaded-Quality Impacted/Number and complexity of projects is exceeding the organization's ability to deliver on them. The risk that increased workload per person may lead to quality drop in individual projects, loss of service to customers, increased costs to customers and loss of reputation: ENWIN has reduced its staff complement over the years since the last CoS, but demands on ENWIN have continued to increase. To mitigate the risk that the quality of work may suffer because of the increased demands on staff, ENWIN has adopted a formal project management framework to be used for all substantial projects. This framework helps to ensure that projects are formally planned, resources identified, milestone timeframes set and reporting identified and executed.

   Project planning ensures that the portfolio of potential projects are reviewed, prioritized and scheduled so that resources are assigned and available, and projects are tracked through to completion.

   Distribution system projects are planned and tracked from engineering through to completion of construction. This is done to try to ensure that capital investment plans are realized and completed on-time and on budget. External resources for engineering work have been contracted to provide capacity to complete engineering work as internal resources do not have capacity to completely fulfill the requirements. External field staff have also been contracted to meet planned distribution system investment levels. These external resources were secured through a competitive bid process and ENWIN trusts those processes to ensure that costs are reasonable. ENWIN has not increased its capital investment plans because of the requirement to contract substantial portions of engineering and construction work.

5.4.1 (b) Asset Risk Management

Within the envelope of the capital expenditure plan, ENWIN utilizes a prioritization protocol to differentiate proposed projects based on the extent of risk mitigation relative to ENWIN's values, as described in detail below. Through this process, ENWIN provides a rigorous and consistent approach to align investment decisions with its corporate objectives and facilitate

trade-offs between investments. The process uses multi-criteria decision analysis to help quantify business risks to ensure ENWIN goes forward with the best portfolio of projects that balances cost effectiveness with risk mitigation, and considers stated customer preferences and asset and business needs within reasonable budget constraints.

Potential System Renewal and System Service projects are developed in consideration of:

1. the health scores for individual assets and the consequence and likelihood (risk) of failure (safety, reliability)
2. forecasts for load growth, discounted for CDM activities, by area, including a network analysis informing the capacity of the existing system to supply the forecast load (sufficiency)
3. worst performing feeders (reliability)
4. contingency analysis (loss of station, loss of feeders) (reliability, resiliency)
5. capacity to accept fault current (REG accommodation)

System Access projects are developed in consideration of external factors and are considered mandatory expenditures and are given top priority. Some System Access projects are not possible to know in advance, such as customer connections, and are budgeted based on recent history. When System Access projects are considered, they are not subjected to the PROSORT prioritization tool, and are instead assigned a value of “1”, which places them at the top of the prioritized list of projects.

General Plant expenditures relating to IT systems, fleet and buildings are developed in consideration of stated customer needs and preferences, security (including cyber security), compliance with regulations, the enablement of staff to serve customers and maintain the distribution infrastructure, and the risk associated with failure of key customer facing systems. In many cases, General Plant expenditures provide compliance to regulations and as such are considered mandatory. Similar to System Access projects, these mandatory projects are assigned a value of “1” on a PROSORT prioritization list.

While risk considerations apply well to System Renewal and System Service investments, they apply less well to General Plant investments. ENWIN puts General Plant projects through the PROSORT prioritization, but General Plant investments often fare poorly when compared to projects in the System Renewal and System Service categories.

PROSORT results are tempered by maintaining a minimum level of investment in the General Plant category, and by considering the implications of <u>not</u> making the investment (i.e. if fleet vehicles are unreliable, staff may not be able to efficiently complete capital projects or may have storm responses delayed, resulting in negative outcomes for customers). ENWIN has not formally established a minimum investment level for General Plant investments but discusses the merits of General Plant investments as compared to other investments at the executive level, and balances needs between the various competing expenditure classifications.

Project selections are made and budgets drawn based on consideration of the priority of competing projects and the availability of capital and human resources. To the extent possible and appropriate, large variations in capital spend are smoothed out to avoid large rate impacts and improve predictability of rates.

Similarly, large variations in human resource requirements are to the extent possible and appropriate, smoothed out to ensure realistic activity targets, avoidance of increased costs associated with labour outsourcing and the associated avoidance of rate increases and the improvement of rate predictability.

In some cases, programs are identified to continue for a number of years and those programs may be targeted to take up resources in the capital and operating plans for the specified period. This activity informs the corporate effort to fulfill the resource requirements needed to sustain the assets. The outputs of this activity are capital and operating and maintenance budgets for the upcoming year and projections for the forward four years from that point.

Annual asset investment plans are detailed in the ENWIN's capital and operating budgets. These budgets provide explicit descriptions of the specific projects and programs that are included in the budget. Each project and program will have an analysis documenting the need for the project or program, the alternatives considered and a cost/benefit summary demonstrating the prudence of the expenditure. The budgets are reviewed by the Hydro Engineering and Operations groups to ensure practicality, achievability, and that they address the issues and concerns known to the groups. They are also reviewed by these groups to ensure that there are adequate resources available to execute the work, and to determine what portions of the work will be undertaken with ENWIN forces and what portion will be tendered to contractors.

Subsequently, the budgets are reviewed and approved by the Finance and Regulatory departments and the executive management group prior to presenting them to ENWIN's Board of Directors for final approval. The reviews are intended to determine whether the proposed budgets are executable within existing financial constraints, and whether any effect on rates is just and reasonable, and within ENWIN's intended sustainability goals. The budgets are also reviewed to ensure that they meet the mission, values and goals of the organization. In a practical sense, reviews with the Finance and Regulatory groups are conducted continually as the investment plans are being drawn up, and are iterative, save for the final, formal review. Final approval of the budgets is provided by the Board of Directors. The budgets are presented and reviewed and approved to ensure they align with the direction of the Board.

As asset investment plans are being executed throughout the year, they are subject to monitoring and control. Progress is checked weekly and reported through ENWIN's Project Management Office ("PMO"). The PMO manages asset investment projects from inception to engineering, budgeting, approval, tendering, execution and closure. The PMO tracks the project on the basis of both percentage of completion and percentage of expenditure. Weekly reports are produced and circulated for management review. The reports indicate whether or

not a project or program is tracking to plan and if not, what the reason for the deviation is and any plans to get back on schedule/budget. On a monthly basis, a summary report is prepared and circulated to Engineering and Operations to review all projects managed by the PMO and to develop any needed mitigation to track to plan.

At the end of every project, a review is made to determine whether or not the project was completed within the planned budgets for cost, time and materials. Where variances beyond specific percentage and dollar limits exist, they are explained and signed off by various levels of management, as applicable. An annual, summary review is also prepared to look for any trends in expenditures or estimates that require correction.

Program expenditures are also reviewed periodically throughout the year to ensure they are tracking to completion and are on-budget. A year-end review is also conducted to review plans versus achievements, program/asset performance, program effectiveness, and any changes that occurred or are recommended. Recommendations for change are made to senior management by the engineer who is responsible for asset management.

Project Prioritization

PROSORT provides a means to prioritize investments on a consistent basis regardless of the asset categories involved. Investments are ranked based on the ratio of the cost of achieving that risk reduction, to the benefit they provide, in terms of risk reduction. The projects which provide the highest risk reduction per unit cost are ranked highest. The risks are based on customer focused business values related to asset investment, and the weighting of those business values, which have been determined and agreed upon by senior management. The business values and their respective weighting were provided in Table 25. The project prioritization will act to ensure the most cost effective projects have top priority and, hence, costs to customers are minimized.

ENWIN's core planning objectives were discusses in Section 5.2.1 (a) of the DSP. Further discussion regarding how the business values are interpreted within the PROSORT tool is provided below.

Safety – ENWIN's customers have a strong expectation that the electrical distribution system that serves their energy needs is safe, and they place a high value on that safety. ENWIN has utmost regard for the safety of the public and its employees and designs, builds, operates and maintains its assets to ensure that the risk of harm to individuals, property or the environment is minimized in accordance with good utility practice. ENWIN's customers agreed that safety was a high priority.

> *"Safety was the third critical priority. More than 6-in-10 (63%) of residential participants consider it a top-three priority." (IRG Final Report pg. 64)*

While safety is considered by customers to be third in priority, ENWIN places safety as its top priority. ENWIN believes that customers rank safety third because ENWIN has had a good safety record, and safety it is not top of mind as a result. As discussed in section 5.3.1 (a), when safety is able to be separated from reliability and cost, safety will always take the top priority.

Reliability – ENWIN defines reliability to include the elements of sufficiency and contingency risk minimization. ENWIN's customer engagement initiative identified that customers value the reliability of their electrical service and are unwilling to accept a lower reliability of service. Customers expect ENWIN to maintain a proactive capital investment program that either improves or maintains system reliability.

> *"They did however underscore the importance of continuing this level of reliability now and into the future. There is limited appetite amongst respondents in this rate class to accept more or lengthier outages." (IRG Final Report pg. 19)*

> *"Most residential participants thought it was important that ENWIN spends what is needed to maintain the system (67%) and a plurality (49%) want ENWIN to invest in aging infrastructure."(IRG Final Report pg. 69)*

A telephone survey conducted by IRG during the customer engagement revealed,

> *"…that a majority of low-volume customers want ENWIN to spend what is needed to either maintain or improve system reliability related to fewer and shorter outages." (IRG Final Report pg. 9)*
> *"Technologies, such as automated switches, that can improve reliability and manage outages more efficiently, were seen to have comparatively the most value in terms of investment. In the telephone survey about 7-in-10 respondents (residential: 69%; small business: 73%) feel that it is important to invest now in modernizing the grid. This sentiment was shared by 47% of residential online respondents, who felt that technology will save money in the long run."(IRG Final Report pg. 9)*

Given the high level of manufacturing in ENWIN's service area, and the fact that ENWIN operates in the highest isokeraunic area in Canada, ENWIN designs and operates its distribution system in conformity with established standards for reliability and power quality. ENWIN's goal is to maintain its current and expected level of reliability and, where appropriate and cost effective, to improve its level of reliability, while also improving communication with customers during outages. ENWIN will strive to improve its ability to provide its customers with information relating the extent and likely duration of outages.

> *"Despite limited displeasure with system reliability, residential participants were still interested in ENWIN offering increased communications regarding estimated time of recovery (ETOR)." (IRG Final Report pg. 20)*

The measures of reliability that ENWIN uses to judge its level of reliability are the SAIFI and SAIDI reliability measures.

With respect to sufficiency, ENWIN designs and operates its distribution system to ensure sufficiency of supply. ENWIN will ensure its distribution system has sufficient capacity to serve reasonably expected near-term growth.

Financial Risk – ENWIN's customers expect to pay just and reasonable rates for their power.

> *"More than 6-in-10 (residential: 63%; small business: 65%) thought "delivering electricity at a reasonable price" was the most important customer priority." (IRG Final Report pg. 123)*

ENWIN recognizes that loss of electrical supply can represent a significant cost to operating businesses in ENWIN's service area. When there is a power outage, ENWIN incurs costs to remedy the outage and more importantly, and customers incur costs and inconvenience. In the case of commercial customers the loss of power during business hours can cost the business a significant amount of money. When considering distribution system risks, ENWIN places value on mitigating costs that its customers would incur in the event of a loss of power.

Sustainability – Sustainability includes values related to regulatory compliance, environmental stewardship, conservation, sufficiency and reputational risk minimization. Additionally, ENWIN recognizes the value its customers place on predictability of rates and strives to manage its distribution system assets in a manner that will smooth the peaks and valleys of expenditures as much as possible.

> *"I'd like to see consistency. I don't want to be surprised. I'd like to know what's in my future regarding prices." (IRG Final Report pg. 29)*

ENWIN's customers are environmentally conscious, and ENWIN strives to be a good steward of the environment, including by minimizing the environmental footprint of its operations commensurate with good utility practice. ENWIN continues to strive to manage its assets and deliver services in compliance with all applicable rules and regulations. These considerations manifest in terms of risk to ENWIN's reputation within the community, with the shareholder and with its various regulators. All of these stakeholders need to have confidence that ENWIN management is able to manage the business in a competent fashion that is responsive to customer's needs, shareholders needs and in compliance with all rules and regulations.

Risk Minimization – PROSORT

ENWIN designs, builds, operates and maintains its distribution system with regard to minimizing risk that would adversely affect the safety and/or reliability of the distribution system, while having appropriate regard for cost effectiveness. Risk, in the context of ENWIN's electrical distribution system, is the risk of not meeting safety, reliability (frequency and

duration of outages) or sustainability performance targets, the risk of insufficient storm response, and the risk of injury to ENWIN's reputation. Risk management is considered as part of the processes of planning, building, operating and maintaining the distribution system. Risk mitigation occurs in the form of inspection, maintenance, replacement of assets, and system modifications.

The PROSORT project prioritization tool uses a "Risk Matrix" to combine the consequence and likelihood of a failure in order to estimate the risk to ENWIN's business values. This is represented as a Total Risk Score. Projects that are proposed address a risk of a negative outcome of an event or failure. The risk is evaluated in terms of the likelihood of occurrence and the consequence.

The Risk Matrix scoring that has been proposed by Kinectrics and is used by a number of utilities including ENWIN is shown in Table 73 below. It provides a distinction between an event that has a low chance of occurrence and a low consequence, to an event that has a high probability of occurrence and a high consequence.

Table 73 Risk Matrix Scoring

Likelihood / Consequence	Low	Medium-Low	Medium	High-Medium	High
Very Likely	9	25	68	184	500
Likely	7	19	51	139	379
Somewhat Likely	5	13	34	93	253
Unlikely	2	6	17	46	126
Remote	1	3	7	19	51

The Total Risk Score of an event is the sum by business value of the "Risk Rating" multiplied by the weighting of the business value. The Total Risk Score for status quo (not undertaking a project) and for undertaking the project are computed. Where a project is undertaken, it is expected that the likelihood and/or consequence of the event is reduced. The Risk Reduction Factor is the difference between Total Risk Scores between undertaking and not undertaking a project. The cost per Risk Reduction Factor is calculated for each project and projects are ranked in terms of their cost effectiveness and that ranking becomes the prioritization for the potential investments being considered.

The Risk Matrix for ENWIN Asset Prioritization is shown in Table 74 below.

Table 74 Risk Matrix for Project Prioritization

	Factor	Values	Categories	1	2	3	4	5
				Insignificant	Minor	Moderate	Major	Catastrophic
Consequence	0.3	Safety	Life/Health	Injuries not requiring medical attention	Minor injuries/First Aid	Serious Injury/Medical Aid/Hospitalization	Life Threatening Injury/Multiple serious injuries	Death/Multiple life threatening injuries
			Property Damage	Minor loss to utility property, < $5k	Loss to Customer/Utility property/claims for damages, $1k - $10k	Damage to buildings/vehicles requiring major repairs, $10k - $100k	Serious damage to buildings/vehicles - non-repairable, $100k - $1 million	Damage to multiple properties, > $1 million
	0.25	Financial	Customer Costs	Minor inconvenience, no claims	< $1,000	$1k - $100k	$100k - $1 million	> $1 million
			Utility Costs	Minor inconvenience	< $1,000	$1k - $100k	$100k - $1 million	> $1 million
			Fines/Penalties	Inquiries from Regulators	Audits from Regulators	Order for change from Regulators	Fines > $50k, $1k/day	Fines > $100k, $1k/day
			Legal/Insurance	No implications	Claims for Damages, settled by Insurance	Lawsuits likely to be settled, < $100k	Lawsuits likely to be defended in court, < $1 million	Lawsuits >$1 million, Insurance claim in excess of deductible
	0.25	Reliability	Customer Disruption	< 10 Customers affected, Customers out < 1hr	<500 Customers affected, majority of affected customers out < 1 hour, SED	1 feeder out, Majority of affected customers out 1-8 hours, MED	> 1 feeder out, Majority of affected customers out 8-24 hours, MED	Station out for > 8 hours, Majority of affected customers out > 1 day, MED
	0.2	Sustainability	Environmental Damage	Minor clean-up required	MOE Notification required, clean-up required	Major cleanup required, cleanup last 1 day - 1 week	Major cleanup required, barricading/area restrictions,	Irreparable harm to environment, large fines, charges
			Non-Compliance	Reported to Regulators	Inquiries from Regulators	Audits from Regulators	Sanctions from Regulators	Threat or Loss of Distribution License, Severe Penalties Imposed
			Reputational Damage	Brief social media comments	Adverse reports on local papers, media	Adverse regional media reporting, loss of faith in ability to operate, loss of jobs	Adverse provincial media reporting, loss of senior staff jobs	Adverse provincial media reporting, sale of company
Likelihood	1	Expected to occur in the next 5 years	Almost Certain	9	25	68	184	500
	2	Will probably occur in the next 5 years	Likely	7	19	51	139	379
	3	Might occur in the next 5 years	Possible	5	13	34	93	253
	4	Doubtful to occur in the next 5 years	Unlikely	2	6	17	46	126
	5	May occur but only in exceptional circumstances	Rare	1	3	7	19	51

This Risk Matrix provides the risk categories by business value along with the rating factor for the values. It also provides descriptors of consequences by increasing severity as a guide for the evaluator to assess the risk score of not doing a project. It is possible that a lower consequence but higher likelihood event will have a higher risk score than a lower consequence but more likely event. In all cases, the scenario with the highest risk score is selected.

In addition to minimizing the probability and consequence of a negative outcome through appropriate plant investment, there is often the possibility that an investment will provide a "side benefit" that is independent of the risk reductions, but would be considered of value to ENWIN's customers. In order to accommodate this within the relative evaluations of projects in the PROSORT tool, ENWIN uses a similar matrix to the one above to assign value to these benefits. The matrix for including these benefits is shown in Table 75 below (the "Benefit Matrix").

Table 75 Benefit Matrix for Project Prioritization

Benefit Matrix for Project Prioritization

	Factor	Values	Categories	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
Consequence	0.3	Safety	Life/Health	Slight safety improvement	Modest safety improvement			
			Property Damage					
	0.25	Financial	Customer and Utility Costs	Reduces Utility Costs	Reduces Customers Direct Costs			
				Reduces Future Replacement Costs	Avoids In-service Failure Costs			
			Efficiency and Flexibility	Improves Efficiency OR Flexibility of Operation	Improves Efficiency AND Flexibility of Operation			
	0.25	Reliability	Customer Disruption	Customer Interruptions are Planned	Avoids In-service Failure	Reliability improvement for a top-10 Worst Performing Feeder		
	0.2	Sustainability	Environmental Damage	Provides Re-Use of Existing Assets	Provide Capacity for Load/Generation Growth			
			Non-Compliance	Includes Replacement of Ancillary Equipment	Creates synergies with Other Projects			
			Reputational Damage	Improves Company Reputation				
Likelihood	1	Expected to occur in the next 5 years	Almost Certain	9	25	68	184	500
	2	Will probably occur in the next 5 years	Likely	7	19	51	139	379
	3	Might occur in the next 5 years	Possible	5	13	34	93	253
	4	Doubtful to occur in the next 5 years	Unlikely	2	6	17	46	126
	5	May occur but only in exceptional circumstances	Rare	1	3	7	19	51

The Benefit Matrix is skewed towards the lower value determinants in the risk model in order to reflect the belief that, in general, the primary purpose for investment in an existing electrical distribution system is to minimize risk of negative outcomes.

The values associated with these benefits are directly added to the net risk score reduction from the Risk Matrix and may elevate the priority associated with a specific project or programme.

Table 76 PROSORT Cost per Unit Risk Score Reduction - Example

UPDATE or Assess A PROJECT

To update a project, please select your target project from either drop-down list. The project properties will be automatically populated on the fields below. Make your changes and/or Assessments and hit the "UPDATE PROJECT" button. The changes will be reflected on the PROJECT LIST on the right.

Select ANY Project	OR	Select a Project that has Not Been Assesssed
3. 1 Feeder Tie - Grand Marais E and South Pacific		

Number	1
Name	Feeder Tie - Grand Marais E and South Pacific
Description	15M11-55M24
Cost	$105,000
Savings	
TOTAL COST	$105,000

Assessment of Impact of Investment to Business Values

RISKS

	Business Values	BEFORE Consequence	BEFORE Likelihood	BEFORE Score	BEFORE TRS	AFTER Consequence	AFTER Likelihood	AFTER Score	AFTER TRS	Comment
0.3	Safety									No risks identified wrt to Safety
0.25	Reliability	Moderate	Almost Certain	68	17	Minor	Unlikely	6	1.5	Risk of feeder out for up to 8 hours without tie.
0.25	Financial	Moderate	Almost Certain	68	17	Insignificant	Unlikely	2	0.5	Risk of 1k-100k in customer costs
0.2	Sustainability	Minor	Almost Certain	25	5	Insignificant	Unlikely	2	0.4	Risk of Reputational Damage through unfavourable media reports.
	Total Risk Score				39				2.4	
	Change in RISK Score (decrease)	36.6								

BENEFITS

	Business Values	BEFORE				AFTER Consequence	AFTER Likelihood	AFTER Score	AFTER TRS	Comment
0.3	Safety									
0.25	Reliability									
0.25	Financial									
0.2	Sustainability									
	Total Benefit Score									
	Change in BENEFIT Score (increase)									

Change in Total RISK-BENEFIT SCORE	36.6
CRBF ($ / Weighted Score)	2,869
Risk Assessment	GO: Project will improve Risk-Benefit Score.

UPDATE PROJECT

The example project shown in Table 76, above, is a System Service project to construct a remote operable feeder tie between segmented sections of a feeder for $105,000. In the event of a fault on the feeder, with the feeder tie in place, the section of the feeder with the fault can be isolated and the feeder tie used to supply sections downstream of the fault so that customers will have their power restored within a couple minutes rather than the full time that it would take to repair the faulted section of the feeder.

No safety risk was identified to be mitigated with this construction. Without the feeder tie, customers that are served from sections of the feeder that are not affected by the fault will remain without service until the repair is completed on the faulted section. This could take up to 8 hours or more depending on the cause and the damages. The “Reliability” value consequence was judged to be “Moderate” and the likelihood “Almost Certain”.
With the feeder tie in place, the customers on the non-faulted sections of the feeder could be isolated and supplied through the feeder tie within a matter of minutes or sooner. In this case the Reliability value consequence is reduced to “Minor” and the likelihood of greater consequence to “Unlikely”.

This resulted in a Total Risk Score reduction of 15.5 points.

Similarly, a long outage to these customers was judged to be “Almost Certain” to cost customers between $1,000 and $100,000, or be of “Moderate” consequence. Completing the project reduces the consequence to “Insignificant” and the likelihood of a greater consequence as “Unlikely” for a Total Risk Score reduction of 16.5 points.

Finally, should all customers on a feeder remain without of power for up to 8 hours, negative local media reports would be “Almost Certain” to result in a “Minor Consequence”, while restoring power within a few minutes would be “Unlikely” to have greater than an “Insignificant” public relations risk. The Total Risk Score reduction is 4.6 points.

The cost per risk point reduction is shown in PROSORT as $2,869 per unit point reduction. Ranking similarly judged potential projects enables a ranking of projects by their cost effectiveness in reducing risk for the customers.

5.4.1 (c) Prioritizing of REG Investments

REG projects may include system expansions to connect REG customers, renewable enabling investments, or connection of REG customers. ENWIN has no generation projects of its own and all generation connection-type REG investments are driven from customer requests. In terms of prioritization, ENWIN considers REG connection requests from customers to be System Access investments and, therefore, mandatory investments. In terms of PROSORT prioritization, ENWIN assigns these requests for investment with a PROSORT value of “1”, placing them in the top priority position.

To date, all the REG connections requested of customers have been at existing load customer sites and, consequently, no expansions were needed to connect REG customers. ENWIN’s distribution system is built out throughout its territory; hence, no system expansion is needed to connect REG customers. Should circumstances change such that system expansion becomes necessary, ENWIN perceives that a request for connection would be pursuant to section 3.2.5 of the DSC, and would be considered a System Access request which would receive top priority.

REG enabling investments for connection of REG customers have been previously undertaken by ENWIN, and a material REG project is contemplated within the Forecast Period. The project undertaken was to provide a SCADA link to REG customers in the >10 kW class. This would allow ENWIN to monitor the amount of power generated, and curtail the generator in the event that the ENWIN distribution system was in an off-normal supply configuration where the generators on the feeder would not have a capacity allocation to the feeder/station from which they were being temporarily supplied. The cost for this system was not considered material, and was considered to be a System Access expenditure to enable compliance with the Province’s directives to connect REG generation.

The REG project contemplated in Forecast Period will provide a bus-tie reactor at the Walker 2 TS. The purpose of the bus-tie reactor is to limit fault current flowing from both transformers that supply the bus. When a fault occurs on a feeder supplied from one of two buses, the fault

current flowing from the transformer furthest from the affected bus is limited by the reactor. This limits the available fault current at the station. This will enable additional REG generators to connect to feeders egressing from the station. This REG enabling enhancement is subject to the rules in sections 3.3.3 and 3.3.4 of the DSC. Hence, this bus-tie reactor will enable System Access connections by generators. Without this bus tie reactor, customers applying for connection will be rejected and queued to a time when ENWIN is able to apply for rates which will include the cost of the reactor.

Government policy regarding the subsidization of REG installations by customers has changed in recent times, making it difficult to make a judgment as to the level of such investments by customers. Additionally, it is not known whether the government plans to change the mechanisms in place to socialize costs for renewable-enabling investments, and thereby minimize the cost burden on ENWIN customers for undertaking these generation projects.

This investment is contingent on the existing government policies with respect to cost mechanisms for REG installations remaining the same. The investment must also be planned and constructed at least 2 years prior to when it is needed. This is due to the long lead times for engineering, procurement, construction, commissioning and rate approvals. ENWIN's determination of the priority of this expenditure places the project at the bottom of the prioritization list and, as such, an investment in a bus-tie reactor must be contingent upon socialization of the costs.

5.4.1 (d) Non-Distribution System Alternatives

ENWIN is not contemplating any non-traditional, non-wires alternatives as part of this DSP. ENWIN reviews its distribution system for constraints related to load capacity, reliability and capacity to accept generation. The first choice for mitigation of constraints is to make use of the existing distribution system. This may be achieved by a reconfiguration of feeders to move load off of a heavily loaded feeder and onto another feeder with available capacity. It may also result in an addition of load to a lightly loaded feeder so that generation on that feeder does not exceed 50% of the minimum load of the feeder, and trigger a need for transfer trip.

While this mitigation has been used successfully in the past, it is becoming more difficult to reconfigure feeders as more generation is attached to those feeders. This is because the generation is assigned to a specific feeder and station, and if it is desired to reassign that section of a feeder to another source, then the existing generation on that feeder will not have a capacity allocation to generate to that alternate source. Consequently, this alternative is becoming less useful as generation continues to connect to the distribution system.

ENWIN had an active CDM program that enabled a load reduction across the entire distribution system. In 2007, following ENWIN's system peak was in August 2006, ENWIN was actively looking to site another TS to supply the growing peak loads the system was experiencing at the time. The CDM initiatives have been sufficiently successful and, along with 2008 economic downturn, have eliminated the need for an additional TS over the Forecast Period.

ENWIN does not have any capacity constraints in areas that are also restricted in terms of the ability to build a wires solution. Consequently, ENWIN does not contemplate any storage or local generation alternatives in the near and mid-term future. For ENWIN's service territory, a wires solution will generally have an advantage over any non-wires alternatives.

ENWIN anticipates that capacity to accept generation will reach its limits on the distribution system either due to fault current capacity, or minimum load. ENWIN has been successful in avoiding the necessity for its customers to provide transfer trip capability by moving load on to such feeders. HONI has installed bus-tie reactors at several of the stations that supply ENWIN in order to limit the cross-bus contribution from the second transformer at their DESN TSs. ENWIN anticipates that its Walker 2 TS will reach the point where a bus-tie reactor will also be required in order to provide capacity to accept additional generation on the Walker 2 TS feeders. This project was detailed in Section 5.4.1 (c) of the DSP.

ENWIN's distribution system is fed from stations that are supplied from HONI's 230 kV and 115 kV systems. HONI's 115 kV system has had issues with capacity in the recent past, which persists today. ENWIN is able, and commonly does, assist HONI during these times by moving load off the 115 kV supplied stations and onto the 230 kV supplied stations. ENWIN is able to accomplish this remotely through its SCADA system. This has provided a benefit to the utilities in the Southwest Regional Planning group and to HONI. That group is executing plans to build a new TS in Leamington which will be 230 kV supplied and will alleviate load on the 115 kV sub-system.

ENWIN has many industrial customers that are sensitive to fluctuations in voltage, which increase when feeders sharing the same bus with these customers experience a fault, and draw the bus voltage down before the protections can clear the fault. ENWIN has one large industrial customer that does not have the ability to "ride-through" such situations and who experiences plant shutdowns whenever this occurs. ENWIN explored the use of a battery storage solution with this customer as part of a federal government grant program in 2017-18. Despite the potential for obtaining grant money for a pilot project, the customer ultimately withdrew their support for the application.

There has been one completed regional planning process and a second process is currently underway. In both processes, the emphasis of the regional plan has been in regard to supply issues that exist in Essex County, outside ENWIN's territory. There has been nothing in those regional plans that have influenced ENWIN's approach to identifying and assessing alternatives.

5.4.1 (e) Capital Expenditure Planning Process Overview – Planning Strategies

Planning Synergies

As discussed in Section 5.2.1 (h) of the DSP, ENWIN seeks to bundle projects in order to satisfy as many of its objectives as possible while minimizing costs for customers.

ENWIN has plans for reliability and resilience improvements which are labelled for execution "upon opportunity". For example, ENWIN plans to convert a number of its feeders to high-capacity feeders between stations. This will assist in moving power around its network in case of contingencies. The routes of these feeders is known, and as EOL pole replacement or road works jobs are engineered, their routes are checked against the plan. Where there is a match, the pole line will be built for a higher capacity service.

The incremental cost for larger conductor is negligible in comparison to the entire project cost, so it makes sense to take that opportunity to build the line as a high capacity feeder. Where the pole line may have a number of poles at EOL and a number of poles approaching EOL, ENWIN may choose not to replace poles on a "one-off" basis and may accelerate the replacement of some poles in order to create a "project" approach to the replacement, so that the high capacity feeder can be implemented, and the overall work completed in a more efficient fashion (e.g. so that costs for pole replacements are less expensive).

Similarly, with reliability improvements through automation, EOL switch replacements are checked against a master plan and, if the switch is part of the automation plan, then the replacement switch will replaced with an automated switch. Switches for feeder automation generally involve two switches, so if one is at EOL, the sister switch may be replaced with an automated switch as well. However, if the existing switch in good condition, it will be refurbished or moved to another EOL replacement location that is not planned for automation.

ENWIN also recently (2016) converted its GM MTS to a distribution station from a dedicated automotive plant TS. The station was built around 1999 and was dedicated to serving the General Motors ("GM") Transmission plant in Windsor. The station was built as a three-wire delta feed to GM. GM closed their plant in 2010 and tried to sell the facility for a few years. ENWIN continued to supply the plant with power until the property was bought by an entity whose intention was to tear down the buildings.

ENWIN discontinued supply to the property in August 2014. The land on which the station is sited is owned by GM and the terms of ENWIN's occupancy calls for ENWIN's interest in the property to cease five years after which it no longer supplies power. ENWIN realized the station could be used to provide two distribution feeders to the distribution system if it was converted to a four-wire grounded-Y supply. ENWIN converted the station in 2016.

The conversion of the station allowed, by displacement, a reduced loading on downtown feeders that were nearing capacity. The new feeders also provided additional capacity to accept generation. Finally, the GM MTS is located near a developing industrial park so that it will become an option for servicing that park, either directly or by displacement.

Customer Access to Consumption Data

ENWIN has a number of offerings whereby interested customers can access data from their meter so that they can make decisions on their energy usage.

ENWIN also contracts with an independent party to read ENWIN's larger customers' meters and present that data back to the customer in the form of a file they can either download or observe on the independent party's web site. For residential and small commercial customers, ENWIN has a product called ENWINConnect® to which customers can subscribe. With ENWINConnect, customers can set up personal dollar amount or usage thresholds, and be notified when they have reached them. Tracking usage patterns helps customers better control the bottom line on their bills. ENWIN is currently in the process of renewing this capability and offering to customers.

Real-Time Data Access

At a customer's request, ENWIN will use a meter at their facility that contains a KYZ pulse output. There are a number of larger customers that use this real-time feed of consumption data at their plant to make decisions on how best to utilize their power consuming equipment.

REG Enablement

Over 800 of ENWIN's customers have installed and connected generation to ENWIN's distribution system. The capacity of the distribution system, as well as the transmission system, is not infinite. There is a finite capacity to accept generation. Generators over 10 kW that connect to ENWIN's distribution system require a capacity allocation which is secured through an application for and completion of a Connection Impact Assessment ("CIA"). The CIA is a study to confirm that the distribution system, TS and transmission system all have capacity to accept that generation. The capacity allocation is specific for the generator, the feeder and the station. Capacity to accept generation is allocated to one feeder and station, and capacity for a single generator cannot be held for two feeders or two stations. Thus, when a feeder is in an off-normal supply configuration, generators holding capacity-to-generate allocations are to disconnect from that feeder.

ENWIN realized that it would be impractical to roll trucks to manually shut generators off or to try to contact generators to have them shut themselves off whenever an off-normal configuration or other situation required generator shutdown. Additionally, all generators coming on to the distribution system are remotely able to be monitored and operated through the internet.

ENWIN's SCADA system requires visibility and operability to these generators in order to shut them off in contingency situations. Typically, utility SCADA systems are highly secure and communicate with devices through private networks so that the SCADA system can control the distribution system. The use of the internet to monitor and operate devices on a SCADA system was found to be highly risky from a cyber security standpoint.

ENWIN innovated a secure solution to this problem. ENWIN set up a second SCADA instance on a separate server from its SCADA server, which is connected to the internet. ENWIN has generator customers install an ENWIN owned virtual private network device on the customer's inverter, which connects it through the customer's internet connection to ENWIN's second SCADA instance.

The devices are installed by the customer and commissioned for operability by ENWIN's SCADA system. Thus, for essentially no cost to the customer, ENWIN is able to monitor and control the larger generators on its distribution system. There is a firewall between the first and second SCADA servers so that generator information can be relayed to the first SCADA instance and displayed for the operator's use.

As penetration of generation on the distribution system increases, ENWIN has several feeder sections where the generation is approaching 50% of the minimum load of the feeder. This generation loading is the point at which, according to HONI's Technical Interconnection Requirements, generators need to install transfer trip between the generator and the station breaker (and recloser, if there are any, between the generator and the station breaker).

Transfer trip is a communication signal that is sent from the station breaker to the generator upon the breaker protections sensing a line fault downstream from the station. This communication signal trips a breaker at the generator end and is there to prevent the generator from feeding into a fault. Where generation can be more than the minimum load on a feeder, if the station breaker has tripped (and/or a recloser) without the trip signal, generators may see each other's generation and not detect that the feeder supply has been interrupted.

This may allow the generators to "island" or continue to generate to the loads closest to them. Without the "strong" 60 Hz power cycle from the grid, the "island" will get out of phase with the grid and when the breaker closes, the difference in phases will cause a fault that may damage the generators and other customer equipment. The transfer trip signal will cause the generators to disengage from the distribution system and prevent this.

Transfer trip communication media are dedicated connections from the station breaker to the generator breaker, and are very expensive to lease and operate. ENWIN has plans to investigate and pilot both a distribution management system and transfer trip systems that use a point-to-multipoint topology through a radio frequency system in the time frame of this CoS application. It is expected that once sufficient numbers of automated points are installed on the distribution system, a logical progression would be for a higher level system to manage switching when there is an upset condition. Currently, switching decisions are done by operators who have to receive the information about a contingency, evaluate the information, form an opinion on the situation, determine mitigations and then execute the switching through the SCADA system to try to restore customer's power as soon as possible. At the best

of times, this will take many minutes but can be accomplished by an intelligent device is a few seconds. This should result in a significant improvement in reliability to customers.

Technology Enabling Opportunities

ENWIN has made a number of investments intended to make itself more efficient and to improve service to customers. ENWIN has, for a number of years, been implementing mobile workforce devices and applications. These applications have field staff enter data on tablets rather than on paper forms. When the worker returns back to the office at the end of the day, the tablet data that was collected is uploaded into the appropriate application and the next day's work is loaded back to the tablet.

The data collection is somewhat faster on a tablet and the tablet is able to provide some screening of the data entered so that it is in the proper format and values entered are within an appropriate range. Loss of paper forms and the data that was collected is no longer an issue. Legibility issues and transcription errors have been eliminated. Clerical costs to reproduce the data into the appropriate application have been reduced. The data is much more reliable and available to users much more quickly than in the past. Additionally, system failures puts only a day's data collection at risk whereas in the past this could have been months of data collection efforts.

Innovative Processes, Services, Business Models and Technologies

In 2016, ENWIN barcoded its poles. This was done to improve the data, because, in the past, pole inspectors had difficulty knowing from maps whether they were inspecting the correct pole. The barcoding ensures that the data collected is attributed to the right pole and that evaluations and plans for that pole are appropriate.

ENWIN makes use of Google Streetview and Google Earth. These free applications have enabled the elimination of many field visits and provided the ability to provide reasonable distance measurements quickly and without resorting to maps and site visits. This makes ENWIN's engineering staff much more efficient and reduces costs for customers. Since these products were available, ENWIN's engineering staff complement has reduced from 10 to 7 staff members.

ENWIN was also a pioneer in the use of a drone for aerial plant inspection. Where ENWIN had previously used two men in a bucket truck to carry out inspections of aerial switches, reclosers, fuses, transformers, etc., ENWIN is now able to carry out effective inspections using a high-definition camera-equipped drone. This enabled ENWIN to perform inspections with a single person, who had prior been limited to light duties, and a pick-up truck. This saved labour and travel costs, as well as allowing the job of inspection to proceed more quickly by minimizing traffic set-up and tear-down time. Unfortunately, a recent decision by Transport Canada required drones to operate no closer than 100-feet from a structure and have thus limited drones to very specific applications.

5.4.1 (f) Distribution Rate Funded CDM Programs

While ENWIN considers non-wires alternatives to avoid or defer distribution infrastructure investments, there have been no opportunities where such alternatives would provide a preferred solution for ENWIN customers. Hence, there has been no distribution rate-funded CDM programs created to fulfill such a need, nor are any such programs contemplated through the period for which this rate application will apply. See section 5.4.1.1 for further details.

5.4.1.1 Rate-Funded Activities to Defer Distribution Infrastructure

On December 19, 2014 the OEB issued the Conservation and Demand Management Requirement Guidelines for Electricity Distributors (the CDM Guidelines)". Section 4.1 of the COM Guidelines outlines the OEB's guidance in support of the government's objective of putting conservation first in infrastructure planning. The OEB established a policy that allows electricity distributors to seek distribution rate funding for CDM programs and other initiatives for the purposes of avoiding or deferring infrastructure projects.

Any application for CDM funding to defer infrastructure must include a consideration of the projected effects to the distribution system on a long-term basis and the forecast expenditures. Distributors must explain the proposed program in the context of the distributor's five-year DSP or explain any changes to its system plans that are pertinent to the program. Distributors may apply to the OEB for funding through distribution rates for the following four types of activities, further details of which are in Section 4.1 of the CDM Guidelines."

a) CDM programs that target distributor-specific peak demand (kW) reductions to address a local constraint of the distribution system

b) Demand response programs whose primary purpose is peak demand reduction in order to defer capital investment for specific distribution infrastructure. These programs are expected to save peak demand or enhance system integrity and reliability in a specific area of the distribution system.

c) Programs to improve the efficiency of the distribution system and reduce distribution losses

d) Energy storage programs whose primary purpose is to defer specific capital spending for the distribution system

5.4.1.1 Rate-Funded Activities to Defer Distribution Infrastructure

In general, ENWIN has not used rate-funded CDM programs or other activities to defer capital investment for specific distribution infrastructure. As yet, there have been no opportunities where a non-wires solution would be the most economic or otherwise most attractive alternative. This is in part due to the fact that ENWIN’s distribution territory is not as congested and difficult to work in as other larger metropolitan areas, and partly because ENWIN’s overall system load has decrease over 23% due to a variety of factors, which are discussed in the following sections.

5.4.1.1 (a) Energy Conservation and Demand Management (CDM)

Under the Ontario government's new conservation framework, which commenced on January 1, 2015, LDC's were mandated to submit a six year CDM plan to the IESO. ENWIN submitted a plan that allowed ENWIN to move toward its target. ENWIN has been assigned a target of 151.3 GWh and has been allocated a budget of $38.4 Million to fund customer incentives and EWU expenses to 2020. The plan has been updated and reported each year.

As of June 2018, ENWIN has fully achieved its target and has fully allocated its incentive dollars, including "in the pipeline" projects that are contracted but not yet started. Thus, ENWIN was already in the position of turning the CDM program over to the IESO and winding down its program outreach prior to the Ontario government announcement of March 21st, which placed all utilities in this position. Accordingly, ENWIN management was already working with the IESO to ensure that local businesses can receive incentive dollars for their energy efficiency projects, directly from the IESO, while ENWIN CDM staff remain involved as local contacts to direct customers to the offerings provided by the IESO.

CDM expenses are not included in ENWIN's expenditure forecasts through the DSP period and may require revision pending review and approval by the IESO on the proposed wind-down funding. In the meantime, ENWIN continues to monitor its very successful CDM program to ensure all existing approved projects achieve fulfillment by 2020 and that all additional projects are directed to the IESO for extra incentive funding.

The revised expectations for CDM plan for persistent savings in the Windsor service territory is shown in Table 77 below.

Table 77 Revised Expectations for CDM Plan for Persistent Savings

SUMMARY OF PERSISTING CDM PORTFOLIO SAVINGS[3]				
	Year	**Persistent Savings from previous implementation year(s)**	**Incremental Savings**	**Plan Total**
Plan Persisting Savings (end-user level)	2015	First year	19.05	**19.05**
	2016	19.05	34.70	**53.75**
	2017	53.75	26.94	**80.70**
	2018	80.70	51.12	**131.82**
	2019	131.82	5.32	**137.14**
	2020	137.14	54.00	**191.14**

ENWIN's 2015-2020 Conservation Targets were considered in the development of the IRRP and RIP for the Windsor/Essex Region as well as ENWIN's DSP. As demonstrated in this plan, ENWIN

[3] Source: CDM Plan submission to IESO August 2018.

is committed to facilitating access to CDM programming to all customer segments within its service territory during the period of 2015-2020, as well as achieving the energy savings target assigned by the IESO. The achievement of said target will contribute to the success of the actions recommended in the Windsor/Essex IRRP, which are intended to ensure that the supply needs of the region are met.

ENWIN's CDM group has secured enough participation through the CFF conservation programs to meet and exceed the CFF target of 151.3 GWh. However, in doing so the CFF budget was fully allocated to customers with over 2 years remaining in the framework term. Customers expressed concern and disappointment in not being able to access funding for their energy efficiency projects moving forward.

The CDM group met with IESO staff to arrange the transition of CDM program funding to the IESO. ENWIN transitioned CDM program funding to the IESO, which enjoys a larger pool of conservation funds than was allocated to ENWIN. This allowed ENWIN customers to once again access funding for their energy efficiency projects.

ENWIN is also actively supporting the City in their Municipal Energy Plan by providing energy data, supporting the City's energy savings projects through the CDM program, and has funded two energy managers for the City through the program as well.

5.4.1.1 (b) Peak Demand Reduction

ENWIN's distribution system has experienced a significant decrease in demand, which is largely a result of the conservation efforts of ENWIN's customers, price elasticity due to rising electricity prices set by the Province, and a severe economic downturn in 2008-09. In the period from 2003 to 2017, the annual system demand (sum of monthly peak system demands) has decreased by over 23% as noted in Table 78 below.

Table 78 Annual System Demand

Annual System Demand (kW)		
Year	**System Demand (kW)**	**Variance (year-to-year)**
2003	6,545,972	
2004	6,531,914	-0.21%
2005	6,610,201	1.20%
2006	6,397,305	-3.22%
2007	6,503,000	1.65%
2008	5,688,742	-12.52%
2009	5,220,330	-8.23%
2010	5,435,608	4.12%
2011	5,405,101	-0.56%

2012	5,405,758	0.01%
2013	5,290,502	-2.13%
2014	5,093,138	-3.73%
2015	5,006,944	-1.69%
2016	5,061,441	1.09%
2017	5,030,980	-0.60%

This overall reduction in demand has resulted in relief from system load increases both in ENWIN's territory and across the Windsor/Essex Regional Planning group. The demand reduction has been general and spread across all areas of the distribution system.

Consequently, there were no demand response programs whose primary purpose was to defer capital investment for specific distribution infrastructure. Nonetheless, ENWIN had experienced its highest peak load in August 2006 and, in 2007, ENWIN was actively considering where it could site an additional TS to serve the growing demand. However, the severe economic downturn in 2008-2009, along with the continuing decline in demand, has indefinitely deferred the requirement for a new TS.

ENWIN's system peak will be impacted by several factors in the future (independent of the economy and weather). For instance, the electrification of transportation (EV uptake), the conversion of heating load from gas to electricity, development of vacant lands, and the lowering of overall electricity costs will place upward pressures on peak demand. Conversely, efficiency and conservation measures, price increases, increasing penetration of distribution connected renewable energy, penetration of electricity storage, and incentives to increase adoption rates for these measures will put downward pressures on system peak demand.

Many of these items are beyond ENWIN's control and, hence, load forecasts are most reliable in the short to mid-term. Longer term forecasts are provided in the LTEP, and are made by government, which has the ability to make strategic choices regarding energy supply, and has the economic ability to drive those choices. ENWIN relies on the Province's LTEP for guidance regarding the long-term forecast for energy usage.

5.4.1.1 (c) Distribution System Loss Reduction

At present, ENWIN is not contemplating any rate-funded initiatives aimed to reduce distribution system losses through this DSP time frame. A brief discussion regarding ENWIN's efforts to reduce distribution system losses is below.

Distribution system losses arise from two main types of causes – technical losses and non-technical losses. The former result from the physical effects of moving power on wires to consumers, and arise due to the dissipation of energy in electrical equipment and conductors. Technical losses have both fixed and variable components. Fixed components include losses due to the energization of the coils in transformers (among other things), and variable losses

are due to heating of conductors which varies with the amount of energy moving on those conductors.

Non-technical losses include everything else that accounts for the difference between energy metered in to a system and energy metered out of the system. This includes variances due to the inherent variation in accuracy of the meters, accounting losses due to errors in recording values, timing of consumption at the beginning and end of periods, estimation differences, power theft, and other items.

During its 2009 CoS application, ENWIN determined that its distribution system losses were 3.77% for its secondary metered customers. Overall, for its 2017 deliveries, including primary metered customers who have a lower loss level, ENWIN's loss level is 2.38%[4], which compares favourably to the 2017 Ontario industry average of 3.87%. ENWIN has undertaken a number of measures whose indirect effect has been to minimize system losses.

For many years, concluding in 2015, ENWIN had been replacing its aging 4 kV distribution system with a 27.6 kV distribution system. With the increase in voltage, there was a corresponding decrease in current carried by the conductors. As line losses vary with the square of the current in a conductor, there was a consequent decrease in "I^2R" or heating losses associated with the conductors. Additionally, the transformer losses associated with the voltage reduction from 27.6 kV to 4 kV were also eliminated.

In 2015/16, ENWIN participated in a Smart Grid Funded pilot project to install and measure the effects of Varentec® grid edge micro-processor managed capacitor banks. The purpose of the project was to facilitate integration of renewable energy sources and enhance power quality of the grid. The project saw the installation of dynamic voltage/VAR control (capacitors) on the grid at transformers in order to reduce the number of VARs that the grid needed to supply to serve the loads. The measure also enabled a voltage reduction at the transformers that in turn created a conservation voltage reduction where some loads would use less power at a lower voltage than they would otherwise use at a higher voltage.

This measure would also reduce the technical losses on the distribution system. Normally, customers provide their own capacitor banks at their places of business. Customers with a poor power factor are consuming high levels of VARs and are being billed on the higher 90% kVA demand, rather than the lower billing determinant of kW. The supply of VARs from the capacitor banks improves customer's power factors and reduces their bills. Customers that do not have poor power factors do not have incentive to install capacitor banks. The piloted system was aimed at those customers' loads. A reduced system VAR load should result in a decrease in heating losses on the system as well as improved voltage support for the grid.

There were 35 units installed and monitored for a period of approximately one year. An economic review was conducted at the end of the period, and ENWIN determined that the cost of installing, operating and maintaining the units did not justify a further deployment of the

[4] OEB Yearbook 2017

devices. The devices continue to operate on the grid, since they operate autonomously and will remain in service indefinitely, or until it becomes apparent that they are no longer working and there is an opportunity to remove them.

In 2015, ENWIN undertook a Smart Grid Funded pilot with GRID 2020®. This pilot was aimed at reducing non-technical losses on the grid. GRID 2020 provided interval transformer metering which could be remotely monitored and compared against the sum of the smart metered interval consumptions. Where the sum of the smart meter consumptions did not match the energy provided by the transformer, it could be concluded that power diversion (theft) was taking place.

This pilot project was successful and identified a number of marijuana "grow-op" power thefts that were subsequently shut down. The reduction of power theft on the grid will reduce the unaccounted-for-energy on the distribution system. ENWIN reviewed the pilot findings and determined that it would be economical, provided that assumptions regarding the amount of theft that was occurring on the grid were reasonable.

ENWIN has completed the pilot and is not currently using the devices although they remain in-place on the distribution system but are not monitored. ENWIN is discussing further deployments with the vendor and a change to the vendor's business model has been suggested.

ENWIN has a program to identify undersized conductors on its distribution system, and to upgrade those conductors. The main driver behind this program is reliability. As ENWIN interconnects its distribution feeders to improve utilization and reliability, the undersized conductors will be overloaded when called upon to support load from a connected feeder that has lost its main supply. A beneficial by-product of this program is that the higher resistance of the undersized conductors will be reduced when the conductor is replaced with a standard sized conductor. This will reduce the technical heating losses on those sections of line that are replaced.

ENWIN has considered the use of amorphous core transformers on its distribution system. These transformers have lower losses than conventional transformers, but cost more than conventional transformers. Use of these transformers would reduce technical losses. An economic analysis showed that over the life of the transformer, the savings associated with the reduction in losses would overcome the increased cost of the transformer.

However, ENWIN became aware, through industry associations, of utilities that had reported premature failures of their amorphous core transformers. Since a reduced transformer life would negate any potential cost benefits from the amorphous core transformers, ENWIN decided not to change its transformer specification, and would instead monitor the experiences of other, larger utilities with their amorphous core transformer fleet.

ENWIN does, however, consider the losses on differing brands of conventional core transformers, and uses that information to make the best economic decision on transformer supply. Generally, the upfront capital cost of the transformer is the primary determinant in the selection decision, as the difference between loss ratings on comparable transformers is minimal. ENWIN continues to monitor the experiences of other utilities that use amorphous core transformers. Once the life expectancies of these transformers is determined, an economic analysis can be completed and a purchase decision can be made.

Should ENWIN choose to purchase amorphous core transformers, the change to these transformers would be through EOL replacement of conventional transformers and it would take considerable time (years) for a decrease in system losses to become apparent.

ENWIN has been able to use its smart meters to reduce power theft. ENWIN's meters are equipped with a tamper alarm and a "last gasp" alarm. ENWIN actively monitors and responds to these alarms. Should a customer tamper with his or her meter in an attempt to either bypass power or reduce registration on the meter, ENWIN will receive an alarm and will send a technician to the meter to determine why the alarm was triggered and whether a theft attempt was in progress. This will reduce the non-technical system losses. When a theft has been detected, ENWIN will pursue the customer to pay back the stolen amount of power so that this amount does not become part of the loss factor applied to other paying customers. Due to the random nature of theft situations, it is not possible to estimate the contribution from power theft on the distribution system losses.

5.4.1.1 (d) Energy Storage Programs

ENWIN is not contemplating the use of energy storage to defer specific capital spending for the distribution system. ENWIN is aware that a number of its customers are considering the use of energy storage in order to reduce the Class A Global Adjustment charges. ENWIN is also aware of the potential use of energy storage to provide customers with "ride-through" capability when there is a voltage sag on their feeder that would otherwise result in equipment shut-downs within the plant, and a potential total stop in production. ENWIN has engaged with its customers to make them aware of this potential solution to their power quality issues. ENWIN has jointly prepared a federal Department of Natural Resources, Green Infrastructure Phase II, Smart Grid Demonstration and Deployment Program application with a customer and a vendor for energy storage project funding. Unfortunately, the customer decided not to pursue the application.

ENWIN views energy storage on its distribution system, whether directly or behind a customer's meter, as a generator that has a fault current contribution, and therefore requires a capacity allocation to accept generation. At time of writing this DSP, ENWIN has one application from a customer for an energy storage project and a number of customers have inquired about the process for connecting storage.

5.4.2 Capital expenditure summary

The purpose of the information filed under this section is to provide a snapshot of a distributor's capital expenditures over a 10 year period, including five historical years and five forecast years. Despite the multi-purpose character a project or program may have, for summary purposes the entire cost of individual projects or programs are to be allocated to one of the four investment categories on the basis of the primary (i.e. initial or trigger) driver of the investment. For material projects/programs, a distributor must estimate and allocate costs to the relevant investment categories when providing information to justify the investment, as this assists in understanding the relationship between the costs and benefits attributable to each driver underlying the investment. In any event, the categorization of an individual project or program for the purposes of these filing requirements should not in any way affect the proper apportionment of project costs as per the DSC.

The distributor must provide the information described in Chapter 2, Appendix 2-AB. Appendix 2-AB illustrates how information filed under this section 5.4.2 includes a distributor's actual and forecast (i.e. proposed) capital expenditures and capital contributions over the historical and forecast periods. At a minimum, for historical years, applicants that have previously filed a DSP must provide the actual total expenditures in each DSP category. All years must be provided per the Chapter 5 investment categories. Plan expenditures over the historical period refer to a distributor's previous plan for capital expenditures filed in its last rebasing application, after adjustments (if any) resulting from the OEB's decision. If no previous plan has been filed, applicants are only required to enter their planned total capital budget in the plan column for each historical year and for the bridge year including the OEB-approved amount for the last rebasing year.

System O&M costs are also shown to reflect the potential impact, if any, of capital expenditures on routine system O&M. A distributor is expected to consider the reduction in O&M costs when planning capital projects. A description of the impacts of capital expenditures on O&M must be given for each year or a statement that the capital plans did not impact O&M costs. A distributor must consider the trade-offs between capital and O&M when assessing alternative options to a capital program.

Explanations should be provided if there are material changes in the percentage a given investment category is of the total investment over the forecast period relative to actual spending over the historical period. In addition to the Plan vs. Actual variances for individual investment categories, explanations must be provided for the following:

- **Plan vs. Actual variances for the total plan for each year of the historical period**

- **Variances in a given investment category that are trending much higher or lower over the historical period**

Applicants must also provide a completed Chapter 2 Appendix 2-AA along with the following

information about capital expenditures on a project-specific basis:

• Explanation of variances by project or category, including that of actuals versus the OEB-approved amounts for the applicant's last OEB-approved CoS or Custom IR application and DSP, if available

• For capital projects that have a project life cycle greater than one year, the proposed accounting treatment, including the treatment of the cost of funds for construction work-in-progress

A statement should be provided that there are no expenditures for non-distribution activities in the applicant's budget.

5.4.2 Capital Expenditure Summary

This section provides a review of ENWIN's capital expenditures from 2009, the last test year, to the current 2020 Test Year. The section discusses the "Plan vs Actual" amounts for each year from 2009 to 2017, along with the 2017 Actual vs 2018 Forecast, the 2018 Forecast vs 2019 Bridge, and the 2019 Bridge vs 2020 Test figures. Explanations for variances in each period are also provided for each investment category.

In 2009, the DSP investment categories did not exist and, hence, were not explicitly discussed in ENWIN's 2009 CoS. However, in this DSP, expenditures were broken out into those categories using the best information available to assist in demonstrating the pattern of expenditure over the period. ENWIN determined that the information available was sufficient to do an appropriate breakdown so that a consistent view of ENWIN's capital expenditures can be presented. All capital expenditures throughout this period were for distribution activities, and there were no expenditures for non-distribution activities.

Reference is made to table 2 in Appendix 2-AB, provided below in Table 79.

Throughout this analysis, "Plan" in 2009 refers to the budget submitted through ENWIN's CoS application for 2009 rates. Thereafter, "Plan" refers to ENWIN's internal capital budget amounts through 2013. Through this period, the concept of investment category did not exist and for purposes of this review, the "Plan" amounts represent the budget line items according to the categories for expenses established in the Chapter 5 filing requirements. In 2014, "Plan" refers to those amounts filed in the 2014 DSP. Thereafter, "Plan" refers again to ENWIN's internal capital budget amounts.

The amounts shown in the schedules are based on Generally Accepted Accounting Principles ("CGAAP") in 2009 through 2011 and, thereafter, the amounts shown are in accordance with the Modified International Financial Reporting Standards ("MIFRS") accounting standard.

Beginning in 2012 and through 2017, there was a change in labour burden rates which caused the applied labour rates to be lower than booked at the time. The amount of internal labour was determined for capital projects for each year and then the amount by which the application of the revised, lower labour burden rates would have reduced the capital projects was determined. The total amount of the reduction was then applied pro rata to the capital costs in the System Renewal and System Service expenditure category. This was done as those were the categories within which the bulk of the internal labour costs would land. System Access and General Plant typically have a higher percentage of contract labour to which the adjustment would not apply.

This has the effect of lowering the stated actual costs for System Renewal and System Service from 2012 to 2017, inclusive. The original plan costs were not adjusted. The magnitude of the adjustment was approximately 8.75%. Thus, the difference between plan and actual expenditures in the System Renewal and System Service categories for years 2012 through 2017 are overstated by 8.75% as compared to what they would have otherwise been.

Table 79 Appendix 2-AB Table 2 – Capital Expenditure Summary from Chapter 5

Consolidated

CATEGORY	2009			2010			2011			2012		
	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var
	$ '000		%	$ '000		%	$ '000		%	$ '000		%
System Access	2,876	1,608	-44.1%	15,061	8,443	-43.9%	5,187	5,099	-1.7%	5,097	5,870	15.2%
System Renewal	6,789	7,848	15.6%	6,380	6,921	8.5%	8,874	8,133	-8.4%	9,483	7,569	-20.2%
System Service	604	253	-58.1%	173	26	-85.1%	910	727	-20.2%	904	983	8.7%
General Plant	8,965	8,067	-10.0%	12,635	9,453	-25.2%	17,123	3,725	-78.2%	3,698	2,660	-28.1%
TOTAL EXPENDITURE	19,234	17,776	-7.6%	34,249	24,844	-27.5%	32,094	17,683	-44.9%	19,182	17,083	-10.9%
Capital Contributions	-	- 520	--	-	- 224	--	-	- 321	--	-	- 1,496	--
Net Capital Expenditures	19,234	17,255	-10.3%	34,249	24,619	-28.1%	32,094	17,362	-45.9%	19,182	15,587	-18.7%
System O&M	$ 5,309	$ 4,956	-6.6%	$ 5,515	$ 4,754	-13.8%	$ 5,134	$ 4,252	-17.2%	$ 4,434	$ 4,157	-6.2%

CATEGORY	Historical Period (previous plan[1] & actual)											
	2013			2014			2015			2016		
	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var
	$ '000		%	$ '000		%	$ '000		%	$ '000		%
System Access	3,079	4,903	59.2%	6,638	4,363	-34.3%	6,258	2,762	-55.9%	3,638	3,946	8.5%
System Renewal	10,766	8,126	-24.5%	8,109	6,952	-14.3%	6,719	8,221	22.4%	5,501	5,475	-0.5%
System Service	1,645	1,304	-20.7%	2,643	2,594	-1.8%	6,363	6,433	1.1%	5,196	2,931	-43.6%
General Plant	8,985	4,680	-47.9%	6,387	4,885	-23.5%	3,273	3,499	6.9%	5,369	2,253	-58.0%
TOTAL EXPENDITURE	24,475	19,014	-22.3%	23,777	18,794	-21.0%	22,613	20,915	-7.5%	19,704	14,605	-25.9%
Capital Contributions	-	- 757	--	- 3,131	- 2,403	-23.2%	- 3,485	- 4,322	24.0%	- 1,874	- 412	-78.0%
Net Capital Expenditures	24,475	18,257	-25.4%	20,646	16,391	-20.6%	19,128	16,592	-13.3%	17,830	14,194	-20.4%
System O&M	$ 4,729	$ 4,229	-10.6%	$ 4,332	$ 4,460	3.0%	$ 4,518	$ 4,398	-2.7%	$ 4,764	$ 4,631	-2.8%

CATEGORY										Forecast Period (planned)				
	2017			2018			2019			2020	2021	2022	2023	2024
	Plan	Actual	Var	Plan	Forecast	Var	Plan	Actual[2]	Var					
	$ '000		%	$ '000		%	$ '000		%	$ '000				
System Access	3,325	3,963	19.2%	5,269	3,310	-37.2%	7,267		-100.0%	6,205	3,476	3,526	3,577	3,628
System Renewal	6,883	5,456	-20.7%	6,482	5,586	-13.8%	7,289		-100.0%	8,440	8,009	7,605	7,850	7,366
System Service	5,979	3,976	-33.5%	6,135	4,427	-27.8%	4,221		-100.0%	3,537	3,622	3,610	3,986	3,623
General Plant	4,652	2,058	-55.8%	2,399	3,098	29.1%	7,507		-100.0%	5,021	4,283	3,856	4,174	4,213
TOTAL EXPENDITURE	20,839	15,452	-25.8%	20,285	16,421	-19.0%	26,284	-	-100.0%	23,203	19,390	18,597	19,587	18,830
Capital Contributions	- 1,234	- 2,217	79.6%	- 2,921	- 1,889	-35.3%	- 4,898		-100.0%	- 3,252	- 813	- 823	- 834	- 844
Net Capital Expenditures	19,605	13,236	-32.5%	17,364	14,533	-16.3%	21,386		-100.0%	19,951	18,577	17,774	18,753	17,986
System O&M	$ 8,813	$ 9,757	10.7%	$ 9,488	$ 9,825	3.6%	$ 10,942		-100.0%	$ 10,904	$ 11,049	$ 11,068	$ 11,102	$ 11,096

1.0 2009 OEB Approved vs 2009 Actual

Table 80 below shows 2009 OEB Approved vs 2009 Actual Expenditures by category.

Table 80 2009 OEB Approved vs 2009 Actual Expenditures by Category

CATEGORY	2009		
	OEB Approved	Actual	Variance
	$ '000		%
System Access	$2,876	$1,607	-44.1%
Capital Contributions	$0	-$520	N/A
System Renewal	$6,789	$7,848	15.6%
System Service	$604	$253	-58.1%
General Plant	$8,965	$8,067	-10.0%
Total Expenditure	$19,234	$17,255	-10.3%
System O&M	$5,309	$4,956	-6.6%

System Access

The OEB approved System Access expenditures and the actual 2009 expenditures are noted in Table 81 below.

Table 81 2009 System Access Expenditures ($'000)

Expenditure	2009 OEB Approved	2009 Actual	Difference
New Services and Meters	$ 2,425	$ 905	-$939
Relocations	incl. in New Services	$ 533	Incl.
Compliance - Long Term Load Transfer	incl. in New Services	$ 48	Incl.
Sub-Total for New Services	$ 2,425	$ 1,485	-$939
Compliance - IESO Wholesale Meters, LTLT	$ 452	$ 25	-$ 426
Compliance - Smart Meters	$0	$ 97	$ 97
System Access Total (Gross)	$0	$ 1,608	$1,269
Capital Contributions	$0	-$520	-$520
Sub-Total	$2,877	$1,087	-$1,789

The budget for new services, including relocations and the elimination of the 7th Concession Long Term Load Transfer with HONI was $2,424,867. However, the expenditures in these categories was $1,485,458. The 2007 new services expenditure was down from prior years and, at the time of budgeting, ENWIN predicted that the level of expenditures on services would rebound, as 2007 was an all-time low for new services (at 346, down from 1257 just a few years prior). ENWIN expected that new services would increase from 2007 levels by $1.4 million;

however, the economy continued to struggle and new services in 2009 dropped to an all-time low of 200 services.

The relocation component in the approved budget was $812,104 (this was the 2008 amount, which was expected to be similar in 2009) while the actual gross expenditure was $532,355. The contributed capital amount for 2009 was larger than expected as the contributed capital for the Parkdale relocation in 2008 landed in 2009 capital totals. The underspending was largely due to the City deferring the start of the Tecumseh at Jefferson road widening. This was budgeted at a net of $553,875, yet only $327,515 was spent in 2009 with the balance of the project completed in 2010. This included an expenditure of $97,781 for the Howard Road Grade Separation, which was fully recoverable, but the expenditure was in 2009 with contributed capital recognized the following year.

Additionally, there were compliance expenditures of $48,399 for the 7th Concession Long Term Load Transfer elimination, and $25,458 for the Walker 2 Station wholesale meters. Thus, the gross expenditure for new services, relocations and compliance items in 2009 was $1,607,617.

ENWIN expected that the wholesale meters at Malden TS would be replaced in 2009, and $451,880 was budgeted for this replacement; however the only expenditure that occurred was a carry-over expenditure for $25,458 for the prior year Walker 2 wholesale meter project. The reason that the Malden TS wholesale metering upgrade was deferred was that in late 2008, HONI identified a problem with the transformers at that station and asked the LDCs to unload the station as much as possible, moving as much load to adjoining stations and feeders as possible. With that operation restriction in place through 2009, it was not possible to further transfer load off any Malden feeders in order to take the lines completely out of service in order to install the wholesale metering pole top metering units.

Finally, there was an unbudgeted expenditure of $96,704 related to preparation work for installing smart meters in 2010.

System Renewal

The OEB approved System Renewal expenditures and the actual 2009 expenditures are noted in Table 82 below.

Table 82 2009 System Renewal Expenditures ($'000)

Expenditure Category	2009 OEB Approved	2009 Actual	Difference
4 kV Conversion Replacements	$ 4,939	$5,240	$301
27.6 kV Pole Replacements	$850	$556	-$294
Subdivision Cable Replacements	$400	$912	$51
Emergency Replacements	$235	$127	-$108
Manhole Rebuilds	$200	$263	$63
Other	$ 165	$750	$585
Sub-Total	$6,789	$7,848	$1,060

The System Renewal expenditure was $1,059,664 more than planned. This partially offset the under expenditure in System Access. Additional 4 kV projects (22F1 and 22F9) were undertaken, which resulted in an expenditure increase of $300,898. The planned subdivision re-cabling projects (Langloise Court and Borrelli subdivision) were undertaken, but the Borrelli subdivision work exceeded estimates by $202,450. At time of budgeting, the detailed engineering for the Borrelli project had not been completed, and the work was more involved than originally thought. In addition, there was $158,764 spent on miscellaneous replacements and $123,614 in cable replacements associated with conversions for a total of $484,828.

Manhole rebuild expenditures exceeded estimates as the detailed engineering had not been completed at budget time, and the work was more extensive than planned. 2009 was the beginning of a 5-year plan to catch up on the manhole deficiencies that had been identified during a 2008 inspection of the manholes.

The "other" category of renewal expenditure included $56k to replace meters that were part of a seal extension group that had failed and were required to be replaced. Since this replacement was very close to the point in time when the meters were to be replaced by smart meters (2010), ENWIN sought used meters from other utilities that were replacing their meters and were successful in obtaining those meters for a nominal cost ($5/m for shipping and handling). Hence, ENWIN was able to replace the meters that had failed their seal extension for a minimum cost.

Other expenditures within this classification included:

1. the replacement failed CPUs in the station controllers at the Chrysler MTS ($38k);
2. Walker 2 TS relay replacements ($167k) (which was a project started in 2008, but the costs landed in 2009);
3. the repair of a bushing leak at the Walker 2 TS ($46k); and
4. a transformer replacement ($373k) (this was a significant expenditure in this category).

The balances of the expenditures in this category were for miscellaneous smaller items.

System Service

The System Service expenditure category was budgeted for an expenditure of $603,675 while actual expenditures were $253,003, as shown in the following Table 83.

Table 83 2009 System Service Expenditures

Expenditure Category	2009 OEB Approved	Actual Charges	Difference
Pole Top Recloser Program	$0	$ 40	$ 40
Single Phase Line Protection	$ 15	$0	-$15
SCADA Improvements	$ 272	$ 113	-$162
Transformer Station Upgrades	$ 167	$0	- 167

Padmounted SU Replacements	$ 150	$ 191	$ 41
Monthly Spare Transformer Adjustment	$0	-$91	-$ 91
Sub-Total	$604	$ 253	$ 351

There were four recloser installation projects that had costs from 2008 projects land in 2009 due to later completion of the project in the year, which resulted in an unbudgeted $40,181 spend in 2009.

Line tap fusing was not undertaken, which resulted in a $15,000 under expenditure.

$200,000 of the budget for SCADA Improvements were for GIS upgrades and Control Room upgrades. The GIS upgrades are categorized as General Plant and the Control room upgrades were not undertaken.

There were 3 other small projects budgeted for $72,175 and were completed for $112,704, which included $84k to put the new downtown switching units on the SCADA system. This was a first for ENWIN, and costs were higher than expected due to the learning curve involved in accomplishing the work.

The station transformer upgrades were replacements and were reported in the "Other" category in System Renewal, and $166,754 was charged. The monthly spare transformer adjustment was for capitalization of spare transformers in inventory. OEB accounting rules allow the capitalization of certain large inventory items. Large transformers are kept in inventory as replacements when in-service transformers fail and need to be replaced quickly in order to restore a customer's service. The lead time for order delivery of large transformers is in the order of many months.

General Plant

The General Plant asset expenditure category was budgeted for an expenditure of $8,964,810 and expenditures were $8,066,575, as shown in Table 84 below.

Table 84 2009 General Plant Expenditures ($'000)

Expenditure Category	2009 OEB Approved	Actual Charges	Difference
Information Technology	$ 491	$ 786	$295
Site Services	$ 440	$ 516	$76
Fleet Support	$ 67	$ 213	$146
Other	$ 58	$ 88	$31
Customer Service	$ 659	$ 114	-$545
Comprehensive ERP	$ 7,250	$ 6,350	-$900
Sub-Total	$8,965	$ 8,067	-$898

Expenditures for the "Other" category included tools for various departments, and the original GIS system licenses ($202k), which were originally budgeted in other categories. Additionally,

the Customer service area started implementation of a planned VOIP telephone system but was unable to deploy an Interactive Voice Recognition and sophisticated outbound dialer system, which resulted in underspending for this category. The SAP comprehensive ERP was initiated this year, with work to carry over into subsequent years; however, approvals were delayed resulting in underspending in the amount of $901k in this category.

System O&M

The 2009 actual O&M costs were less than the board approved amount by $353k. The largest part of this deficit was due to reductions in line and transformer maintenance line items. 2009 has proven to be the mildest storm season with the best reliability stats in the last 20 years. In 2009, line and transformer replacement due to storms was charged to O&M (this changed in 2011). Since the year was abnormally mild, the spending on these line items was reduced. For a full explanation of the effect of capital investment on O&M costs see section 5.4.3.1 (b) Capital Investment Impact on O&M Costs.

2.0 2010 Plan vs 2010 Actual

Table 85 below shows 2010 Plan vs Actual Expenditures by category.

Table 85 2010 Plan vs 2010 Actual Expenditures

CATEGORY	2010		
	Plan	Actual	Variance
	$ '000		%
System Access	$15,061	$8,443	-43.9%
Capital Contributions	$0	-$224	N/A
System Renewal	$6,380	$6,921	8.5%
System Service	$173	$26	-85.1%
General Plant	$12,635	$9,453	-25.2%
Total Expenditure	$34,249	$24,619	-28.1%
System O&M	$5,515	$4,754	-13.8%

System Access

The 2010 Plan vs Actual System Access expenditures are noted in Table 86 below.

Table 86 2010 Plan vs Actual System Access Expenditures ($'000)

Projects	Plan	Actual	Difference
New Customer Connections	$2,674	$993	-$1,681
City Driven Road Work	$0	$867	$867

Wholesale Metering	$1,026	$384	-$642
Green Energy Line Extensions	$900	$0	-$900
Smart Meters	$10,458	$6,200	-$4,258
System Access Total (Gross)	$ 15,058	$8,444	-$6,614
Contributed Capital	$0	-$224	$224
Sub-Total	$15,058	$8,220	-$6,838

In 2010, the Windsor area was in a period of economic downturn, and only approximately 300 service connections were made. This resulted in significant underspending from the planned amount. City driven road work was not budgeted due to the downturn in the economy, and no clear signal was provided from the City as to whether any work would be undertaken, other than some fully funded underpass development work. Nevertheless, the City did progress with some projects resulting in a net spend of $867k.

Additionally, wholesale meter work did progress at Walker 2 TS and Malden TS. Wholesale meter work at the Keith TS, while planned, was deferred pending construction of the GHIB.

Furthermore, $900k was budgeted for green energy program line extensions. The program was new and it was not known at the time whether there would be many requests for extensions. In fact, all the connections were related to locations already served by load customers and there were no line extensions required.

Finally, the majority of the domestic smart meters were installed in 2010 at a cost of $6,200k. This was less than budgeted due to fortuitous pricing for the meters (Canadian dollar exceeded the US dollar in 2007, when the price was locked in, and, with most utilities finishing their smart meter installations, ENWIN was able to contract for a lower installation price than expected).

System Renewal

The 2010 Plan vs Actual System Renewal expenditures are noted in Table 87 below.

Table 87 2010 Plan vs Actual System Renewal Expenditures ($'000)

Expenditure Category	2010 Plan	2010 Actual	Difference
4 kV Conversion	$4,314	$ 5,284	$970
27.6 kV Pole Replacements	$500	$661	$161
Planned & Reactive Cable Replacements	$104	$6	-$98
Planned & Reactive Transformers	$282	$208	-$74
Reactive Pole Replacements	$0	$223	$223
Reactive Equipment Replacements	$0	$4	$4
Reactive Conductor Replacements	$0	$99	$99
Manhole Rebuilds	$256	$319	$63

Switching Units	$208	$119	-$89
Station Equipment	$717	$0	-$717
Other	$0	$0	$0
Sub-Total	$6,381	$6,923	$542

The 4 kV conversion work was increased this year by $970k over planned amounts in part due to the nature of the projects selected, and also due to the fact that System Access spending was much lower than planned.

Similarly, expenditures related to 27.6 kV system pole replacements were increased by $161k.

Finally, there were known problems with the SCADA control equipment at the Ford Annex that was planned for rectification. However, discussions with Ford (along with media coverage at the time) left doubt that the plant had a future. Consequently, the planned expenditures were deferred.

System Service

The 2010 Plan vs Actual System Service expenditures are noted in Table 88 below.

Table 88 2010 Plan vs Actual System Service Expenditures ($'000)

Expenditure Category	2010 Plan	2010 Actual	Difference
Conductor Upgrades	$0	$0	$0
New Switches and Sectionalizers	$0	$0	$0
New Connections	$0	$0	$0
SCADA Improvements	$145	$18	-$127
Other	$28	$8	-$20
Sub-Total	$ 173	$26	-$147

System Service expenditures were less than planned. Expenditures were related to a FCI pilot for $5,716, miscellaneous upgrades to the SCADA system implemented for $18,313, and various other small expenditures. Planned improvements to the SCADA system to capture FIT and mFIT data was deferred to 2011.

General Plant

The 2010 Plan Vs Actual General Plant expenditures are noted in Table 89 below.

Table 89 2010 Plan vs Actual General Plant Expenditures ($'000)

Expenditure Category	2010 Plan	2010 Actual	Difference
Building	$626	$581	-$45
Information Technology	$876	$660	-$216
Fleet & Welding	$66	$26	-$40

Tools	$239	$105	-$134
GIS	$638	$479	-$159
ERP	$10,190	$7,602	-$2,588
CIS	$0	$0	$0
Sub-Total	$12,635	$9,453	-$3,182

General Plant expenditures were $3.2 million less than budgeted in 2010. The largest part of the difference was due to the SAP ERP system implementation. The start of the implementation of the system was delayed in 2009 and the implementation was taking longer than anticipated—it would ultimately stretch into 2011. Consequently, less money was spent in 2010 than budgeted. Miscellaneous IT expenditures were also under budget in part due to the continuing and heavy involvement of the IT department in the SAP implementation.

3.0 2011 Plan vs 2011 Actual

Table 90 below shows 2011 Plan Vs Actual expenditures by category.

Table 90 2011 Plan vs Actual Expenditures by Category ($'000)

Category	2011 Plan	2011 Actual	Variance
System Access	$5,187	$5,099	-$88
Capital Contributions	$0	-$321	-$321
System Renewal	$8,874	$8,133	-$741
System Service	$910	$727	-$183
General Plant	$17,123	$3,725	-$13,398
Total Expenditure	$32,094	$17,362	-$14,731
System O&M	$5,124	$4,252	-$872

System Access

The 2011 Plan Vs Actual System Access expenditures are noted in Table 91 below.

Table 91 2011 Plan vs Actual System Access Expenditures ($'000)

Projects	2011 Plan	2011 Actual	Difference
Overhead Customer Connections	$72	$475	$403
Underground Customer Connections	$73	$318	$245
Plaza	$0	$0	$0
Windsor-Essex Parkway	$0	$600	$600
Windsor-Essex Parkway Contributions	$0	$0	$0
City Driven Road Work	$291	$86	-$205
Wholesale Metering: Keith TS Feeders	$0	$0	$0

Meter Work - New Customers	$90	$206	$116
Smart Meters	$3,313	$3,211	-$102
Wholesale Meters	$1,348	$202	-$1,146
System Access Total (Gross)	$5,187	$5,099	-$88
Contributed Capital	$0	-$321	-$321
Sub-Total	$5,187	$4,778	-$410

Customer connections, including meters, in 2011 exceeded budget by $764k. The amount budgeted was likely too low, but at the time the budget was struck, ENWIN had completed a prior year (2009) where the number of service connections were at a record low and it was thought that the situation would likely worsen. However, it instead improved slightly.

Work commenced for the Windsor-Essex Parkway project, which was completed in the same year. Costs for this project were 100% recoverable from the provincial government. Hence, although there were no impacts to ENWIN's budget, there were timing differences that resulted in year-end balances. These were reconciled in the following year.

Smart meter installations for small commercial customers continued through 2011, as planned. The bulk of the residential customers were converted in 2010.

Moreover, wholesale meter work continued at Walker 2 TS. However, the installation of wholesale meters at Keith TS Malden and TS were deferred. This was because Hydro One had a problem with one of the Malden TS transformers, and could not release the station to allow the wholesale meters to be installed.

System Renewal

The 2011 Plan vs Actual System Renewal expenditures are noted in Table 92 below.

Table 92 2011 Plan vs Actual System Renewal Expenditures ($'000)

Expenditure Category	**2011 Plan**	**2011 Actual**	**Difference**
4 kV Conversion	$ 6,249	$ 5,454	-$795
27.6 kV Pole Replacements	$1,500	$1,219	-$281
Planned Cable Replacements	$460	$328	-$132
Planned & Reactive Transformers	$140	$343	$203
Reactive Pole Replacements	$30	$132	$102
Reactive Equipment Replacements	$0	$79	$79
Reactive Conductor Replacements	$105	$326	$221
Manhole Rebuilds	$265	$253	-$12
Switching Units	$50	$0	-$50
Station Equipment	$50	$0	-$50
Other	$25	$0	-$25

Sub-Total	$8,874	$8,133	-$741

The 4 kV conversions and 27.6 kV pole replacements were under budget by a combined $1,076k. This was due to the fact that staff and contractors were not able to complete as much work as was originally planned. This was due to a variety of reasons, but the main reason was that the projects were not designed when the budget was made. As projects progress and designs are completed, it is typical that the fully designed cost estimate will often be less than unit cost estimates.

Additionally, a major storm hit Windsor in 2011. The storm-recovery required considerable work and time. This is a reason that reactive work is up a combined $605k.

Finally, the Erie Street cable replacement was performed under budget by $132k due to the job running smoother than expected.

There were no switching units, miscellaneous station equipment, etc. that were undertaken this year.

System Service

The 2011 Plan vs Actual System Service expenditures are noted in Table 93 below.

Table 93 2011 Plan vs Actual System Service Expenditures ($'000)

Expenditure Category	2011 Plan	2011 Actual	Difference
Conductor Upgrades/Extensions	$0	$43	$43
New Switches and Sectionalizers	$0	$48	$48
New Connections	$323	$226	-$97
SCADA Improvements	$582	$404	-$178
Other	$5	$5	$0
Sub-Total	$910	$726	-$183

System Service expenditures included:

1. a line extension on the 25M7 feeder to provide a back feed to a radial section for $43k;
2. a ScadaMate sectionalizing switch on Malden Road for $48k;
3. an overhead section linking feeders 55M24 and 24M3 so they could back each other up for $226k; and
4. $5k in new overhead fusing on unfused laterals.

Additionally, SCADA system improvement costs included $225k on various head-end components which enabled the monitoring of FIT generators on a second instance of the

SCADA system, and $179k for the installation of SCADA monitored FCIs on the downtown network ($136k) and on various other overhead locations ($43k).

General Plant

The 2011 Plan vs Actual General Plant expenditures are noted in Table 94 below.

Table 94 2011 Plan vs Actual General Plant Expenditures ($'000)

Expenditure Category	2011 Plan	2011 Actual	Difference
Building	$626	$470	-$156
Information Technology	$713	$327	-$386
Fleet & Welding	$57	$41	-$16
Tools	$220	$150	-$70
GIS	$507	$196	-$311
ERP	$0	$0	$0
CIS	$15,000	$2,540	-$12,460
Sub-Total	$17,123	$3,725	-$13,399

Building expenditures in 2011 were for a number of smaller items related to ongoing repairs of the building structures at ENWIN's Rhodes and Ouellette sites. The largest expenditures included $126k for a renovation of the HR area at Ouellette, $65k for replacement of the Rhodes yard gates, and $54k for boiler replacement at Rhodes.

IT sustainment work included replacement laptops, monitors, servers, switches, etc. GIS costs pertained to software development and implementation for $196k, as well as data improvements. At time of budgeting, an estimate of $507 was identified. However as the project was further developed, $250k was requested, while $196k was ultimately required for implementation of the final scope of the GIS development.

Efficiencies were found by using summer students to do a significant amount of data scrubbing. The original budget contemplated the commencement of SAP CIS implementation following the implementation of the SAP ERP. The cost estimate for the SAP CIS implementation exceeded budget estimates, and a decision was made to re-scope requirements and seek alternatives.

The money spent in 2011 represents the work required to study the SAP CIS alternative, to determine the feasibility of implanting a reduced-scope system, and to investigate alternatives. Consequently, 2011 General Plant expenditures were significantly underspent in order to ensure an economic decision on the CIS would be made.

4.0 2012 Plan vs Actual

Table 95 below shows 2012 Plan vs Actual expenditures by category.

Table 95 2012 Plan vs Actual Expenditures by Category ($'000)

Category	2012 Plan	2012 Actual	Variance
System Access	$5,097	$5,870	$773
Capital Contributions	$0	-$1,496	-$1,496
System Renewal	$9,483	$7,569	-$1,914
System Service	$904	$983	$79
General Plant	$3,698	$2,660	-$1,038
Total Expenditure	$ 19,182	$ 15,587	-$3,595
System O&M	$4,434	$4,157	-$277

System Access

The 2012 Plan vs Actual System Access expenditures are noted in Table 96 below.

Table 96 2012 Plan vs Actual System Access Expenditures ($'000)

Projects	2012 Plan	2012 Actual	Difference
Overhead Customer Connections	$300	$359	$59
Underground Customer Connections	$468	$544	$76
Windsor-Essex Parkway	$3,269	$1,307	-$1,962
Windsor-Essex Parkway Contributions	-$3,269	-$965	$2,304
City Driven Road Work	$2,216	$2,319	$103
Meter Work - New Customers	$540	$588	$48
Smart Meters	$100	$193	$93
Wholesale Meters	$1,083	$560	-$523
GEA Connections/EV Charging	$390	$0	-$390
Contributed Capital (non-Parkway)	$0	-$530	-$530
Sub-Total	$5,097	$4,375	-$723

Costs for customer connections exceeded the budgeted amount, since the number of new connections was starting to increase.

Work on the Parkway project continued, but the capital contribution from prior years caused differences due to timing between completion of the work and settling the account.

The City began a large road widening project on Walker Road, as well as a large intersection rebuild at Provincial and Cabana, a major intersection in Windsor.

Wholesale meter work was completed at the outstanding locations with the exception of Keith TS, which was deferred pending completion of the Parkway and GHIB projects.

Finally, funds were budgeted for green energy connections and EV charging stations, but neither materialized.

System Renewal

The 2012 Plan vs Actual System Renewal expenditures are noted in Table 97 below.

Table 97 2012 Plan vs Actual System Renewal Expenditures ($'000)

Expenditure Category	2012 Plan	2012 Actual	Difference
4 kV Conversion	$ 4,382	$ 3,920	-$462
27.6 kV Pole Replacements	$1,500	$1,389	-$111
Planned Cable Replacements	$1,884	$743	-$1,141
Planned & Reactive Transformers	$632	$281	-$351
Reactive Pole Replacements	$50	$295	$245
Reactive Equipment Replacements	$0	$34	$34
Reactive Conductor Replacements	$0	$68	$68
Manhole Rebuilds	$720	$679	-$41
Switching Units	$315	$161	-$154
Station Equipment	$0	$0	$0
Other	$0	$0	$0
Sub-Total	$9,483	$7,569	-$1,914

The costs for 4 kV conversion work were lower than planned by $462k. At the time of budgeting, it was expected that there would be $1,300k of carryover work from 2011, but only $471k was required. The difference was partially made up by increasing the number of HV conversions undertaken, but there was still a difference.

The planned conversion work was performed very close to budget. Planned cable replacements included cables on Lauzon Road, and the completion of the Erie Street lead cable replacement. The Erie Street cable project was completed for $542k, and it was discovered that the Lauzon cable was younger than records had indicated at budget time. A 15M8 cable on McDougall was substituted, but it cost only $141k.

Planned padmount transformer replacements were also less than budgeted. $500k was budgeted for Watson Ave and University Ave replacements, but only Watson could be completed for $86k.

Only two of the planned switching unit replacements were completed. Reactive pole replacements were up due to a major storm that impacted the service territory on July 5th and catch up pole pulling work contributed to the $245k increase over budget.

System Service

The 2012 Plan vs Actual System Service expenditures are noted in Table 98 below.

Table 98 2012 Plan vs Actual System Service Expenditures ($'000)

Expenditure Category	2012 Plan	2012 Actual	Difference
Conductor Upgrades	$300	$225	-$75
New Switches and Sectionalizers	$230	$272	$42
New Connections	$0	$2	$2
SCADA Improvements	$338	$211	-$127
Other (Control Room)	$36	$272	$236
Sub-Total	$904	$983	$79

There was one conductor upgrade on Wyandotte between Pratt and George that was $225k, which was less than the unit cost based estimate of $300k.

Two switching units were installed in Southwood Lakes for $272k, which exceeded the unit cost estimate.

SCADA expenditures included:

1. $62k for additional FCIs;
2. $28k for improving the uninterrupted power supplies on pole to recloser hubs;
3. $22k for back-up SCADA servers; and
4. $18k for intrusion detection sensors to improve the cyber security level for ENWIN's SCADA system.

The "Other" expenditures consisted of a $257k charge for spare transformers and $15k for power quality improvements. The spare transformer charge was not anticipated as a capital expenditure.

General Plant

The 2012 Plan vs Actual General Plant expenditures are noted in Table 99 below.

Table 99 2012 Plan vs Actual General Plant Expenditures ($'000)

Expenditure Category	2012 Plan	2012 Actual	Difference
Building	$495	$505	$10
Information Technology	$1,299	$742	-$557
Fleet & Welding	$73	$56	-$17
Tools	$286	$142	-$144
GIS	$0	$24	$24

ERP	$0	-$4	-$4
CIS	$1,545	$1,197	-$348
Sub-Total	$3,698	$2,662	-$1,036

The IT sustaining expenditure consisted of $742k on various replacements and upgrades.

Included in the budget was $810k for a meter data management system for the new CIS work, which had started, but had not progressed to the point where the meter data management system was required. Hence, the expenditure was deferred to 2013. The work on the new CIS had begun, but expenditures were $348k less than budgeted due to a variety of delays and other issues.

5.0 2013 Plan vs Actual

Table 100 below shows 2013 Plan vs Actual expenditures by category.

Table 100 2013 Plan vs Actual Expenditures by Category ($'000)

Category	2013 Plan	2013 Actual	Variance
System Access	$3,079	$4,903	-$1,824
Capital Contributions	$0	-$757	-$756
System Renewal	$10,766	$8,126	-$2,640
System Service	$1,645	$1,304	-$341
General Plant	$8,985	$4,680	-$4,305
Total Expenditure	$ 24,475	$18,256	-$6,219
System O&M	$4,729	$4,229	-$500

System Access

The 2013 Plan vs Actual System Access expenditures are noted in Table 101 below.

Table 101 2013 Plan vs Actual System Access Expenditures ($'000)

Projects	2013 Plan	2013 Actual	Difference
Overhead Customer Connections	$406	$562	$156
Underground Customer Connections	$772	$944	$172
Plaza	$0	$0	$0
Windsor-Essex Parkway	$0	$2,253	$2,253
Windsor-Essex Parkway Contributions	$0	-$322	-$322
City Driven Road Work	$984	$215	-$769
Wholesale Metering: Keith TS Feeders	$332	$0	-$332
Meter Work - New Customers	$566	$743	$177
Smart Meters	$0	$0	-$0
Wholesale Meters	$19	$187	$168

Contributed Capital	$0	-$435	-$435
Sub-Total	$3,079	$4,146	$1,068

Customer connections were conservatively budgeted, but exceeded expectations. There were also several large new services connected this year, including $108k for the new Family Aquatic Centre, and $132k for the District Energy Chiller.

Timing differences between spending and capital contribution receipt continued to add to the differences between plan and actual.

The wholesale meter variance was due to work at the Lauzon TS by Hydro One for $45k and payment of invoices for prior-year work by Hydro One for $142k.

The budget for City driven roadwork included $291k for carry forward work from 2012 pertaining to an underground section of Walker under the EC Row Expressway. The actual cost was $191k. Additionally, $393k was budgeted for the Foster to Melinda section, but actual costs proved to be minimal. The Melinda to Division section was also budgeted to cost $393k, but work on this section only just started in 2013.

Finally, $300k was budgeted (based on history) for unforeseen roadworks that did not materialize.

System Renewal

The 2013 Plan vs Actual System Renewal expenditures are noted in Table 102 below.

Table 102 2013 Plan vs Actual System Renewal Expenditures

Expenditure Category	**2013 Plan**	**2013 Actual**	**Difference**
4 kV Conversion	$ 5,806	$3,612	-$2,194
27.6 kV Pole Replacements	$1,450	$1,435	-$15
Planned Cable Replacements	$680	$691	$11
Planned & Reactive Transformers	$975	$770	-$205
Reactive Pole Replacements	$50	$192	$142
Reactive Equipment Replacements	$180	$47	-$133
Reactive Conductor Replacements	$90	$112	$22
Manhole Rebuilds	$530	$819	$289
Switching Units	$600	$339	-$261
Station Equipment	$0	$0	$0
Other	$405	$108	-$297
Sub-Total	$10,766	$8,126	-$2,641

The 4 kV conversion work was $2.2 M less than budgeted. This conversion program was coming to an end, and the most difficult projects were left to the end as they required the most customer coordination. This resulted in projects being push to the following year, as not all the projects coordinated in time.

Manhole rebuild costs were increased due to completion of the 2012 projects, which spilled over to the following year. Also, late invoicing pushed costs in the amount of $171k into 2013. Additionally, the 2013 projects were more costly when tendered, likely due to the large amount of civil work undertaken in the City for the Parkway projects.

Furthermore, fewer switching units were undertaken than planned.

There were a variety of projects which made up the "Other" estimate, such as a metering tank replacement that was unable to be coordinated with a customer, and transformer station roof replacements that were not invoiced in time for the 2013 close of business. These also resulted in underspending.

System Service

The 2013 Plan vs Actual System Service expenditures are noted in Table 103 below.

Table 103 2013 Plan vs Actual System Service Expenditures ($'000)

Expenditure Category	2013 Plan	2013 Actual	Difference
Conductor Upgrades	$1,290	$520	-$770
New Switches and Sectionalizers	$0	$511	$511
New Connections	$0	$126	$126
SCADA Improvements	$278	$87	-$191
Other	$77	$60	-$17
Sub-Total	$1,645	$1,304	-$341

While one category was budgeted, the projects chosen actually had components related to not just poles but switches and new connections. There were 12 new automated overhead switches and one padmount switch installed for $511k.

Additionally, there were two new feeder to feeder connections built for $126k.

Moreover, one existing switch was relocated to a more advantageous location.

Finally, SCADA improvements included additional FCIs, and a number of smaller items for the SCADA system, as well as a relocation of some SCADA equipment from a point of presence site to a more advantageous (accessible) location.

General Plant

The 2013 Plan vs Actual General Plant expenditures are noted in Table 104 below.

Table 104 2013 Plan vs Actual General Plant Expenditures ($'000)

Expenditure Category	2013 Plan	2013 Actual	Difference
Building	$658	$195	-$463
Information Technology	$1,434	$651	-$783
Fleet & Welding	$74	$32	-$42
Tools	$254	$243	-$11
GIS	$605	$19	-$586
ERP	$0	$0	$4,203
CIS	$5,960	$3,559	$2,401
Sub-Total	$8,985	$4,680	- $4,286

The 2013 budget contained funding for interior and exterior renovations and lighting upgrades. While some of this work was undertaken, the quantum of interior renovations and lighting upgrades was less than budgeted.

The IT sustainment budget included funding for SAP upgrades ($480k) and an SAP Mobility system ($415) which was not undertaken.

The spending on the new NorthStar CIS was less than expected due to project delays.

The only spending on GIS was a minor software upgrade for $19k.

The CIS implementation had heavier involvement by ENWIN staff rather than consultants and as such, there was less time for other IT work, resulting in underspending in all areas.

6.0 2014 Plan vs Actual

Table 105 below shows 2014 Plan vs Actual expenditures by category.

Table 105 2014 Plan vs Actual Expenditures by Category ($'000)

Category	2014 DSP	2014 Actual	Variance
System Access	$3,500	$4,363	-$540
Capital Contributions	$0	-2,403	-$1,646
System Renewal	$8,500	$6,952	-$1,174
System Service	$2,500	2,594	$1,290
General Plant	$6,500	$4,885	$205
Total Expenditure	$21,000	$16,391	-$1,865
System O&M	$4,332	$4,460	$231

The planned amounts from the 2014 DSP are used here as the comparator to which the actual costs incurred in 2014 are measured.

System Access

The 2014 Plan vs Actual System Access expenditures are noted in Table 106 below.

Table 106 2014 Plan vs Actual System Access Expenditures ($'000)

Projects	2014 Plan	2014 Actual	Difference
Overhead Customer Connections	$500	$738	$238
Underground Customer Connections	$500	$322	-$178
Plaza	$0	$0	$0
Windsor-Essex Parkway	$2,000	$2,505	$505
Windsor-Essex Parkway Contributions	$0	-$1,944	-$1,944
City Driven Road Work	$0	$1	$1
Wholesale Metering: Keith TS Feeders	$0	$0	$0
Meter Work - New Customers	$500	$796	$296
Smart Meters	$0	$0	$0
Wholesale Meters	$0	$0	-$0
Contributed Capital	$0	-$459	-$24
Sub-Total	$3,500	$1,959	-$1,541

The sum of overhead and underground customer connection costs is comparable to the forecasted amounts but is skewed towards overhead connections. The predominantly overhead connection costs means that there were likely a greater number of larger commercial connections involved and, consequently, the amount spent on meter work for new customers is also higher than forecasted.

Furthermore, the Parkway relocation work continued and timing differences between completion of work and contribution receipts contributes to the overall difference between forecast and actual.

System Renewal

The 2014 Plan vs Actual System Renewal expenditures are noted in Table 107 below.

Table 107 2014 Plan vs Actual System Renewal Expenditures ($'000)

Expenditure Category	2014 Plan	2014 Actual	Difference
4 kV Conversion	$2,750	$2,259	-$491
27.6 kV Pole Replacements	$3,000	$2,548	-$452
Planned Cable Replacements	$100	$91	-$9

Planned & Reactive Transformers	$1,000	$788	-$212
Reactive Pole Replacements	$400	$296	-$104
Reactive Equipment Replacements	$100	$98	-$2
Reactive Conductor Replacements	$100	$6	-$94
Manhole Rebuilds	$0	$30	$30
Switching Units	$750	$623	-$127
Station Equipment	$100	$77	-$23
Other	$200	$136	-$64
Sub-Total	$8,500	$6,952	-$1,548

The replacement of the 4 kV infrastructure was largely completed in 2014 and that is why expenditures are diminishing. Expenditures on the 27.6 kV infrastructure is now increasing relative to the 4 kV infrastructure as now the 27.6 kV is older than the last part of the 4 kV system remaining. Other expenditures were modestly less than forecast using the nominal unit costs for the work.

System Service

The 2014 Plan vs Actual System Service expenditures are noted in Table 108 below.

Table 108 2014 Plan vs Actual System Service Expenditures ($'000)

Expenditure Category	2014 Plan	2014 Actual	Difference
Conductor Upgrades	$1,500	$1,292	-$208
New Switches and Sectionalizers	$500	$784	$284
New Connections	$500	$428	-$72
SCADA Improvements	$0	$74	$74
Other	$0	$16	$16
Sub-Total	$2,500	$2,594	$94

System Service expenditures are focused on system improvements related to eliminating undersized conductors, sectionalizing feeders and constructing support connections to the newly sectionalized feeder sections. Some minor SCADA improvements were also undertaken.

General Plant

The 2014 Plan vs Actual General Plant expenditures are noted in Table 109 below.

Table 109 2014 Plan vs Actual General Plant Expenditures ($'000)

Expenditure Category	2014 Plan	2014 Actual	Difference
Building	$1,000	$575	-$425
Information Technology	$2,500	$2,434	-$66
Fleet & Welding	$150	$41	-$109

Tools	$150	$144	-$6
GIS	$0	$0	$0
ERP	$0	$0	$0
CIS	$2,700	$1,691	-$1,009
Sub-Total	$6,500	$4,885	-$1,615

Building costs were less than budgeted. At the time of budgeting, ENWIN planned to replace roofs on the automotive transformer station buildings (Ford PH, Ford Annex, GM and Chrysler). Part of the work started in 2013, and was completed and invoiced in 2014 (for the amount of $309k). This was much more than budgeted ($87k).

The balance of the expenditure was $264k for Rhodes and Ouellette work, which was reduced from what was budgeted ($900k), in part due to the increased cost for the TS building roofs.

The GIS evolution and integration with SAP work was completed for $748k, along with SAP Mobility for $692k.

Other sustainment expenditures made up the balance, with hardware replacements totaling $729k. Work continued on the NorthStar CIS for $1,691k, which was less than expected, in part due to the use of ENWIN rather than contract staff to perform the installation, customization, testing and training.

7.0 2015 Plan vs Actual

Table 110 below shows 2015 Plan vs Actual expenditures by category.

Table 110 2015 Plan vs Actual Expenditures by Category ($'000)

Category	2015 Plan	2015 Actual	Variance
System Access	$6,258	$2,762	-$3,496
Capital Contributions	-$3,485	-$4,322	-$837
System Renewal	$6,719	$8,221	$1,502
System Service	$6,363	$6,433	$70
General Plant	$3,273	$3,499	$226
Total Expenditure	$19,128	$16,593	$2,535
System O&M	$4,518	$4,398	$120

System Access

The 2015 Plan vs Actual System Access expenditures are noted in Table 111 below.

Table 111 2015 Plan vs Actual System Access Expenditures ($'000)

Projects	2015 Plan	2015 Actual	Difference
Overhead Customer Connections	$572	$859	$287
Underground Customer Connections	$510	$682	$172
Plaza	$322	$128	-$194
Windsor-Essex Parkway	$3,013	$707	-$2,306
Windsor-Essex Parkway Contributions	-$3,013	-$4,017	-$1,004
City Driven Road Work	$1,034	$7	-$1,027
Wholesale Metering: Keith TS Feeders	$417	$0	-$417
Meter Work - New Customers	$390	$337	-$53
Smart Meters	$0	$0	$0
Wholesale Meters	$0	$41	$41
Contributed Capital	-$472	-$305	$167
Sub-Total	$2,773	-$1,560	-$4,334

Customer connections were increasing over 2014, and conservative budgeting resulted in a slight overspending on new services and meters compared to budget.

The Parkway project was winding down in 2015, and the Plaza work was just beginning. Timing differences between completion of work and contribution receipts contributes to the overall difference between forecast and actual costs. The City halted work on their Walker Road widening project due to conflicts with the airport runway clearance requirements and land acquisition issues. Thus little was spent against the amount budgeted when the City's priorities shifted.

System Renewal

The 2015 Plan vs Actual System Renewal expenditures are noted in Table 112 below.

Table 112 2015 Plan vs Actual System Renewal Expenditures ($'000)

Expenditure Category	2015 Plan	2015 Actual	Difference
4 kV Conversion	$128	$211	$83
27.6 kV Pole Replacements	$2,500	$3,741	$1,241
Planned Cable Replacements	$0	0	$0
Planned & Reactive Transformers	$690	$816	$126
Reactive Pole Replacements	$25	$277	$252
Reactive Equipment Replacements	$140	$598	$458
Reactive Conductor Replacements	$45	$11	-$34
Manhole Rebuilds	$100	$138	$38
Switching Units	$500	$666	$166
Station Equipment	$960	$783	-$177

Other (Pole Inspection & Misc.)	$1,631	$981	-$650
Sub-Total	$6,719	$8,221	$1,503

There was a small amount of 4 kV work to finalize projects that were started in 2014. Replacement of the 27.6 kV system was well above the budgeted amount. This was, in part, to offset a late start to a pole inspection project that was needed to replace a badly outdated and unreliable pole condition database. Additionally, one of the large pole replacement projects included underground primary connections ($265k) that were included in the pole replacement expenditure category rather than the cable replacement expenditure category as it was integral to that project.

Reactive replacement work was up as 2015 was a year with a number of significant storms which pushed ENWIN's reliability stats in a negative direction.

Pole inspection work was budgeted at $1,500k, but only $646k was able to be undertaken due to a late start in the year.

System Service

The 2015 Plan vs Actual System Service expenditures are noted in Table 113 below.

Table 113 2015 Plan vs Actual System Service Expenditures ($'000)

Expenditure Category	2015 Plan	2015 Actual	Difference
Conductor Upgrades	$650	$1,073	$423
New Switches and Sectionalizers	$660	$702	$42
New Connections	$3,475	$4,014	$539
SCADA & Station Improvements	$1,476	$617	-$859
Other	$102	$27	-$75
Sub-Total	$6,363	$6,433	$70

The conductor upgrades exceeded budget due to the 15M11 project, which cost $858k, plus some other minor projects.

The new connections expenditure category exceeded the planned spending due to a number of large projects, including:

1. the 15M10 Walker/Cabana project at a cost of $1,860k (including station egress), which was estimated to cost $1,558k; and
2. the WFCU backup feeder connection on McHugh for $1,246k, which was estimated to cost $1,030.

Additionally, SCADA and Station Improvements included an estimate for $1,185k to convert the GM MTS to a 4-wire distribution station. Due to a later start on the work, only $410k was spent. This project would span into 2016.

General Plant

The 2015 Plan vs Actual General Plant expenditures are noted in Table 114 below.

Table 114 2015 Plan vs Actual General Plant Expenditures ($'000)

Expenditure Category	2015 Plan	2015 Actual	Difference
Building	$890	$357	-$533
Information Technology	$1,471	$1,055	-$416
Fleet & Welding	$61	$30	-$31
Tools	$81	$120	$39
GIS	$770	$1,936	$1,166
ERP	$0	$0	$0
CIS	$0	$0	$0
Sub-Total	$3,273	$3,499	$225

General Plant expenditures were overspent by $225k against the plan amount. A large expenditure for Rhodes Drive site work was not undertaken and there was underspending on IT sustainment. The underspent amounts were used for GIS and OMS work.

8.0 2016 Plan vs Actual

Table 115 below shows 2016 Plan vs Actual expenditures by category.

Table 115 2016 Plan vs Actual Expenditures by Category ($'000)

Category	2016 Plan	2016 Actual	Variance
System Access	$3,638	$3,946	$308
Capital Contributions	-$1,874	-$412	$1,462
System Renewal	$5,501	$5,475	-$26
System Service	$5,196	$2,931	-$2,265
General Plant	$5,369	$2,253	-$3,116
Total Expenditure	$17,830	$14,193	-$3,637
System O&M	$4,764	$4,631	-$133

System Access

The 2016 Plan vs Actual System Access expenditures are noted in Table 116 below.

Table 116 2016 Plan vs Actual System Access Expenditures ($'000)

Projects	2016 Plan	2016 Actual	Difference

Overhead Customer Connections	$505	$882	$377
Underground Customer Connections	$620	$1,107	$487
Plaza	$1,341	$1,068	-$273
Windsor-Essex Parkway	$0	-$9	-$9
Bridge/Windsor-Essex Parkway Contributions	-$1,341	$0	$1,341
City Driven Road Work	$625	$439	-$186
Wholesale Metering: Keith TS Feeders	$232	$0	-$232
Meter Work - New Customers	$315	$460	$145
Smart Meters	$0	$0	$0
Wholesale Meters	$0	$0	$0
Contributed Capital	-$533	-$412	$121
Sub-Total	$1,764	$3,534	$1,771

The customer connection and meters for new customers were all over the forecast as new connections were at a 10-year maximum in 2016.

Plaza work was underway in 2016, with the Parkway portion of the project completed. Timing differences between completion of work and contribution receipts contributes to the overall difference between forecast and actual costs.

Hydro One civil work delays resulted in the downsizing of the construction scope for part of the GHIB work planned for this year. These delays also prevented the Keith TS wholesale meters from progressing. Similarly, the City's Riverside Vista roadwork program was downsized because of land acquisition issues resulting in less spending than had been planned.

System Renewal

The 2016 Plan vs Actual System Renewal expenditures are noted in Table 117 below.

Table 117 2016 Plan vs Actual System Renewal Expenditures ($'000)

Expenditure Category	2016 Plan	2016 Actual	Difference
4 kV Conversion	$0	$26	$26
27.6 kV Pole Replacements	$2,382	$2,660	$278
Planned Cable Replacements	0	$0	$0
Planned & Reactive Transformers	$865	$701	-$164
Reactive Pole Replacements	$200	$395	$195
Reactive Equipment Replacements	$180	$283	$103
Reactive Conductor Replacements	$45	$70	$25
Manhole Rebuilds	$120	$25	-$95
Switching Units	$320	$498	$178
Station Equipment	$355	$2	-$353
Other (Pole Inspection)	$1,034	$815	-$219

Sub-Total	$5,501	$5,475	-$26

System Renewal expenditures were very close to plan in 2016. The 27.6 kV expenditures were $278k above what was planned due to the choice of projects. Additionally, as the pole inspection work progressed, a number of dangerous poles were identified, which were added to the project scope. These dangerous poles were not ascertained when the original plan was set. The costs for reactive pole replacements also exceed planned amounts due to catch-up work on pole pulling.

Manhole rebuilds were under budget due to a deferral of the one project at a major city intersection where the City was planning work nearby the following year. The City preferred to interrupt traffic only one time in one year.

The SU expenditures exceed the planned values primarily due to the need to replace a number of potential transformers in certain units after a failure due to a manufacturer's defect, which was beyond the warranty period.

The planned station work was completed and was $120k over budget due to the discovery of a broken connector in the station during the work; however, the costs for this were added to the "Other" line item.

The "Other" line item was under budget due to a variety of issues:

1. there was a problem programming the MIST meters, which caused ENWIN to underspend by $250k;
2. ENWIN was unable to complete the animal guard project, resulting in an underspent amount of $80k; and
3. the pole inspection tender was much lower than expected, which saved $210k.

System Service

The 2016 Plan vs Actual System Service expenditures are noted in Table 118 below.

Table 118 2016 Plan vs Actual System Service Expenditures ($'000)

Expenditure Category	2016 Plan	2016 Actual	Difference
Conductor Upgrades	$810	$114	-$696
New Switches and Sectionalizers	$1,300	$1,718	$418
New Connections	$1,777	$449	-$1,328
SCADA & Station Improvements	$1,232	$575	-$657
Other	$77	$75	-$2
Sub-Total	$5,196	$2,931	-$2,265

The planned conductor upgrade projects have been delayed by customers, including a project at Chrysler's waste treatment plant supply, due to delays with Chrysler returning a signed agreement, and delays with Hydro One and CN Rail pushing the 55M3 upgrade to 2017.

Additional switches were added to the scope of the SU upgrade program for the College Ave project. The scope increase enabled removal of an older, EOL switch in favour of a switch with additional bays.

New connections for the new GM feeders were delayed due to availability of crews. The line extension on Walker also continued to be delayed because of the City's issues with obtaining land rights for their road widening.

Radial branch back-ups were deferred and funds reassigned to the College Ave project.

The SCADA communications evolution design consultation was delayed by the vendor and pushed into 2017 for an underrun of $300k. Moreover, another vendor was unable to complete a protection coordination study resulting in an underrun of $150k.

The conversion of the GM MTS to a distribution station was completed for $271k, but was estimated to cost $250k.

Finally, the high speed radio link between Hanna Tower and the Cook pumping station was not completed due to issues with the required height of the tower, resulting in an underrun of $100k.

General Plant

The 2016 Plan vs Actual General Plant expenditures are noted in Table 119 below.

Table 119 2016 Plan vs Actual General Plant Expenditures ($'000)

Expenditure Category	2016 Plan	2016 Actual	Difference
Building	$463	$191	-$272
Information Technology	$1,436	$704	-$732
Fleet & Welding	$65	$82	$17
Tools	$140	$135	-$5
GIS	$1,136	$775	-$361
ERP (SAP HANA)	$2,129	$366	$1,763
CIS	$0	$0	$0
Sub-Total	$5,369	$2,253	-$3,116

The Rhodes building costs were limited to reactive replacements and lighting upgrades to take advantage of incentives. Ouellette spending was minimized pending consideration of amalgamating locations, resulting in a net cost underrun of $272k.

IT was very involved with OMS and cyber security upgrades and, consequently, there were insufficient internal resources available for hardware continuity purchases ($274k underrun), SAP upgrade ($140k underrun), and tools updates ($155k underspend).

Additionally, a planned telephony upgrade, which was estimated to cost $80k, was put on hold pending a review of using cloud services.

The SAP Hana Integration project got a late start resulting in an underrun of $1,763k. The CYME network analysis implementation was spread out to 2017, resulting in an underrun of $150k, and the OMS outage map development was also pushed to 2017, resulting in an underrun of $150k.

9.0 2017 Plan vs Actual

Table 120 below shows 2017 Plan vs Actual expenditures by category.

Table 120 2017 Plan vs Actual Expenditures by Category ($'000)

Category	2017 Plan	2017 Actual	Variance
System Access	$3,325	$3,963	$638
Capital Contributions	-$1,234	-$2,217	-$983
System Renewal	$6,883	$5,456	-$1,427
System Service	$5,979	$3,976	-$2,003
General Plant	$4,652	$2,058	-$2,594
Total Expenditure	$19,605	$13,236	-$6,369
System O&M	$8,813	$9,757	$944

System Access

The 2017 Plan vs Actual System Access expenditures are noted in Table 121 below.

Table 121 2017 Plan vs Actual System Access Expenditures ($'000)

Projects	2017 Plan	2017 Actual	Difference
Overhead Customer Connections	$515	$464	-$51
Underground Customer Connections	$632	$1,269	$637
Plaza	$840	$1,050	$210
Windsor-Essex Parkway	$0	$0	$0
Bridge/Windsor-Essex Parkway Contributions	-$840	$0	$840
City Driven Road Work	$515	$599	$84
Wholesale Metering: Keith TS Feeders	$474	$0	-$474
Meter Work - New Customers	$349	$581	$232
Smart Meters	$0	$0	$0
Wholesale Meters	$0	$0	$0
Contributed Capital	-$394	-$2,217	-$1,823
Sub-Total	$2,091	$1,746	-$345

After peaking in 2016, new customer connections started to decrease. However, more underground commercial customers were connected, which resulted in overspending relative to the forecast of $818k for new customer connections and meter work.

There were additional costs for new meters due to the need to purchase a stock of meters in order to change-out the existing smart meters for sample testing. Timing differences between completion of work and contribution receipts contributes to the overall difference between forecast and actual costs. Again, slow progress by the WDBA and Hydro One resulted in deferral of the Keith TS wholesale meters.

System Renewal

The 2017 Plan vs Actual System Renewal expenditures are noted in Table 122 below.

Table 122 2017 Plan vs Actual System Renewal Expenditures ($'000)

Expenditure Category	2017 Plan	2017 Actual	Difference
4 kV Conversion	$0	$0	$0
27.6 kV Pole Replacements	$2,950	$2,351	-$599
Planned Cable Replacements	$100	$42	-$58
Planned & Reactive Transformers	$915	$1,104	$189
Reactive Pole Replacements	$100	$315	$215
Reactive Equipment Replacements	$430	$194	-$236
Reactive Conductor Replacements	$90	$190	$100

Manhole Rebuilds	$120	$100	-$20
Switching Units	$320	$272	-$48
Station Equipment	$810	$463	-$347
Other (Meter Work)	$1,048	$424	-$624
Sub-Total	$6,883	$5,456	-$1,428

The 27.6 kV replacement expenditures were underspent by $599k due to difficulty getting enough work through the engineering group. Engineering contractors were hired to assist in the workload, but were not able to be fully productive.

Reactive pole and transformer replacements were over budget this year, primarily due to a severe windstorm on March 8th. ENWIN's neighbouring utility, DTE, reported that this storm was the second most impactful storm in their 100-year history.

There was also an expense category reporting discrepancy, and only the Walker 2 TS transformer bushing replacement costs were reported. The costs for repairing the GM MTS breakers and the PLC/Relay replacements ($211k) were reported within the "Other (Meter Work)" category. The Walker 2 TS work was estimated at $345k, while actual costs were $463k. The discrepancy was due to the fact that the tender for the work was far more than had been bid for similar work on the other Walker 2 TS transformer two years earlier.

ENWIN planned to complete $968k worth of meter work, but only $61k was completed as meter tank replacements and smart meter retest work was deferred to 2018. Also, MIST meter work, which was planned at $634k, could not be completed and was deferred to 2018. There was delay in determining the appropriate means of communicating with the meters, which pushed the purchase of the meters later into the year. A late start would have meant the meters would have lost a seal year, so a decision was made to push the purchase into 2018 to save the seal year.

System Service

The 2017 Plan vs Actual System Service expenditures are noted in Table 123 below.

Table 123 2017 Plan vs Actual System Service Expenditures ($'000)

Expenditure Category	**2017 Plan**	**2017 Actual**	**Difference**
Conductor Upgrades	$325	$710	$385
Feeder Reliability Improvement	$2,175	$864	-$1,311
New Switches and Sectionalizers	$1,100	$1,003	-$97
New Connections	$772	$254	-$518
SCADA/ Station Improvements	$1,105	$624	-$481
Radial Branch Back-ups	$400	$468	$68
Other	$102	$52	-$50
Sub-Total	$5,979	$3,976	-$2,004

Conductor upgrades exceeded the plan amount by $385, as there was one project that started in the prior year, which could not be completed in that year and was pushed to 2017.

The feeder reliability improvement project was a line upgrade/replacement on Tecumseh Road. The project was under budget in part due to a late start on the project. The project was delayed by the City, as they were reluctant to provide their construction permits as the line replacement was in a section of roadway that the City had a future plan to widen. Since their plans were not fully developed, it took additional time to ensure that the replacement line was going to be installed outside the likely area for the road widening. The project was planned in two parts with the second half of the work proceeding in 2018.

New connection work was less than plan by $518k. A feeder that traverses an inaccessible section of airport property was planned to be re-routed for $325k, but a closer review of the pole conditions revealed that they were in better condition than originally thought. Hence, ENWIN decided to defer the project indefinitely. Also, a design change on the Cousineau Road connection enabled a reduction in project costs of $160k.

The SCADA/Station Improvements expenditure category included a budget of $600k for the design of a WiMAX communication system, and the first stage of construction for that system. The prior year study was completed for $76k, and it was then decided that cellular costs had reduced sufficiently to put the WiMAX system on hold indefinitely. An additional $20k was spent on 900 MHz radios and cellular modems, resulting in an underrun of $481k. A redundant station battery bank was also constructed for $50k.

General Plant

The 2017 Plan vs Actual General Plant expenditures are noted in Table 124 below.

Table 124 2017 Plan vs Actual General Plant Expenditures ($'000)

Expenditure Category	2017 Plan	2017Actual	Difference
Building	$654	$352	-$302
Information Technology	$1,623	$889	-$734
Fleet & Welding	$87	$87	$0
Tools	$150	$231	$81
GIS	$475	$0	-$475
ERP (SAP HANA)	$1,663	$499	-$1,164
CIS	$0	$0	$0
Sub-Total	$4,652	$2,058	-$2,594

Spending on the Ouellette building was curtailed to just contingency items in view of the plan to sell the building, saving almost $300k. A planned floor replacement at Rhodes was deferred, saving $114k. However, this was offset by an unbudgeted expense to remediate two ex-substation properties to prepare them for sale ($107k).

The GIS outage map upgrade and several analytics programs were deferred to 2018, saving approximately $325k from the budget. The SAP Investment module implementation and a customer mobility app were put on hold, saving $150k and $250k, respectively. The Records Management System was also deferred, saving $385k from planned spending. Finally, the SAP/Hana integration project was delayed and was carried over into 2018, saving $1,164k from budget.

Conclusion

In the historical reference years from 2009 to 2017, there has been a pattern of actual spending being consistently less than budgeted spending. This was in part due to the fact that budgets were cast from unit costs that included contingencies in order to complete projects at or under budget, as ENWIN values completing a project at or under budget.

At the time when budgets are cast, the projects are generally not engineered at all or not engineered in sufficient form to enable an accurate estimate for the cost of the projects. This, along with a culture that values the avoidance of exceeding budgets, results in a tendency for actual expenditures to fall short of planned expenditures.

In 2017, ENWIN began to lay the groundwork to minimize this difference by hiring two engineering firms to perform distribution system designs and estimates. The addition of these firms, along with ENWIN's own design staff, are increasing the amount of fully engineered jobs that have reasonable cost estimates attached to them prior to budgets being cast.

It will take time to get a bank of jobs engineered ahead to the point where all planned jobs are identified, scoped, engineered, estimated and budgeted in the prior year. However, since 2017, ENWIN has been making progress to close the gap between budget and actual costs and ENWIN estimates that by 2022 all planned 2022 construction will have been engineered, estimated, budgeted and approved the prior year.

10.0 2017 Actual vs 2018 Forecast

Table 125 below shows 2017 Actual vs 2018 Forecast expenditures by category.

Table 125 2017 Actual vs 2018 Forecast Expenditures by Category ($'000)

Category	2017 Actual	2018 Forecast	Variance
System Access	$3,963	$3,310	-$653
Capital Contributions	-$2,217	-$1,889	$328
System Renewal	$5,456	$5,586	$131
System Service	$3,976	$4,427	$451
General Plant	$2,058	$3,098	$1,040
Total	$13,236	$14,532	$1,296
System O&M	$9,757	$9,825	$68

System Access

The 2017 Actual and 2018 Forecast System Access expenditures are noted in Table 126 below.

Table 126 2017 Actual vs 2018 Forecast System Access Expenditures

Projects	2017 Actual	2018 Forecast	Difference
Overhead Customer Connections	$464,048	$515,000	$50,952
Underground Customer Connections	$1,269,433	$1,100,000	-$169,433
Plaza	$1,050,168	$550,000	-$500,168
Windsor-Essex Parkway	$0	$0	$0
Windsor-Essex Parkway Contributions	$0	$0	$0
City Driven Road Work	$598,995	$675,000	$76,005
Wholesale Metering: Keith TS Feeders	$0	$0	$0
Meter Work - New Customers	$580,797	$470,000	-$110,797
Smart Meters	$0	$0	$0
Wholesale Meters	$0	$0	$0
Contributed Capital	-$2,216,539	-$1,888,586	$327,953
Sub-Total	$1,746,902	$1,421,414	-$325,488

Customer connections have begun to trend downward resulting is lower forecast connections for overhead and underground customers, as well as meter work for new customers. The Plaza work that is planned for 2018 is predominantly work done by HONI in their Keith TS to provide ducting for new feeder egresses from their station. This work was directly paid for by the WDBA and HONI. Hence, amounts in System Access and Contributed Capital is lower in 2018 compared to 2017. This work is expected to complete in early 2019, and will be followed by a

significant increase in work in 2019 and 2020 to install cables, meters, etc. The relocation work for this project is net zero to ENWIN—only timing differences between expenditures and contribution payments account for variations in year-to-year spending.

System Renewal

The 2017 Actual and 2018 Forecast System Renewal expenditures are noted in Table 127 below.

Table 127 2017 Actual vs 2018 Forecast System Access Expenditures

Expenditure Category	2017 Actual	2018 Forecast	Difference
4 kV Conversion	$0	$0	$0
27.6 kV Pole Replacements	$2,350,615	$2,200,000	-$150,615
Planned Cable Replacements	$41,908	$215,077	$173,169
Planned & Reactive Transformers	$1,104,211	$1,265,000	$160,789
Reactive Pole Replacements	$315,268	$150,000	-$165,268
Reactive Equipment Replacements	$194,262	$115,218	-$79,044
Reactive Conductor Replacements	$190,110	$30,000	-$160,110
Manhole Rebuilds	$100,103	$160,000	$59,897
Switching Units	$271,844	$340,000	$68,156
Station Equipment	$463,166	$2,658	-$460,508
Other/ (Pole Inspection)	$424,201	$1,108,250	$684,049
Total	$5,455,688	$5,586,203	$130,515

Overall, System Renewal expenditures in 2018 are comparable to the expenditures for 2017. Notable exceptions are those for station equipment, where replacement of EOL protection equipment and other items at the GM MTS were budgeted but are running behind and are expected to complete in early 2019. Additionally, other renewals were planned to increase in excess of the 2017 investments. Notable expenditures are $560k for replacement of submersible transformers, $393k for MIST meter replacements, $57k for EOL metering tank replacements, and $68k for other miscellaneous meter replacements.

System Service

The 2017 Actual and 2018 Forecast System Service expenditures are noted in Table 128 below.

Table 128 2017 Actual vs 2018 Forecast System Service Expenditures

Expenditure Category	2017 Actual	2018 Forecast	Difference
Conductor Upgrades	$709,821	$741,000	$31,179
Feeder Reliability Improvement	$864,033	$1,600,000	$735,967
New Switches and Sectionalizers	$1,003,047	$1,297,684	$294,637
New Connections	$254,112	$92,316	-$161,796
SCADA/ Station Improvements	$624,411	$340,000	-$284,411

Radial Branch Back-ups	$467,674	$355,715	-$111,959
Other	$52,470	$180	-$52,290
System Service Sub-Total	$3,975,568	$4,426,895	$451,327

Conductor upgrade expenditures were consistent between 2017 and 2018, which included a large project on Jefferson at Rhodes Drive to provide additional flexibility of system operation and eliminate a 27.6 kV overhead crossing of the EC Row Expressway.

The feeder reliability improvement expenditure was increased this year with the completion of the Crawford to Walker high capacity feeder on Tecumseh Road. That project was begun in 2017 and extended through 2018. Part of the 2017 work could not be completed in 2017 and was pushed to 2018, accounting in part for the increased 2018 expenditure.

The new switches and sectionalizers included 12 ScadaMate switches and reclosers, as well as 5 padmount switching units for 2018.

New feeder tie connections were reduced from prior years with only one tie planned to link sections of the 15M11 feeder with the 55M24 feeder. SCADA and station improvements were planned to include the deployment of additional FCIs as well as the installation of redundant DC battery back-ups at Ford Powerhouse MTS and Chrysler MTS.

2017 station investments were higher due to a one-time protection study. The Radial branches eliminated were the 55M2 at Kildare and Seneca and the 55M22 at Pillette and Seminole.
General Plant

General Plant

The 2017 Actual and 2018 Forecast General Plant expenditures are noted in Table 129 below.

Table 129 2017 Actual vs 2018 Forecast General Plant Expenditures

Expenditure Category	2017 Actual	2018 Forecast	Difference
Building	$351,588	$354,000	$2,412
Information Technology	$888,462	$0	-$888,462
Fleet & Welding	$87,479	$87,500	$21
Vehicles	$0	$833,547	$833,547
Tools	$231,272	$90,000	-$141,272
GIS/IT	$0	$1,733,000	$1,733,000
ERP (SAP HANA)	$498,746	$0	-$498,746
CIS	$0	$0	$0
Total General Plant	$2,057,547	$3,098,047	$1,040,500

Building costs were similar in 2018 as compared to 2017. Expenditures were kept to a minimum, as plans were developed in 2018 to sell the Ouellette building and consolidate operations at the Rhodes Drive site, and only $20k of the $354k was earmarked for Ouellette.

Tool expenditures were $80k for Operations and $10k for Engineering and Meter Shop power quality investigation meters.

In 2018, ENWIN planned to move to a capital purchase of vehicles rather than lease of vehicles, resulting in a planned increase of $834k for vehicle expenditures.

The IT expenditure included $458k for EOL replacements of servers, computers, and tablets. The balance of the IT expenditures was for software, including $195k for GIS, $425k for SAP – including integration to GIS, $100k for network hardening and cyber security, $255k for the billing system, and $300k on various other systems and software tools including a new Records Management System.

System O&M

System O&M are forecasted to be $68k more in 2018 than in 2017. For a full explanation of the effect of capital investment on O&M costs see section 5.4.3.1 (b) Capital Investment Impact on O&M Costs.

11.0 2018 Forecast vs 2019 Bridge

Table 130 below shows 2018 Forecast vs 2019 Bridge expenditures by category.

Table 130 2018 Forecast vs 2019 Bridge Expenditures by Category ($'000)

Category	2018 Forecast	2019 Bridge	Variance
System Access	$3,310	$7,267	$3,957
Capital Contributions	-$1,889	-$4,898	-$3,009
System Renewal	$5,586	$7,289	$1,703
System Service	$4,427	$4,221	-$206
General Plant	$3,098	$7,507	$4,409
Total	$14,532	$21,386	$6,854
System O&M	$9,825	$10,942	$1,117

System Access

The 2018 Forecast and 2019 Bridge System Access expenditures are noted in Table 131 below.

Table 131 2018 Forecast and 2019 Bridge System Access Expenditures

Projects	**2018 Forecast**	**2019 Bridge**	**Difference**
Overhead Customer Connections	$515,000	$525,000	$10,000
Underground Customer Connections	$1,100,000	$750,000	-$350,000
Plaza	$550,000	$1,700,000	$1,150,000
Windsor-Essex Parkway	$0	$0	$0
Windsor-Essex Parkway Contributions	$0	$0	$0
City Driven Road Work	$675,000	$3,886,000	-$386,400
Wholesale Metering: Keith TS Feeders	$0	$0	$0
Meter Work - New Customers	$470,000	$406,000	-$64,000
Smart Meters	$0	$0	$0
Wholesale Meters	$0	$0	$0
Contributed Capital	-$1,888,586	-$4,898,000	-$3,009,414
Sub-Total	$1,421,414	$2,369,000	$947,586

System Access expenditures are forecasted to be somewhat lower in 2019 than 2018, with the bulk of the change in underground customer connections. This is an expansion of a trend started after new connections peaked in 2016, and has been decreasing since that time. Work at the Plaza is ramping up in 2019, as HONI is expected to complete work within Keith TS, and cable pulling and termination will begin. Contributed capital is also increased by a corresponding amount, as the Plaza work is 100% paid for by the federal government.

City driven road work is also substantially increased. The largest part of this increase is a $2,000,000 increase for relocation work for the Ambassador Bridge twinning project. Again, this work will be 100% paid for by the proponent, and there is a corresponding increase in contributed capital. In addition to these projects, the City has a number of projects on their books, and has increased their capital roadworks budgets in this year. ENWIN's budget for City roadwork projects has been increased accordingly.

System Renewal

The 2018 Forecast and 2019 Bridge System Renewal expenditures are noted in Table 132 below.

Table 132 2018 Forecast and 2019 Bridge System Renewal Expenditures

Expenditure Category	2018 Forecast	2019 Bridge	Difference
4 kV Conversion	$0	$0	$0
27.6 kV Pole Replacements	$2,200,000	$2,950,000	$750,000
Planned Cable Replacements	$215,077	$120,000	-$95,077
Planned & Reactive Transformers	$1,265,000	$1,350,000	$85,000
Reactive Pole Replacements	$150,000	$100,000	-$50,000
Reactive Equipment Replacements	$115,218	$280,000	$164,782
Reactive Conductor Replacements	$30,000	$90,000	$60,000
Manhole Rebuilds	$160,000	$150,000	-$10,000
Switching Units	$340,000	$825,000	$485,000
Station Equipment	$2,658	$0	-$2,658
Other/ (Pole Inspection)	$1,108,250	$1,424,000	$315,750
Total	$5,586,203	$7,289,000	$1,702,797

System Renewal expenditures are increased in 2019 by approximately $1.7 million. An increase in pole replacement budget of $750k was made to bring the pole replacement budget closer to the values indicated in the ACA, which was done in 2017.

Reactive equipment replacement was increased by $165k, based on historical figures and the fact that 2018 was a poor year with respect to reliability performance.

SUs are increased by $485k due to the intended replacement of a switches and transformers in customer vaults that have proven, because of their location, extremely difficult to maintain in good condition. Additionally, ENWIN has EOL Canada Power Products switches that serve customers in the downtown core and need to be replaced. ENWIN is continuing its aggressive replacement program for submersible transformers that are at EOL and have been failing at higher rates than forecast. Other items planned for replacement include EOL NSD70 transfer trip equipment ($350k), MIST meters ($509k), meters ($270k) and insulators ($200k).

System Service

The 2018 Forecast and 2019 Bridge System Service expenditures are noted in Table 133 below.

Table 133 2018 Forecast and 2019 Bridge System Service Expenditures

Expenditure Category	2018 Forecast	2019 Bridge	Difference
Conductor Upgrades	$741,000	$712,000	-$29,000
Feeder Reliability Improvement	$1,600,000	$1,250,000	-$350,000
New Switches and Sectionalizers	$1,297,684	$1,054,000	-$243,684
New Connections	$92,316	$155,000	$62,684
SCADA/ Station Improvements	$340,000	$595,000	$255,000
Radial Branch Back-ups	$355,715	$400,000	$44,285
Other	$180	$55,000	$54,820

System Service Sub-Total	$4,426,895	$4,221,000	-$205,895

System Service expenditures are comparable between 2018 and 2019, with only a $206k decrease from 2018 to 2019. Investments in feeder reliability are $350k lower due to the differences in the individual nature of the projects selected.

The lower level of investment in new switches and sectionalizers is due to the overhead distribution system winding down as underground sections are automated in order to provide reliability and resiliency to customers.

SCADA and station improvements are due to continuation to completion of the FCI program, and replacement of EOL NSD70 transfer trip equipment in the automotive stations.

General Plant

The 2018 Forecast and 2019 Bridge General Plant expenditures are noted in Table 134 below.

Table 134 2018 Forecast and 2019 Bridge General Plant Expenditures

Expenditure Category	2018 Forecast	2019 Bridge	Difference
Building	$354,000	$2,592,330	$2,238,330
Information Technology	$0	$0	$0
Fleet & Welding	$87,500	$70,500	-$17,000
Tools	$90,000	$187,000	$97,000
Vehicles	$833,547	$2,652,178	$1,818,631
GIS/IT	$1,733,000	$2,005,400	$272,400
ERP (SAP HANA)	$0	$0	$0
CIS	$0	$0	$0
Total	$3,098,047	$7,507,408	$4,409,361

General Plant investments are increased due to the planned sale of the Ouellette office building, and the consolidation of operations to the Rhodes Drive office. Expenditures for renovations and moving are expected to take place over 2019 and 2020.

Vehicle expenditures are planned to increase by $1.8 M due to the number and nature of the vehicles that are at end of economic life.

IT expenditures include $452 for EOL replacements of hardware, $190k for GIS improvements, $100k for SAP improvements, $100k for network and cyber security improvements, $315k for customer portal improvements, $324k for upgrading the NorthStar billing system, $345k for a new Records Management system, and $180k for miscellaneous enhancements and tools.

System O&M

System O&M are forecasted to be $1,117k more in 2019 than in 2018. For a full explanation of the effect of capital investment on O&M costs see section 5.4.3.1 (b) Capital Investment Impact on O&M Costs.

12.0 2019 Bridge vs 2020 Test

Table 135 below shows 2019 Bridge vs 2020 Test Expenditures by category.

Table 135 2019 Bridge vs 2020 Test Expenditures by Category ($'000)

Category	2019 Bridge	2020 Test	Variance
System Access	$7,267	$6,205	-$1,062
Capital Contributions	-$4,898	-$3,252	$1,646
System Renewal	$7,289	$8,440	$1,151
System Service	$4,221	$3,537	-$684
General Plant	$7,507	$5,021	-$2,486
Total	$21,386	$19,951	-$1,435
System O&M	$10,942	$10,904	-$38

System Access

The 2019 Bridge and 2020 Test System Access expenditures are noted in Table 136 below.

Table 136 2019 Bridge and 2020 Test System Access Expenditures

Projects	2019 Bridge	2020 Test	Difference
Overhead Customer Connections	$525,000	$535,500	$10,500
Underground Customer Connections	$750,000	$525,000	-$225,000
Plaza	$1,700,000	$1,000,000	-$700,000
Windsor-Essex Parkway	$0	$0	$0
Windsor-Essex Parkway Contributions	$0	$0	$0
City Driven Road Work	$3,886,000	$3,250,000	-$636,000
Wholesale Metering: Keith TS Feeders	$0	$477,000	$477,000
Meter Work - New Customers	$406,000	$417,000	$11,000
Smart Meters	$0	$0	$0
Wholesale Meters	$0	$0	$0
Contributed Capital	-$4,898,000	-$3,251,860	$1,646,140
Sub-Total	$2,369,000	$2,952,640	$583,640

Customer connections are forecasted to continue a downward trend noted since 2016.

The Plaza work will be winding down, but the GHIB is not expected to be in service until 2024, so some level of work is likely to continue.

City driven road work is somewhat reduced, but relocation work for the Ambassador Bridge continues and increases both the roadwork budget and the contributed capital lines.

The wholesale meters at the Keith TS have been deferred for many years until the feeders are reconfigured. It is expected that the wholesale meters will finally be upgraded in 2020.

System Renewal

The 2019 Bridge and 2020 Test System Renewal expenditures are noted in Table 137 below.

Table 137 2019 Bridge and 2020 Test System Renewal Expenditures

Expenditure Category	2019 Bridge	2020 Test	Difference
4 kV Conversion	$0	$0	$0
27.6 kV Pole Replacements	$2,950,000	$3,300,000	$350,000
Planned Cable Replacements	$120,000	$512,000	$392,000
Planned & Reactive Transformers	$1,350,000	$1,325,000	-$25,000
Reactive Pole Replacements	$100,000	$100,000	$0
Reactive Equipment Replacements	$280,000	$280,000	$0
Reactive Conductor Replacements	$90,000	$90,000	$0
Manhole Rebuilds	$150,000	$150,000	$0
Switching Units	$825,000	$1,025,000	$200,000
Station Equipment	$0	$0	$0
Other/ (Pole Inspection)	$1,424,000	$1,658,000	$234,000
Total	$7,289,000	$8,440,000	$1,151,000

System Renewal expenditures are increased in 2019 by approximately $1.2 million. An increase in pole replacement budget of $350k was made to bring the pole replacement budget closer to the values indicated in the ACA done in 2017. Reactive equipment replacement was expected to remain relatively steady.

SU investments are increased by $200k, which was driven primarily because of the differences in units listed for replacement. This also includes an additional unit due to the intended replacement of a switch and transformer in customer vaults that have proven, because of their location, extremely difficult to maintain in a good condition. ENWIN is continuing its aggressive replacement program for submersible transformers that are at EOL and have been failing at higher rates than forecast. Other items planned for replacement include EOL NSD70 transfer trip equipment ($350k), MIST meters ($509k), meters ($270k), and insulators ($200k).

System Service

The 2019 Bridge and 2020 Test System Service expenditures are noted in Table 138 below.

Table 138 2019 Bridge and 2020 Test System Service Expenditures

Expenditure Category	2019 Bridge	2020 Test	Difference
Conductor Upgrades	$712,000	$580,000	-$132,000
Feeder Reliability Improvement	$1,250,000	$1,224,000	-$26,000
New Switches and Sectionalizers	$1,054,000	$694,000	-$360,000
New Connections	$155,000	$169,000	$14,000
SCADA/ Station Improvements	$595,000	$465,000	-$130,000
Radial Branch Back-ups	$400,000	$400,000	$0
Other	$55,000	$5,000	-$50,000
System Service Sub-Total	$4,221,000	$3,537,000	-$684,000

Conductor upgrades are $132k less in 2020 than 2019 due to the nature of the projects selected. The projects include a pilot project for a feeder ring, which will enable machine restoration of a circuit, rather than a human intervention to restore a feeder. Feeder reliability improvement investments are similar in 2020 and 2019, with the 2020 project consisting of a line segment from Prince Road to Brock Road. This is described in the Material Investments section of this DSP.

New switches and sectionalizers are reduced by $360k, which includes upgrades of 4 SUs and a recloser. This is the last recloser in the program to sectionalize feeders.

New connection investments are consistent between the years and represent one additional tie between feeders.

While SCADA and station improvements are lower by $130k, they include miscellaneous EOL replacements as well as $200k for a point-to-multipoint transfer trip scheme, which, if successful, will reduce transfer trip costs substantially in the future, provided that the technology can be applied elsewhere in the system.

Radial branch back-up investment is consistent with projects planned for the 23M2, 55M1 and 55M5 feeders.

General Plant

The 2019 Bridge and 2020 Test General Plant expenditures are noted in Table 139 below.

Table 139 2019 Bridge and 2020 Test General Plant Expenditures

Expenditure Category	2019 Bridge	2020 Test	Difference
Building	$2,592,330	$1,521,000	-$1,071,330
Information Technology	$0	$0	$0
Fleet & Welding	$70,500	$74,500	$4,000
Tools	$187,000	$102,000	-$85,000
Vehicles	2,652,178	$1,604,576	-$1,047,602
GIS/IT	$2,005,400	$1,719,000	-$286,400
ERP (SAP HANA)	$0	$0	$0
CIS	$0	$0	$0
Total	$7,507,408	$5,021,076	-$2,486,332

The building investment represents the completion of a two-year project to consolidate operations into ENWIN's Rhodes Drive operation centre. Fleet, welding and tools expenditures are reasonably consistent.

Vehicle expenditures drop by $1 M due to differences in the number and nature of the vehicles reaching economic EOL in 2020 compared to 2019.

GIS and IT spending is reduced by $286k due to the completion of the NorthStar upgrade done in 2019. Other GIS and IT expenditures are comparable with $503k for hardware replacement, $210k for GIS improvements, $100k for SAP improvements, $100k for network cyber security measures, $240k for the CIS system improvements, $332 for the final year of the new records management system, and $235k for miscellaneous enhancements and tools.

System O&M

System O&M are forecasted to be $38k less in 2020 than in 2019. For a full explanation of the effect of capital investment on O&M costs see section 5.4.3.1 (b) Capital Investment Impact on O&M Costs.

5.4.3 Justifying capital expenditures

As indicated in Chapter 1, the onus is on a distributor to provide the data, information and analyses necessary to support the capital-related costs upon which the distributor's rate proposal is based. Filings must enable the OEB to assess whether and how a distributor's DSP delivers value to customers, including by controlling costs in relation to its proposed investments through appropriate optimization, prioritization and pacing of capital-related expenditures. A distributor should also keep pace with technological changes and integrate cost-effective innovative projects and traditional planning needs such as load growth, asset condition and reliability.

5.4.3.1 Overall plan

The OEB's assessment of DSPs includes the costs of material projects/programs included in the DSP, as well as how the overall DSP budget is allocated to each of the four investment categories. Information to be provided in this section pertains to the latter; the former is addressed in section 5.4.3.2.

To support the overall quantum of investments included in a DSP by category, a distributor should include information on:

• Comparative expenditures by category over the historical period

• The forecast impact of system investment on system O&M costs, including on the direction and timing of expected impacts

• The drivers of investments by category (referencing information provided in response to sections 5.3 and 5.4), including historical trend and expected evolution of each driver over the forecast period (e.g. information on the distributor's asset related performance and performance targets relevant for each category, referencing information provided in section 5.2.3)

• Information related to the distributor's system capability assessment (see section 5.3.4)

5.4.3.1 (a) Capital Expenditures by Category

ENWIN has tracked expenditures by the OEB's spend categories since it filed its 2014 DSP, and has broken out prior years' expenditures by rate classification. The history of expenditures by classification is shown in the Table 140 below.

Table 140 Expenditures by OEB's Spend Categories

Projects	2009	2010	2011	2012	2013

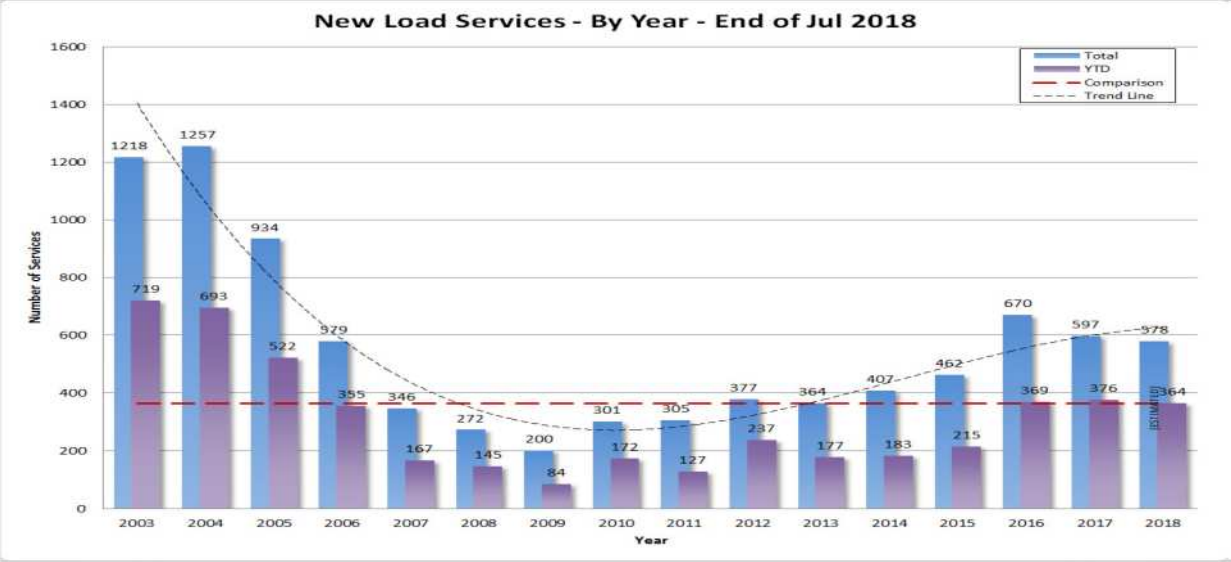
Reporting Basis	**CGAAP**	**CGAAP**	**MIFRS**	**MIFRS**	**MIFRS**
System Access	$ 1,607,620	$ 8,443,156	$5,098,731	$5,870,148	$4,903,306
System Renewal	$ 7,848,312	$ 6,921,307	$7,416,253	$7,569,208	$8,126,349
System Service	$ 253,003	$ 25,783	$662,601	$982,938	$1,304,262
General Plant	$ 8,066,576	$ 9,453,392	$3,724,687	$2,660,388	$4,679,933
Total (Gross)	$17,775,511	$ 24,843,638	$16,902,271	$17,082,682	$19,013,849
Capital Contributions	-$ 520,301	-$ 224,159	-$321,196	-$1,495,683	-$757,276
Total (Net)	$ 17,255,210	$ 24,619,479	$16,581,075	$15,586,999	$18,256,573

Projects	**2014**	**2015**	**2016**	**2017**	**2018-budget**
Reporting Basis	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**
System Access	$4,362,540	$2,762,116	$3,945,623	$3,963,441	$3,310,000
System Renewal	$6,951,993	$8,221,104	$5,474,883	$5,455,688	$5,586,203
System Service	$2,594,215	$6,432,888	$2,931,171	$3,975,568	$4,426,895
General Plant	$4,885,125	$3,498,840	$2,253,412	$2,057,547	$3,098,047
Total (Gross)	$18,793,873	$20,914,948	$14,605,089	$15,452,244	$16,421,145
Capital Contributions	-$2,403,163	-$4,322,469	-$411,579	-$2,216,539	-$1,888,586
Total (Net)	$16,390,710	$16,592,479	$14,193,510	$13,235,705	$14,532,559

System Access

System Access expenditures for new services have varied over the period. In 2008, there was a recession in progress which significantly adversely affected the number of new connections in Windsor, as shown in Figure 80 below. New load connections in Windsor hit an all-time low in 2009, and had not really recovered until 2016. The connections in 2017 and 2018 are lower than in 2016, and appear to be flattening out.

Figure 80 New Load Services



In addition to the load connections, ENWIN has connected over 800 generators to its distribution system. Prior to 2000, there were 4 behind the meter load displacement generators operating in parallel to ENWIN's distribution system. Since that time, the government programs supporting renewable energy sources has increased the number of generators connected to ENWIN's distribution system to over 800, as per Table 141 below.

Table 141 Generator Connections by Year/Month

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Grand Total
pre-2000	4	0	0	0	0	0	0	0	0	0	0	0	4
2010	0	0	0	1	0	0	4	0	0	2	10	7	24
2011	1		1	3	4	2	3	6	7	4	15	11	57
2012	9	4	8	5	7	6	4	5	16	14	10	7	95
2013	15	3	1	7	8	13	14	8	11	3	4	5	92
2014	6	4	4	3	4	6	4	8	2	1	5	4	51
2015	4	2	1	3	12	19	18	8	22	12	10	17	128
2016	20	12	20	13	14	12	5	19	8	15	5	3	146
2017		1	2	7	7	8	7	6	10	12	11	29	100
2018	21	13	16	11	19	22	1	0	1	1	0	0	105
Grand Total	80	39	53	53	75	88	60	60	77	64	70	83	802

Additionally, beginning in 2011, the ENWIN service territory was impacted by the largest federal infrastructure program the country has ever seen—the building of the Parkway, which is a link between Hwy 401 and the GHIB. The Parkway was constructed first, and the GHIB construction is ongoing, with an expected opening date in 2024.

Since costs related to the GHIB project are 100% recoverable from the federal government, variations in expenditure and in receipt of capital contributions have occurred over the period from 2011 to present. Consequently, some of the System Access expenditures and capital contributions do not perfectly align in the year in which the work was completed, but they do net to zero.

City roadwork projects have also been "lumpy" over the Historical Period, and have varied depending on the City's budget for roadwork projects. This was due to City policy regarding tax increases, and the availability of grants to complete road works. The historical expenditure for City Roadworks is shown in Table 142 below.

Table 142 City Driven Roadwork Expenditures

City Driven Roadwork Expenditures

Year	Amount (actuals)	Year	Amount (forecast)
2009	$532,355	2018	$1,186,000
2010	$867,290	2019	$1,619,000
2011	$86,393	2020	$900,000
2012	$2,318,762	2021	$900,000
2013	$214,793	2022	$900,000
2014	$1,338	2023	$900,000
2015	$7,098	2024	$900,000
2016	$438,733	Average '16-'19	$960,632
2017	$598,995		
Average	$562,862		

Over the Forecast Period, the City has a number of large, continuing projects. The Cabana Road project will see the rebuild of a road which provides a continuous east-west route across the City. The existing road will be rebuilt from a 2-lane residential road to a 4-5 lane arterial road. Work has already started on this project and is expected to continue in sections through the Forecast Period.

The Riverside Vista project is intended to improve the east-west road which follows the Detroit River across the City. This project has already begun and has driven System Access costs, which is expected to continue. It involves road widening, curve straightening, sewers and curbs and it has, and is expected to continue, to extensively involve utility relocations. It is being done in sections from east to west as land rights are acquired and engineering is completed.

The City has provided ENWIN a list of projects (in various stages of engineering and execution) through 2023 of which they are aware. The City roadworks budgets for 2019 and 2020 are better known and engineering work has gone into the estimates. The projects for 2019 and 2020 are shown in Table 143 below. Projects beyond 2021 are identified, but the City has not

completed their engineering work, so an average value based on 2016 and 2017 actuals, 2018 (underway), and 2019 (projected) was used to predict costs for these projects.

In addition to this, the City has announced an $89.3 million additional budget for sewer and road reconstruction in Windsor. While specific projects have not been identified yet, it is expected that this project will drive a significant increase in roadwork expenditures for ENWIN.

Table 143 Projected Roadwork Expenditures (Net) 2019 & 2020

Year	Project Name	Amount
2019	Provincial – 6th Concession to Walker	$450,000
	Cabana – Dougal to Dominion	$560,000
	Riverside Vista – Phase 2A Design	$176,000
	Memorial – Vimy to East of Marentette	
	Matthew Brady – Edgar to Tranby	
	Aubin – Guy to Tecumseh	
	Belle Isle View – Wyandotte to St. Rose	
Total		$1,186,000
2020	Riverside Vista – Buckingham to St. Rose	$785,000
	Francois – Seminole to Alice	$834,000
	Jos. St. Louis – Tecumseh to Rose	
	Cadillac – Alice to Tecumseh	
	Cabana –Dominion to Huron Church	
Total		$1,619,000

The sewer improvement budget announcement is excerpted in Figure 81 below. The affected areas have large sections served by underground plant, which are likely to be disturbed during the construction.

Figure 81 Sewer Improvement Budget Announcement Excerpt

Mayor touts $89.3M plan to curb flooding in Windsor's east side

Windsor will start in 2019 a massive series of projects — including upgrades to pumping stations, sewer replacements, and even rebuilding roads — all aimed at reducing basement flooding in the east end.

A City of Windsor map, released to media Monday, July 23, 2018, outlines the projects to be included in an $89.3-million, 10-year plan to address basement flooding in east Windsor.

System Renewal

ENWIN's investments in System Renewal from both an historical and prospective basis is shown in Table 144 below.

Table 144 ENWIN's Investments in System Renewal

System Renewal Expenditures - Actual

Year	Amount
2009	$ 7,848,312
2010	$ 6,921,307
2011	$ 8,132,941
2012	$ 7,569,208
2013	$ 8,126,349
2014	$ 6,951,993
2015	$ 8,221,104
2016	$ 5,474,883
2017	$ 5,455,688
Average	$ 7,211,804

System Renewal Expenditures - Prospective

Year	Amount
2018	$ 5,586,000
2019	$ 7,289,000
2020	$ 8,440,000
2021	$ 8,009,000
2022	$ 7,605,000
2023	$ 7,850,000
2024	$ 7,366,000
Average	$ 7,449,000

As can be seen in Table 144 above, ENWIN's investment in System Renewal has been relatively consistent year over year, and is projected to remain so through the DSP prospective period.

System Renewal expenditures include renewal for poles, transformers, switches, meters, manholes, cables, and TS equipment. ENWIN's last rate application described ENWIN's replacement of its oldest 4 kV distribution system assets with a 27.6 kV distribution system. This effort spanned the period since the last CoS (2009 rates) until 2014. While there were some minor "clean-up" expenditures on these projects in 2015, from 2015 forward, distribution System Renewal expenditures were on the 27.6 kV distribution system. ENWIN eliminated its 4 kV distribution system to improve efficiency. With a single voltage, the following benefits and efficiencies were realized:

1. Eliminated the need to maintain inventory for two separate distribution systems
2. Eliminated 27.6/4 kV substations throughout the City of Windsor and avoided the need to replace 1940/50's vintage power transformers that were at EOL.
3. Reduced the number of FTE staff needed to maintain the 4 kV substations thereby reducing costs for customers.
4. Eliminated duplication of high voltage feeders traversing the city (i.e. 27.6 kV with 4 kV underbuilt lines) thereby reducing the number of kilometers of line and reducing the "footprint" of the distribution system that is exposed to risk.
5. Increased safety of the distribution system for customers by reducing the "footprint" and eliminating the possibility of creating a damaging voltage spike should the 27.6 kV lines fail and fall into the 4 kV lines.

6. Increased safety for employees that work on the overhead distribution system as they no longer needed to work between primary lines with risk hazards both above and below them.
7. Eliminated lead cable in the distribution system thereby eliminating a required skill (lead splicing) and removed a risk from the environment from the lead and from the PCB oil that impregnated some of the lead cables that were in service.
8. Freed up duct space in duct banks in the most congested areas of the city (downtown core) thereby providing duct capacity for the future and enabling a lower cost future expansion that can be accomplished without the need to dig up roadways. This also provided pathways for communications cables should they be needed in the future.
9. Return of 4 kV substation properties to other community uses thereby enhancing the neighbourhoods in which they resided.
10. Reduced system losses by eliminating an additional step-down transformation for customers served from the 4 kV system.
11. Through each of the above benefits, reduced distribution system costs for the benefit of ENWIN's customers.

After the 4 kV system was replaced, ENWIN's System Renewal expenditures were then focused on the 27.6 kV system plant that was also at EOL. Renewal expenditures on the 27.6 kV system were being made from the last CoS application forward. However, once the 4 kV system was eliminated, the investments simply transferred to the infrastructure that was next in line for replacement, which was on the 27.6 kV system.

Near the end of the 4 kV system conversion efforts, ENWIN slightly accelerated the level of investment aimed at the 4 kV system. This was because as more 4 kV systems were eliminated, the tie support between 4 kV systems was reduced and then eliminated. This put the last 4 kV served customers at increased risk because they were now served from radial feeders from the substations that had no feeders to back them up. These customers were also being served by the oldest plant still in operation and ENWIN was beginning to experience supply interruptions that were longer than they would have otherwise have been a few years earlier. In order to address this situation, ENWIN prioritized expenditures aimed at more quickly eliminating the 4 kV system.

In 2015 and 2016, ENWIN undertook a mass re-inspection of its pole fleet as the data that had been maintained for those assets had become unreliable. This work was completed, and the database of pole health information is now improved and reliable. That database currently indicates that there are approximately 2,750 poles that are flagged for action. That is a sufficient number of poles to support the level of expenditure proposed for the Test Year and the Forecast Period of the DSP. Additionally, it is expected that as that period progresses, there will be more poles that fall into the FFA category.

Other assets are also included within the renewal expenditure envelope. These are described elsewhere in this DSP. Of note, ENWIN is increasing its level of investment for replacement of submersible transformers. These transformers have a poor record of in-service failure and consequently, ENWIN has increased the pace of investment to provide customers with a more

reliable service. ENWIN has received complaints from customers served by these transformers as well.

System Renewal expenditures for the 2020 Test Year are shown in Table 145 below and are generally typical of the expenditures in both Historical Period and the Forecast Period of the DSP. There are two expenditures in the Test Year that are specific, one-off investments and which are described in fuller detail in section 5.4.3.2 Material Investments. The first is the replacement of poles in a certain section on Walker Road and for which there are additional reasons to replace the poles than just their condition. The second is for replacement of transformers and switches out of a customer owned vault to an above-ground location due to the fact that the location of the underground vaults have proven untenable due to the ingress of salty water in the winter, which severely corrodes the equipment in these vaults.

Table 145 System Renewal Expenditures for the 2020 Test Year

Asset Renewal Type	**2020 Investment Amount ($'000)**
Poles	$3,300
Metering Equipment	$294
Reactive (poles, cable, etc.)	$470
Transformers	$1,325
Manholes	$150
Switches	$1,025
Cable	$512
Walker Road Pole Replacement	$750
Customer Vault Relocations	$400
Other Miscellaneous	$214
Total	$8,440

System Service

System Service expenditures at ENWIN are noted in Table 146 below. In the period before the 2014 DSP filing, ENWIN was planning the completion of the replacement of its 4 kV distribution system with 27.6 kV feeders. One of the differences between the 4 kV distribution system and the 27.6 kV distribution system is that the 27.6 kV system has longer feeders and, hence, a larger "footprint" or base upon which power quality and reliability incidents could occur, and affect the entire feeder. The 4 kV system had many more numerous and shorter feeders that generally all had at least one other feeder supporting it. In the case of an upset, if all or part of the feeder needed to be isolated, an unfaulted section could be restored using the supporting feeder.

With longer, less sectionalized and fewer supporting feeders, which are characteristic of the 27.6 kV distribution system, it was expected that the level of reliability that customers would experience would be lower. Consequently, a program was developed to provide additional sectionalisation switches for the 27.6 kV feeders along with feeder ties to each of the sections. Additionally, the sectionalizing and feeder tie switches were also made to be remotely operable in order to provide an improvement in reliability for ENWIN customers.

Table 146 ENWIN's System Service Expenditures

System Service Expenditures - Actual

Year	Amount
2009	$ 253,003
2010	$ 25,783
2011	$ 726,663
2012	$ 982,938
2013	$ 1,304,262
2014	$ 2,594,215
2015	$ 6,432,888
2016	$ 2,931,171
2017	$ 3,975,568
Last 5-Year	$ 3,447,621

System Service Expenditures - Prospective

Year	Amount
2018	$4,426,895
2019	$4,221,000
2020	$3,537,000
2021	$3,622,000
2022	$3,610,000
2023	$3,986,000
2024	$3,623000
Average	$3,861,000

In the 6-year period from 2003 to 2008, inclusive, the SADI average was 1.61 system average hours of interruption per year. The 2012 – 2017 period the SAIDI average was 0.94 hours, or over a 40% reliability improvement. (Note: the 2009-11 period was excluded in the averages as 2009 was an anomalously low SAIDI and 2011 had an anomalously high SAIDI.) Furthermore, the introduction of remote operable switches was a prerequisite for a Smart Grid which was contemplated in the Order in Council/Minister's Directive of November 23, 2010.

In addition to this System Service expenditure, ENWIN also invested in FCIs that are connected remotely to the SCADA system and provide ENWIN with the ability to better pinpoint the location of a feeder fault, which will improve reaction time and, hence, reliability for customers. ENWIN is also investing in elimination of large pockets (over 500) of singly supplied customers by constructing back-up supplies to those areas. In the event of a fault, the number of customers affected by the fault could then be reduced and power quickly restored for the majority.

Additionally, ENWIN was aware that the end points of many of its feeders were constructed with non-standard, undersized conductors. With the intention of implementing a system where one feeder can support the load on 1/3rd of another feeder, there was a need to replace these undersized conductors with standard sized conductors. Where possible, conductor upgrade projects were combined with System Renewal or road widening System Access driven projects.

Similarly, ENWIN's system planning efforts identified that the ENWIN distribution system is unable to supply all load on a peak day with a loss of supply of the Lauzon station. While HONI DESN stations are constructed for redundancy, whole stations outages have occurred as happened to the Lauzon station twice in 2017, and Malden TS and Keith TS in 2018. Additionally, HONI lost a large TS in Toronto due to fire and a station in Ottawa due to a tornado in 2018. Thus, there is a very realizable risk of such occurrences. ENWIN judges that extended periods of repeated interruptions due to loss of a station would be unacceptable to ENWIN's customers.

Consequently, to mitigate this situation and to facilitate various other system re-configurations, ENWIN decided to identify certain feeders that traverse between supply stations for re-build with larger conductor (795 MCM) than ENWIN's standard conductor (556 MCM). This increased capacity conductor will carry a maximum load of 900 A compared to standard conductor, which will carry 600 A. Normal feeder peak loading is 450 A so an increased conductor size will allow that feeder to carry the full peak load of another feeder while carrying a full peak load of its own. These feeders were identified to be along driveable routes for bucket truck access for ease and quickness of repair and, where possible, major arterial traffic routes were selected as there is generally less tree cover along these routes and, hence, less risk of tree damage in a storm. The incremental cost of the increased size conductor was nominal.

The plan also selected feeders along routes where it was expected that the City was planning roadway improvements so that the increased sized feeder could be constructed when other drivers than system reliability were initiating the work so costs would be minimized to achieve the plan (Feeder Reliability Improvement Plan).

ENWIN also conducts various reconfigurations of its distribution system. Generally this reconfiguration is done to accommodate load balancing, generation capacity re-allocations, transfer trip accommodations, station loading re-allocations, load restoration, feeder phase balancing, construction convenience, etc. These items are done reactively to accommodate emergent conditions or conditions to which we become aware and proactively where we recognize a system deficiency that we then plan to mitigate. They will generally involve a span or two of conductor, poles and a switch.

The 2020 system investment plan for System Service is noted in Table 147 below and explanations of the expenditures follow.

Table 147 2020 System Investment Plan for System Service

Major Category	Specific Project	Budget Amount
Conductor Upgrade	2020|55M21:(55M21 LTP-1)	$181,000
	2020|23M2:(23M2 LTP-1)	$352,000
	2020|25M7:Feeder Ring Pilot-Project	$380,000

Sectionalizing Switches	2020|25M13-RC-AC(Tecumseh & Mercer)#136	$77,000
UG Switching Units	2020|TRADERS SU SE CORNER TEC E&FOREST GLADE.(#20100091)	$140,000
	2020|EASTCOURT SU SS, EASTCOURT W, SUFFOLK.(#20105896)	$140,000
	2020|CASINO SU S WS GLENGARRY N OF CHATHAM.(#20020156)	$140,000
	2020|CASINO SU N - WS GLENGARRY N OF CHATHAM.(#20020155)	$140,000
Feeder Reliability Improvement Project:	2020|Prince to Brock #4	$1,224,000
Feeder Ties	2020|15M11A-MS-55M24A(Grand Maris E & South Pacific)#133	$119,000
Radial Branch Backups	2020|23M2-1P radial#9	$36,000
	2020|55M1-3P radial section #16	$125,000
Stations	Green Energy Plan/Remote Trip Project	$200,000
SCADA	SCADA FCI's	$70,000
	SCADA Communications Equipment	$150,000
Other Miscellaneous	Feeder Balancing, Power Quality, etc.	$63,000
Total		$3,537,000

Conductor upgrade 55M21 LTP-1 for $181,000 is to add an additional cable to cable sections C2 and C3 on the 55M21 cable on Central, north of the North Service Road and south of the CN tracks. This will provide an additional cable so that the full 600A capacity of the 55M21 feeder can be realized. The cable currently limits ampacity on the feeder to 400 A.

The 23M2 LTP-1 conductor upgrade is to increase the conductor size on a section of the 23M2 feeder along Matchette from Armanda to Prince. This project will provide a 900 A section of the Feeder Reliability Improvement plan. The existing line will be reframed for a second circuit and there are available ducts for a third cable at the EC Row highway crossing. This is part of a long term plan to improve contingency load support around the city. As the poles and conductor are in poor condition, this represents an opportunity to build another section of the high capacity feeder ring between stations while achieving a parallel purpose of renewal of EOL plant.

The 25M7 Feeder Ring Pilot is a project to create a self-healing loop on the 25M7 feeder that serves the downtown area. This pilot will result in fault identification, isolation and restoration within a few seconds to provide customers with state-of-the-art reliability. This is a smart grid project that is intended to provide learning for future feeder configuration and operation in order to provide the best service for customers. This project aligns with the Minister of Energy's directive of 2010 to provide a smart grid that improves service to customers.

The 25M13-RC-AC project is the installation of a sectionalizing recloser which will sectionalize the 25M13 feeder into thirds and provide a more granular ability to isolate faulted sections and restore unfaulted sections.

There are four underground SU automation projects consisting of two sets of two SUs that work together in a pair. The first set is the Traders and Eastcourt SUs. These SUs will be automated so that sections of the 56M8 feeder can be isolated remotely in the event of a fault and sections of that feeder restored. The 56M8 feeder is the worst performing feeder of ENWIN's feeders. This will assist in improving reliability for those customers served by that feeder.

The second set is the two Glengarry SUs. These two SUs work together to manage the 55M1 and 15M6 feeder supplies to a large customer and the downtown area. Automating those SUs will improve the reliability of customers served by these feeders by allowing faster sectionalization and restoration in the event of a fault. Additionally, these SUs are in poor condition and ENWIN chose not to remediate the SUs as the large customer was working through plans for connecting generators and those plans would have required reconfiguration of the feeders and SUs in that area. The large customer has now advised that their plans have changed, which necessitated ENWIN to revisit the condition of the SUs and plans for their upgrade.

Plans also include a feeder tie between 15M11A and 55M24A at Grand Maris E & South Pacific. This feeder tie is part of an overall plan for sectionalizing of feeders at third points and providing a feeder tie. This feeder tie is in the first section beyond the station. The feeder tie will provide an alternate feed for approximately 1,000 customers in the event of loss of supply from the section of line that normally supplies the area.

There are two radial branch back-up projects in 2020. These projects are aimed to provide back-up supplies to large pockets of customers that have only a single supply. For those customers, when their only supply is interrupted, there is no backfeed with which to restore service to some or all of the customers. The first project is an alternate single phase supply to a pocket of 596 customers at Grove and Campbell. The second is a 3-phase alternate supply to 568 customers along Brant St. to Argyle.

The Green Energy Plan/Remote Trip Pilot is a pilot project to assess point to multi-point transfer trip systems. A constraint on the connection of increasing amounts of generation, including renewable generation, on a feeder is the requirement that the amount of generation connected to a feeder is less than 50% of the minimum loading for a feeder. Once connected generation exceeds 50% of the minimum feeder loading, all generators on the feeder are required to have transfer trip capability in order to prevent islanding upon the occurrence of a fault.

Traditional transfer trip equipment requires dedicated point to point communication paths which are prohibitively expensive for smaller generators. ENWIN has reconfigured feeders to increase minimum loading and avoid the need for transfer trip. As applications for generator connections continue to increase in the future, the opportunity to reconfigure feeders will

diminish. ENWIN plans to review point to multi-point transfer trip schemes and pilot the most promising scheme. A point to multi-point transfer trip scheme, if reliable, will enable increased amounts of generation to connect to ENWIN's grid at a markedly lower cost than traditional means.

SCADA FCIs are planned as an upkeep item for when new connections are made or new lines extended. The bulk of the distribution system has remotely connected FCIs to assist Operators to know where a fault lies so staff may be dispatched efficiently and reliability improved. The SCADA Communications Equipment is for new devices that require communication to connect to the SCADA system in order to make them remote operable and to improve reliability for customers.

Finally, as mentioned earlier, there is budget for miscellaneous reconfigurations that may need to occur in order to assist customers or generators to connect to the grid.

General Plant

The historical and prospective expenditures for General Plant categories are shown in Table 148 below. Expenditures in 2009 and 2010 were relatively high, as ENWIN was installing a new ERP system in 2009, and was installing smart meters in 2010. In 2013 and 2014, ENWIN changed its Customer Information and Billing system to accommodate smart meter Time-of-Use billing. Other General Plant expenditures were for renewals for fleet, site and other smaller IT systems.

The prospective expenditures for 2019 and 2020 include a large expenditure for renovating ENWIN's Rhodes Drive Operating Centre so that it can accommodate the employees from its Ouellette Avenue Head Office location, which is to be sold. Moving the entire organization will save money since expenditures for maintaining the 1950's vintage Ouellette Avenue site will be avoided and will make the organization more efficient as staff will not need to travel between locations to meet and communication in general will be improved. The anticipated payback for the site consolidation is less than 3 years. A thorough discussion of the plan for consolidating operations into a single building is presented in *Appendix C – Building Consolidation* to this DSP. Excepting the years in which this expenditure occurs, the average expenditure on General Plant is slightly lower than the average of the last 5 historical year expenditures on General Plant.

Table 148 Historical and Prospective General Plant Expenditures

	General Plant
2009	$8,066,576
2010	$9,453,392
2011	$3,724,687
2012	$2,660,388
2013	$4,679,933
2014	$4,885,125
2015	$3,498,840

Year	IT	Site	Vehicles	Fleet/Weld	Tools	Total
2018	$1,733,000	$354,000	$833,547	87500	$90,000	$3,098,047
2019	$2,005,400	$2,592,330	$2,652,178	$70,500	$187,000	$7,507,408
2020	$1,719,000	$1,521,000	$1,604,576	$74,500	$102,000	$5,021,076
2021	$2,288,000	$507,000	$1,303,000	$75,000	$111,000	$4,284,000
2022	$1,863,000	$500,000	$1,309,000	$75,000	$111,000	$3,858,000
2023	$1,828,000	$501,000	$1,660,000	$75,000	$111,000	$4,175,000
2024	$2,013,000	$496,000	$1,530,000	$75,000	$101,000	$4,215,000
Average		$4,594,076				
Avg. Exc. '19 & '20:		$3,926,009				

2016 $2,253,412 2017 $2,057,547 Last 5 Year Average: $3,474,971	

General Plant – Vehicles

ENWIN uses a five-year rolling capital replacement plan for both its Site and Fleet operations. This budget is based on the equipment life cycle, which is determined by utilizing seven years of equipment history and condition. The budget forecast amounts are adjusted over time for inflation, as required.

At times, an unexpected failure may occur, and the resulting repair expense far exceeds the value of the asset. When this occurs, replacement funds are found within the existing capital budgets through a reassessment of all equipment replacements and the deferral of a lower priority replacement expense or project.

ENWIN uses a blend of in-sourced and out-sourced maintenance services for its Fleet services operations. ENWIN employs only the required number of staff to safely maintain the fleet vehicles. External resources are contracted to provide services including light duty drive clean, tire service, spring work, body work, and drivability (including warranty repairs, engine and transmission issues, etc.).

The ENWIN Fleet department continues to explore different technologies in order to reduce the operating cost of the fleet. ENWIN will continue to monitor the evolution and viability of electric fleet vehicles and, when economically justified, will adjust the multi-year fleet replenishment plans accordingly. Tests are underway on an electrically operated PTO system for an aerial device (bucket truck); the reduction of truck engine sizes from a V8 to V6 with 8 speed transmissions, where possible; the installation of anti-idle devices; and the installation of cab heaters in trucks to reduce fuel consumption and carbon footprint. Oil sampling is now completed based upon lab reports that indicate the need for oil replacement (as opposed to arbitrarily changing the oil at the time of preventative maintenance). This has resulted in a reduction in costs and the amount of used oil products going into the waste stream.

All fleet equipment is subject to a preventive maintenance and inspection program, and all data from these inspections is captured on an ERP Work Order and stored in ENWIN's ERP asset maintenance system. Fleet vehicles are scheduled four times per year for lubricant and safety inspection. At this time, each vehicle is assessed and any component that is deemed unsafe, or worn to a point where it will likely not continue to function properly until the next inspection, is repaired or replaced. Vehicles over 4545 kg undergo a Ministry of Transportation annual safety inspection, as required under the *Highway Traffic Act* (Ontario). If any safety-related issues are detected, the relevant components are repaired or replaced. When fleet vehicles are required to undergo an emission ("Drive Clean") inspection, any deficiency found during this inspection is also repaired. All driveline components are inspected and maintained as per the

manufacturers' specifications, and aerial devices are scheduled for preventative maintenance service and inspection four times per year in accordance with manufacturers' requirements. An annual lifting inspection and di-electric test/inspection is also performed as required by the Ministry of Labour and in accordance with CSA (and ANSI) standards.

In 2018, ENWIN changed from leasing to purchasing the vehicles for its fleet. This was based on an economic decision relative to the total cost of ownership for vehicles. As a result, actual and forecast capital expenditures for 2017 and beyond exceed prior years' spending. The amount by which the General Plant investment is augmented by spending on replacement vehicles is shown in the Table 148 above, and will vary year over year depending on the number and nature of vehicles reaching EOL.

General Plant – Site

ENWIN's Site department maintains a minimum level of internal staff resources to attend to the day-to-day building and property maintenance duties. Other services such HVAC, electrical, plumbing, and construction work are out-sourced to external contractors. The blending of in-sourced and out-sourced services allows for optimal staffing levels for day-to-day operations while providing additional resources and expertise for peak periods.

By utilizing the expertise of professional inspection services to assess the condition of equipment/buildings, ENWIN is able to determine the necessary repairs required to extend the lifecycle of the assets and the appropriate replacement timeline. The utilization of an engineering service to assist with consultation and design of replacement equipment helps to ensure that ENWIN procures the best energy efficient design and equipment for the required application.

All HVAC equipment is subject to a preventive maintenance and inspection program. These preventative maintenance services and inspections are designed to follow the manufacturers' recommendations and performance measurements. These preventative maintenance services and inspections are completed by a contract service that supplies the qualified service personnel for each particular type of equipment (e.g. refrigeration mechanic, boiler technician, etc.). Elevators, fire suppression systems, and emergency generators are all scheduled for monthly inspections to ensure their safety and performance. These types of equipment are scheduled for either quarterly or annual preventative maintenance and inspections, in accordance with the relevant regulatory requirements and manufacturers' recommendations.

General Plant – Tools

General Plant expenditures for tools are for replacement of hydraulic hand tools such as crimpers, concrete saws, and for tools for line locating, fault locating, di-electric hot work sticks, etc. The expenditures are relatively consistent from year to year, and efforts are made to smooth large purchases so that year to year variations in expenditures are minimized.

General Plant – Information Technology – the following describes the IT General Plant expenditures.

Based on the criticality of the asset, industry best practice and vendor specifications, each IT asset is assigned an estimated asset life. ENWIN relies on this information to make investment decisions in addition to other key data, including: vendor, contract, and license information; security risks; interdependencies with other IT assets; capacity planning; and utilisation reviews.

The objective of ENWIN's IT investment planning process is to maintain the IT assets to satisfy optimal system reliability and availability. This is intended to provide satisfactory levels of service for customers and the utility, and to mitigate IT-related business and operational risks in a cost efficient manner.

IT assets in the data centre are visually inspected for any lights or indicators on a daily basis that may identify a problem that needs resolution. Some critical IT hardware devices are able to email problems to administrators and vendors for repair instructions when a problem occurs. Maintenance policies exist for patching software to maintain appropriate patch levels through automated system management software. ENWIN uses a 3rd party security firm to monitor vulnerabilities and report cyber threats.

ENWIN's technology investment decisions continue to be based on three basic considerations:

1. Enhancing service to our customers;
2. Creating efficiencies that will increase our cost effectiveness; and
3. Improving agility and resilience in the face of industry disruption.

In addition to routine IT asset renewal investments (Life Cycle Upgrades program), ENWIN has identified several additional capital projects that are required during the Forecast Period.

1. Implement and enhance a new records management system
2. Improve security systems according to OEB cyber security guidelines
3. Upgrade customer facing systems through self-service and mobile applications
4. Continue investment in employee mobile field applications and process improvement projects
5. Further develop our OMS to improve communication with customers during storm events

It is important to note the list of capital projects above does not include a major expenditure for replacement of ENWIN's ERP or Customer Relationship and Billing system. At the present time, ENWIN is focused on optimization of its current systems through Life Cycle Upgrades. This approach minimizes the customer rate impact given the current ERP and Customer Billing systems are substantially fully amortized. In the event an opportunity arises in which customer service, efficiencies, risk and ongoing operating costs can be optimized through migration to a new system, a larger IT (or Plant) related expenditure may be required. At that time, a business model considering all relevant matters would be done to justify the expenditure.

In developing its IT capital plan, ENWIN considers industry best practices, vendors' information, and historic trends including evolving regulatory requirements. Efforts are made to level spending between the years, ensuring a steady and manageable stream of projects with as minimal impact to all stakeholders. A detailed plan is formalized for the next year, including project dependencies, cost estimates and detailed plans which lists, prioritizes, and tracks all the projects while in execution.

ENWIN requires flexibility over the Forecast Period to execute its IT capital investment plan due to external drivers that can impact risk and priorities. This includes unforeseen regulatory changes, new cyber risks, and changes to vendor support. Furthermore, technology evolves at a fast pace and unforeseen opportunities or risks may arise that could impact ENWIN's plans.

Life Cycle Upgrades

This program addresses the renewal and maintenance of existing hardware, system software and miscellaneous applications that support ENWIN's core functions and processes. It includes upgrades to infrastructure and endpoint assets (e.g. servers, storage disks, desktops, laptops, tablets), initiatives to upgrade system software and miscellaneous applications (e.g. operating system, backup software, engineering tools) and upgrades to our phone system.

If the cost pertains to existing functionality or equipment replacement, it is funded through this initiative. Costs associated with new requirements are funded through Network Infrastructure Update and Cyber Security or the specific project associated with the need.

> **Hardware:** Assets in this grouping include servers, network switches and routers, firewall devices, personal computers, laptops, tablets, printers, disk drives and miscellaneous devices. ENWIN has 3 data centers, 3 facilities and approximately 650 endpoints. Asset conditions vary and are typically replaced on a 3-5 year life cycle taking into consideration the cost and risk of maintaining the aging asset both from a performance and security perspective.
>
> **Software:** Included in this category are system and application software. Due to potential security risks, ENWIN strives to keep its system software at the highest patch level. Since this is often dependent on its application software, ENWIN plans regular upgrades to keep its software at the version that is at one version lower than the current vendor released version. This process enables ENWIN to be more agile, take advantage of enhanced features, and minimize the need and risk of large project upgrades. The oldest asset in this category is the Records Management software which is currently being replaced. Most software assets range in age from 1 to 5 years.
>
> **Telephone:** ENWIN's phone assets include both hardware and software which provide analog, digital, and IP service between its three facilities. It includes software for voicemail, call recording, call management, and reporting. Hardware includes servers, proprietary vendor hardware, and digital, analog and IP phones.

Network Infrastructure Update and Cyber Security

The network infrastructure update and cyber security project is required to improve ENWIN's networking and security systems to support the evolving needs of the organization such as allowing for greater bandwidth and more intelligent routing of data across the corporate network. Cyberattacks are constantly evolving and new technology will be acquired and implemented to mitigate risks and comply with regulations. ENWIN has adopted the OEB Cyber Security Framework to guide and prioritize its investments.

ENWIN conducts yearly network penetration testing and web application testing on applications that are exposed to the internet. Network penetration tests are conducted yearly and the results of those tests lead to improvements in ENWIN's cyber security posture. Web Application tests are conducted prior to any new application role out, and any major upgrade. The results of these tests can lead to purchases for tools, licenses and consulting projects to increase cyber security resiliency for the protection of ENWIN's networks and data including Customer information.

ENWIN continues to invest in new software and hardware products each year, as new threats emerge technology adapts to protect from these threats, therefore new technology is purchased. ENWIN continues to invest in training and education for its employees that work in cyber security roles and also for cyber security awareness for the entire organization.

GIS Evolution and Integration

This program upgrades and evolves the GIS application suites in order to increase efficiencies in asset management, in scheduling work and in communications to customers and stakeholders. Initiatives include new or enhancements to field mobility programs, improvements to ENWIN's OMS and enhancements and upgrades to improve communication during storm events, including enhancements to ENWIN's outage map and use of social media.

ERP Evolution

This program upgrades and evolves the ERP stack of applications which include Payroll, Finance, Asset Management, Supply Chain, Capital Project Costing and Mobility for field crews and warehouse. It also includes various application software that helps support these areas such as data extraction, testing and change management tools.

Upgrades are typically performed every 18 months. New functionality may be deployed during upgrades or as needed. Improvements may include process improvements, changes to the user interface, to self-service functionality and to add new mobility programs.

Customer Relationship and Billing

This program will perform both regulatory and business driven version upgrades to the customer suite of applications which includes CIS, AMI, customer portal and interfaces.

Upgrades are required to better meet our customers' evolving needs and to gain efficiencies by improving customer self service capabilities.

Records Management System

ENWIN recognizes the importance of its corporate records and its adherence to the regulations that govern records retention, including the OEB's Mandatory Record Retention Policy for Regulated Entities. ENWIN is operating very outdated and unsupported software to account for corporate records. A multi-phase project to define necessary corporate records and upgrade and adopt this system corporate-wide commenced in 2017 and will continue in subsequent years. Funding in 2020 has been allocated to complete the phase that will replace this legacy system and is described in detail in Section 5.4.3.2. Further improvements and use of the new software will continue under the Strategic Enhancement and Tools program.

Strategic Enhancements and Tools

The purpose of this program is to support the Enterprise Content Management and Collaboration suite of products which requires a level of continued investment to keep the products at an acceptable version level and to roll out new process improvement initiative including analytics.

In 2021, following the legacy system replacement, improvements will be made to the tracking and retention of electronic records and will include process improvements such as workflow and archiving to further support regulatory obligations.

Future years will include the development of a contract management application and employee collaboration tools.

5.4.3.1. (b) Capital Investment Impact on O&M Costs

During the period from 2009 through 2016, contrary to what might be expected, System O&M costs reduced from $4,956k to $4,631k. System O&M expenditures generally have not shown a direct relationship to capital investments. This is due to the number of variables that affect system O&M costs. Within the Historical Period there were a number of changes to accounting practises which had a significant influence on O&M costs.

Accounting Changes

In 2009, reactive maintenance (i.e. poles and transformers changed due to storms) was charged to O&M. However, this was changed when the accounting system changed from CGAAP to

International Financial Reporting Standards ("IFRS"). This had the effect of reducing O&M expenses.

Another accounting practise change was associated with charging a significant portion apprentice time to training and development (O&M) despite the fact that they were working on capital projects. This was changed so that apprentice time was only charged to training if they were taking formal training, and all time spent on capital construction projects is now charged to the capital project. Another change in accounting practises occurred in 2017 when O&M increased from the previous year by $5,126k or 111%. The change was to charge administrative burden to system O&M rather than to administrative accounts. This was done to be more in line with practises at other utilities.

These accounting changes affect the reported O&M costs. However, the underlying drivers of O&M expenses are independent from the accounting changes. The accounting changes immediately affected the reported values for the year in which the changes were adopted and carried forward thereafter.

Drivers Increasing System O&M Costs

There are some general trends that would provide a direct relationship between capital expenditures and system O&M charges. As the distribution system expands, there is more infrastructure to inspect and maintain so O&M charges would tend to increase. Additionally, as the distribution system is automated there are higher expenses for telecommunication and for maintenance of automated switching equipment.

In general, capital investment in replacement of existing assets such as poles, wires and transformers does not result in any change in O&M costs. O&M costs for assets are generally related to the mandated inspections for those assets, and regardless of whether the assets are new or near EOL, the costs to undertake the inspections is the same, as the frequency of inspection is dictated by the DSC, and that code does not differentiate new from old assets.

Where asset investment has been directed towards the automation of the distribution grid with remote operable switches, FCIs, reclosers, etc. there has been a commensurate increase in O&M costs. Initially, there will be costs for communications media that was not there prior to automation. Thereafter, such devices invariably require more attention and maintenance than their mechanical counterparts. This is because the devices are more complicated and there is more that can go wrong. Because the devices are more complicated, it takes a higher skill set and a longer time to troubleshoot the devices and repairs are likely to be more costly.

Additionally, ENWIN provides battery back-up for its SCADA communications devices in the field and to its remote operable devices. The batteries are provided so that in the event of a storm and lengthy outages, the remote operable devices will still be able to communicate and operate. These battery systems also require maintenance and periodic replacement. These factors all put upward pressure on O&M costs.

In order to mitigate this upward pressure on O&M costs, ENWIN tries to standardize as much as possible on the variations in manufacturer, control systems and software/firmware versions so that staff responsible for maintaining the equipment does not have to maintain skill sets for too many differing varieties of equipment.

While this new technology requires increased preventive maintenance efforts, it yields benefits in terms of increased reliability and an improved customer experience, as emergent and impactful reactive maintenance is reduced. These changes will continue to affect system O&M as soon as the capital expenditures are made, and will persist thereafter.

ENWIN is also investing in maintenance activities that it expects will increase the useful life of its assets. Wood poles are drilled and filled with preservatives intended to stop core rot. These preservatives used to be added when there was external evidence of pole rot. In 2016, ENWIN changed its standard so that poles are drilled at age 20 years as a preventive measure and before any rot is expected through the ground line. While this is expected to provide a temporary increase in system O&M costs while ENWIN catches up the older poles that have not been drilled, once caught up in the 3-year inspection cycle, those costs should reduce to normal levels in 2020.

Additionally, ENWIN is purchasing concrete poles with corrosion inhibitor in its concrete mix and is applying a topical corrosion inhibitor to its poles. While the placing of corrosion inhibitor in the concrete mix is a capital expense, the topical application of the inhibitor is a system O&M expense that will continue, but is expected to increase the useful life of the poles.

Moreover, ENWIN has undertaken a number of pilot projects of a new technology which is able to spray metal on existing substrate metals to eliminate corrosion of the substrate metals and place an anodic metal to preserve the substrate. This new technology is being piloted on transformers and switches whose cabinets have deteriorated due to corrosion and are in danger of becoming perforated. If the pilots are satisfactory, the use of this technology may be expanded so that ENWIN can achieve the full useful life expectancy from these devices.

Finally, ENWIN is piloting new technology which is promising to provide a reasonable structural repair for its concrete poles that have significant deterioration. These new maintenance initiatives will increase system O&M costs going forward but will delay capital costs for asset replacement and provide a net benefit to customers.

Investments in station assets will generally not result in decreases in O&M costs. ENWIN has invested in replacement of EOL station control equipment. Despite that this equipment is newer than the equipment it replaced, there is still the same need to test and maintain the new equipment at the same frequency and with the same effort as the equipment it replaced.

There will be one-time increases in O&M costs to provide for training time for technicians to learn the new technology and to develop any different test requirements for that equipment. Once this has been trained and developed, generally in the year the capital investment was made, O&M costs should return to normal levels.

While smart meter investment has provided efficiencies which have been outlined earlier in section 5.2.4, there are also aspects which drive increased O&M costs. In particular, smart meters will have problems with communications from time to time and those problems will need to be addressed through a site visit. Additionally, smart meters provide a variety of alarms that their mechanical predecessors we incapable of producing. While these alarms provide a value-added service to the utility and its customers, reacting to those alarms provides upward pressure on O&M costs. Moreover, the nature of some of these alarms, such as "hot socket" and "tamper" alarms, are such that a responsibility and a liability may be created if the alarms are not investigated in a timely manner. Thus, the upward pressure these alarms create on O&M costs are not able to be mitigated by reverting to old operating processes where these situations were not able to be reported and, hence, did not consume resources to investigate. These increases in O&M costs began in 2010 when the smart meters were installed and persisted thereafter.

In the years since ENWIN's last CoS application, there have been a number of non-capital items which have acted to impact ENWIN's O&M costs. With increasing costs for electricity, customers' expectations for the level of service they should receive for that additional cost have increased as well. It is increasingly difficult for ENWIN to get commercial customers to agree to planned outage times on other than after-hours periods, which drives up costs for both capital and O&M work. This is particularly evident for annual maintenance and inspection work needed to be done at ENWIN's MTS stations serving its automotive manufacturing customers.

Despite the stations having been constructed with full redundancy so that half the station could be out of service for maintenance and the full load carried by the other half, customers refuse to allow any work to take place at the stations other than during the company's annual summer shut down time, or on specific statutory holidays. These limitations drive ENWIN's O&M costs upward as work is often scheduled on overtime to accommodate the customer's demands. These customer expectations have been building over time as have the associated system O&M costs, and will persist going forward.

Similarly, the addition of many generators on the distribution system (over 800 new generators since 2010) has made the operation of the distribution system increasingly constrained. Solar generation customers are loath to accept any planned outages for maintenance during daytime hours, and CHP customers claim that any planned generator disruptions cost them thousands of dollars in commodity charges. With generators only able to generate on the feeders and stations for which they have a capacity allocation, it is increasingly difficult for ENWIN to make configuration changes to its distribution system.

These constraints make operating the distribution system more complex, onerous and costly. There has been a steady increase in distributed generation connections on ENWIN's distribution system through the FIT and mFIT programs. While the level of constraint associated with generators on the distribution system has not become critical, it is expected to become so. When this occurs, it is likely there will be a considerably increase in system O&M costs. Since

government policy has changed since the FIT and mFIT programs were operating, it is not known when this will be a significant impactor to O&M costs.

Tree trimming costs continue to climb as trees in ENWIN's territory continue to grow larger and are more difficult to maintain. Additionally, the City of Windsor has had a practise of closing alleys and selling the parcels off to adjacent homeowners. This entices homeowners to grow trees and occasionally place structures on reserved easements on these closed alleys. This contributes to cost increases for obtaining access and for maintaining clearances.

ENWIN contracts tree trimming on a 3-year contract. The current contract will end in 2020 and it is expected that tree trimming costs will increase at that time for the 2021 – 2023 years.

Inspections of distribution plant have become more detailed as regulators require more data and require utilities to become more data driven, again putting upward pressure on O&M costs. The regulatory burden for reporting has also increased substantially since ENWIN last filed a CoS application in 2008. These filings require people to collect, manage, scrutinize, report and audit on an increasing number of measures, all of which puts upward pressure on O&M costs. This driver places upward pressure on system O&M costs whenever a new reporting or other requirement is proposed.

Cyber risk continues to increase world-wide, and regulators have imposed mandatory cyber security requirements to which utilities must comply. As cyber threats become more sophisticated, so too must the measures taken to prevent them. The increasingly complex cyber threat counter-measures are adding upward pressure to ENWIN's O&M costs. It is expected that cyber security will continue to increase in cost, year over year at a pace which exceeds inflationary rates of increase.

Finally, the labour pool at ENWIN and other utilities is aging and being replaced by new apprentices. As workers age, their levels of absences due to illness grows, resulting in more non-productive O&M time through direct illness absences and sometimes through work accommodations. As new replacement workers enter the workplace, their requirements for training increase O&M costs. ENWIN hired a complement of apprentices in 2010, and has hired apprentices thereafter to replace retiring workers. Retirements are expected to continue through the Forecast Period and then plateau thereafter, as most "baby-boomer" employees will have retired by that point in time.

Drivers Decreasing System O&M Costs

There are a number of factors which put upward pressure on O&M costs that are not attributable to simple inflation. ENWIN does not track the individual effect of the factors. However, it is evident that pressures exist to increase system operating and maintenance costs since ENWIN's last CoS application. These pressures are mitigated by a number of things including ENWIN's efforts to more efficiently manage the operating and maintenance work. This includes using students and apprentices for pole inspections, implementing mobile applications for data collections and using drones for aerial inspections.

Appendix 2-AB shows the history of system O&M expenses and shows a reduction in O&M expenses from 2009 to 2016 with a marked increase in 2017. One of the reasons for reductions in O&M through the early period was that ENWIN was completing its elimination of the 4 kV distribution system. As 4 kV feeders were converted to 27.6 kV feeders, the 4 kV substations were shut down. This significantly reduced the O&M associated with the maintenance of those stations.

As time progressed, ENWIN has been decommissioning, cleaning up and selling those substation properties and thereby eliminating the remaining O&M costs for things such as building maintenance, lawn care and snow removal. All 4 kV substations have been decommissioned and there are only a few left which are in various stages of being prepared for sale. It is expected that all 4 kV substations will be sold and, hence, all system O&M expenditures for their maintenance will be ended by June 2021.

Historically, capital investments have created significant reductions in reactive maintenance work, largely due to the "system hardening" attributable to replacing old, weaker assets with new ones. While expenses relating to inspections do not decrease with capital investment, capital investment enables the distribution system to withstand external factors associated with weather, animals and ordinary time related degradation in the asset's ability to serve its intended function; hence, reducing reactive maintenance costs. While these investments will reduce reactive maintenance costs, ENWIN is in a "steady-state" mode where reactive maintenance work costs are relatively static save for inflationary increases.

In contrast, where it is necessary to open and close switches to operate the distribution system and change its configuration, the availability of remote operable switches and devices will eliminate the need for a truck roll and will put downward pressure on O&M costs. Similarly, in the event of an outage, FCIs will direct field staff to the location where the fault is most likely to have occurred. This will not only reduce O&M costs to search for faults but will result in shorter outage times and improved reliability for customers. While truck roll O&M costs will be reduced because of these investments, the investments were made to improve service to customers and any reduction in truck roll O&M costs would be a minor savings.

Summary

The future trend for system O&M expenses is expected to increase as grid automation increases, and the gaps in the smart metering portfolio are filled in and will drive communication costs upward. Additionally, as more generation is added to the distribution system, there will be a corresponding increase in the complication of operating the system, and an increase in the use of overtime labour to accommodate generators with a corresponding increase in O&M expenses. Moreover, there will be inflationary increases in operating costs. These cost drivers are in play now, and many of the efficiencies that have offset past increases in O&M expenses have already been delivered. Thus, it is expected that O&M cost increases will rise at a modest rate, starting immediately.

Finally, to the extent that capital investment increases the size of the distribution grid, the costs for maintaining that grid will naturally increase.

5.4.3.1 (c) Primary Drivers Associated With Each Investment Category

Table 149 below summarizes the primary drivers and corresponding project types for each investment category over the Forecast Period.

System Access investments are expansions and modifications (including asset relocation) to ENWIN's distribution system which ENWIN is obligated to perform to provide a customer (including a generator customer) or group of customers with access to electricity services via the distribution system. Investment in this category is largely in response to customer service requests for new connections and system expansions to accommodate these connections.

System Access expenditures for new services has varied over the period. In 2008, there was a recession which significantly adversely affected the number of new connections in Windsor, which hit an all-time low in 2009 and only recovered around 2016. New services appear to be again flattening out.

Relocations are required based on third-party infrastructure development requirements including the City of Windsor, WDBA, DIBC, the MTO and individual property developers. Since 2011, the ENWIN service territory has been impacted by the largest federal infrastructure program the country has ever seen – the building of the Parkway, a link between Hwy 401 and the GHIB. The GHIB relocations project will be largely complete during the Forecast Period; however, the Ambassador Bridge project is expected to start during this period. Both projects are net zero investments for ENWIN.

City roadwork projects have been "lumpy" over the Historical Period, and have varied depending on the City's budget for roadwork projects. In the Forecast Period, the City has a number of large, continuing projects.

As an aggregate, System Access spending is forecasted to be higher for 2019 and 2020 due to the GHIB and Ambassador Bridge projects, and the consequent plant relocations required. It is relatively stable over the remainder of the Forecast Period due to a steady customer growth predicted.

System Renewal investments involve replacing and/or refurbishing system assets to extend the original service life of the assets and thereby maintain the ability of ENWIN's distribution system to provide customers with electricity services. The primary driver for investments in this category is assets at the end of their service life based on the ACA. Where feasible, replacements are planned in common geographic areas as overhead or underground rebuilds to save costs. Other distribution system investments in the System Renewal category are

generally spot replacement where individual assets are replaced (often “like for like”). Meter replacements and MTS EOL equipment replacements are included under this category.

System Service investments are modifications to ENWIN’s distribution system to ensure the distribution system continues to meet ENWIN’s operational objectives while addressing anticipated future customer electricity service requirements. System Service investments are also undertaken to improve the reliability, resilience and flexibility of the distribution system in order to provide customers with more reliable service. Customers have identified during the Customer Engagement that they are willing to pay marginally more to obtain improved service. They are also clear that they do not want any deterioration of the current level of reliability.

Customers are increasingly intolerant of significant outages. Windsor has experienced back-to-back “100-Year” storms in 2016 and 2017, which caused widespread basement flooding and many customers have had their flood insurance cancelled. A customer group met with ENWIN to express the need for reliable service in order to keep their sump pumps running during periods of heavy rain. In many cases, a System Service grid improvement is the most effective means of ensuring the reliability of the distribution system. The primary driver in this investment category is reliability, with investments planned to facilitate enhanced switching, enhanced fault detection and feeder improvements.

Additionally, another driver is to change ENWIN’s distribution system to operate in 3 sections rather than the traditional 2 sections. This means that feeders can be loaded to a normal 450 A rather than a normal 300 A with provision of any feeder to carry 600 A in a contingency situation. This means that not only will ENWIN be able to reduce the number of customers affected by an outage, but ENWIN is also able to make greater use of the existing distribution system without needing to add additional feeders to satisfy loads. To achieve this, System Service sectionalizing devices with feeder ties have been built at a lower cost than would have been required to provide additional feeders and stations. This driver will diminish during the Forecast Period for the DSP as the desired system will be largely achieved in 2020.

General Plant investments are modifications, replacements or additions to ENWIN’s assets that are not part of the distribution system. Investments into non-system physical plant are primarily structures and depreciable improvements. Investments into office equipment and furniture, information technology, vehicles, and tools and equipment are made to support day-to-day business operations and improve operational efficiency. Drivers for General Plant investments can be replacement of EOL assets, improvements to assets, regulatory requirements (i.e. billing system modifications for smart meters) and customer requirements.

Customer requirements include items such as billing system modifications to provide access to customer metering information, outage maps, electronic billing, etc. Drivers of General Plant are expected to continue at their current pace or higher as increasing reliance is made on digital information and system simulations. Additionally, mobile applications for field staff and for customers is an area that is just developing at ENWIN and is an area that promises long term efficiency and increased service to customers.

Table 149 Primary Drivers for Each Project Type

Category	Primary Drivers	Project Types
System Access	Customer service requests	. New customer connections . Expansions for customer connections or property developments
	Third-party infrastructure development	. City's road widening . WDBA and DIBC relocations
	Mandate services obligations	. Metering
System Renewal	Assets/asset systems at end of service life	. Pole replacements . Transformer replacements . Cable Replacements . Switchgear replacements . Manhole rebuild program . Reactive equipment replacements . Meter replacements . MTS equipment replacements
System Service	Reliability	. Conductor upgrades . Feeder ring project . Feeder reliability improvements . Feeder ties program . Radial branch backups . Sectionalizing load break switches program . SCADA improvements
General Plant	Non-system physical plant	. Buildings consolidation . Office equipment and furniture . Information Technology . Vehicles . Tools and equipment

Local Drivers

Windsor has traditionally had a strong manufacturing base that requires a reliable supply of power. Manufacturing plants are increasingly automated and even minor power quality issues can cause entire plants to shut down for hours with hundreds of thousands of dollars' worth of product lost.

ENWIN meets regularly with its industrial customers and understands that these plants are constantly compared to other plants in North America. These plants are fighting for their

survival in Windsor and have repeatedly stated their need for reliable power. In turn, the City of Windsor needs the jobs that these plants provide. In fact, 16 of ENWIN's 45 distribution feeders serve 18 industrial customers (excluding the automotive plant customers), which ENWIN classifies as "sensitive", meaning that they will suffer severe economic impact and/or production loss if their electrical service suffers even a "momentary" interruption. These customers "feel" faults on adjacent feeders and have reported plant shutdowns to ENWIN despite there not being a bona fide power quality event or reportable outage on their feeders.

Several customers are aware that they are served from a shared TS and have expressed concern that the long rural feeders on the TSs shared with neighbouring, rural utilities, present a larger footprint and greater likelihood of an event which may interrupt their plant. In addition, ENWIN serves 26 other customers that are considered "sensitive" because of their sensitivity to power quality and their importance to the community. ENWIN serves these customers on 21 feeders, 15 of which are unique and not part of the 16 feeders with sensitive industrial customers.

In total, 31 of ENWIN's 45 feeders directly serve "sensitive" customers, and all of ENWIN's supply stations have "sensitive" customers connected to them. ENWIN regularly converses with these customers; they have all expressed concerns about being able to be competitive in their markets and have noted electrical system reliability among their significant concerns. Power quality is expected to continue to be a driver for investment for ENWIN as customers make more reliance on electric power. The adoption of EVs will put additional pressure on utilities including ENWIN to provide reliable service as customers do not want to wake up in the morning to find they are unable to get to work because their EV did not get a full charge.

ENWIN also hears from its residential customers about cancelled flood insurance and the customers' need for reliable power during storm conditions so that their basement sump pumps continue to keep their basements dry. Windsor is located in Canada's highest isokeraunic (lightning) zone and has a primarily overhead distribution infrastructure. These conditions create challenges for ENWIN to maintain reliable electric service to its customers. ENWIN takes seriously its responsibility to provide reliable power, but is also careful to try to balance customers' desire for reliable power with their desire for reasonable rates.

This driver has been growing in importance recent years with basement flooding being a major election issue in the 2018 elections. This was made clear by customers who attended City councillor open houses which ENWIN attends to provide customers another means by which to engage and advise of their concerns. Further discussion on how customer engagement influenced the capital expenditure plan is covered in 5.4 (a) of this DSP.

ENWIN's electrical distribution infrastructure is an aged infrastructure. The City of Windsor has not experienced the same level of growth as communities in other areas of the Province. Consequently, and in comparison, ENWIN has relatively older, overhead distribution infrastructure, which ENWIN has been working to renew over an extended period of time. As a result, ENWIN has been able to maintain a relatively consistent capital spend aimed at renewing its infrastructure as it reaches EOL. In addition, ENWIN's consistent past attention to

infrastructure renewal has meant that ENWIN has been able to manage its capital renewal expenditures with only modest cost increases, which it has mitigated as much as possible through efficiencies. This long-term approach has contributed to ENWIN's ability to minimize cost increases while providing reasonable reliability. ENWIN's expectation is that aging infrastructure will be a consistent, steady driver over the Forecast Period, as ENWIN has been steadily investing in its infrastructure and does not face a coming "bow wave" of investment.

One of the means by which ENWIN is able to maintain reasonable reliability is through system automation. Automation includes automation of both the distribution system and of internal processes using new tools such as GIS and Mobile work management and dispatch. The drive to automate ENWIN's distribution system will decrease through the Forecast Period, as ENWIN has nearly completed the planned automation investments.

Windsor is located in one of the sunniest areas of the Province; consequently, there is significant customer interest in undertaking renewable energy generation projects in conjunction with the Province's programs. As of July 2018, ENWIN has connected 800 generators to the grid with over 47 MW connected. It is expected that interest in renewable energy will continue in ENWIN's service territory, and ENWIN will need to consider installing a reactor at Walker 2 TS in the Forecast Period.

Connection of DER is expected to be a continuing driver affecting ENWIN's capital investments. While this driver is significantly influenced by Provincial policy on incentives in the sector, expected decreases in solar panel costs is expected to drive solar connections. The structure of the Class A Global Adjustment charges will also affect investments needed to connect additional generation. While ENWIN's investment in a reactor at Walker 2 TS is conditional upon realization of need, CHP behind the meter generation is expected to be an on-going and significant driver of investment. Further discussion of this driver is in section 5.3 (c) of this DSP.

5.4.3.1 (d) System Capability Assessment

The capacity of the ENWIN distribution grid to serve both load and generation customers is discussed in sections 5.3.2 (d) and 5.3.4 respectively. While ENWIN's distribution territory is finite and much of that territory is already developed, there is still some room for growth. ENWIN expects load growth on its distribution system to be manifest through customer requests for new connections. As such, ENWIN has forecast the need for investment in the System Access expenditure category.

ENWIN has not invested to serve new growth on a speculative basis, but relies on customer requests for service. At present, there are no systemic investments forecast that would be required to serve growth. The ENWIN distribution system has capacity to serve, and System Access investments are forecast only for line extensions and connection assets to serve new customer requests.

While ENWIN has capability to serve forecast load, ENWIN has identified investments that would make serving that load more reliable. Section 5.4 (b) discusses the need to facilitate the movement of power from station to station, thereby increasing the reliability of supply. ENWIN has identified certain feeders and routes for interstation power transfers. ENWIN generally plans to build these feeders when an opportunity arises to undertake the construction in conjunction with another driver such as a road widening project or pole renewal for condition.

Section 5.3.4 discusses the capability of the ENWIN distribution system and the TSs that supply it to serve new generation connections. In the case of new generation connections, the typical limiting factor for connection of generators is the capability of the distribution system and the TSs to accept incremental fault current contributions from connecting generators.

The new provincial government has cancelled pending FIT and mFIT connections and directed the IESO to cease incenting CHP generators as of July 2018. Consequently, ENWIN has seen a marked reduction in applications for generator connections. As discussed in section 5.3.4, there is a significant difference in fault current contribution depending on the class of generator with synchronous generators pushing 5 times the fault current per unit of generation capacity than inverter type generators.

ENWIN's distribution system generally has capacity to connect generation. Where a prospective generator is limited in its ability to connect because that generator would provide more than 50% of the minimum load of the feeder, ENWIN will generally try to reconfigure its distribution feeder. Connecting nearby sections from other feeders and thereby adding load to the feeder avoids the prospective generator from having to pay for an expensive transfer trip.

ENWIN has a project in 2020 to pilot a point-to-multipoint transfer trip scheme in its System Service investment category. This pilot project, if successful, will provide a much more cost effective methodology for generators needing transfer trip thus allowing generators to pursue their projects.

It is difficult to forecast what the change in government policy will have on generator applications. Many of ENWIN's larger customers are investigating battery storage options and those installations can appear as a generator to the distribution system. The limiting factor in connecting a generator can be the TSs ability to accept incremental fault current contribution from the generator. In the case of a HONI station that is at its fault current limit, it would be HONI's responsibility to install a reactor that would limit the station fault current.

ENWIN's Walker 2 TS has capacity to connect generation. However, the amount of the available capacity may be consumed in a single synchronous generator application. ENWIN has identified in its System Service investment forecast for the Forecast Period, an expenditure to put a reactor in the Walker 2 TS. The reactor expenditure is planned to be spread over a number of years (2022 and beyond) in order to balance expenditures year over year. The need and timing of the expenditure will be subject to actual requests and commitments from generators for the prospective connections.

Thus, the ENWIN distribution system has current capacity to connect both new load and generation. Requests are individually reviewed at the time of application and the trends for requests are monitored so that any prospective constraints can be identified and plans made to mitigate the constraints.

ENWIN does not allocate an arbitrary quantum of investment to each of the four investment categories but determines the investment potential on the basis of historical projections and any known regulatory or legislative requirements (i.e. smart meters) for System Access investments, and the merits of the individual investments for the other expenditure categories.

Potential System Renewal expenditures are determined through the asset management system, and potential System Service expenditures are identified through analysis of system operations and reliability experiences. Potential General Plant expenditures are identified through the examination of a combination of historical expenditures, EOL replacements, potential service improvements for customers (i.e. outage map) and any regulatory requirements (i.e. cyber security).

The quantum of the capital investment program is generally targeted to ensure that System Access investments can be accommodated and System Renewal investments are sufficient to ensure delivery of power to customers with the same degree of reliability that customers have come to expect. Mandatory and renewal General Plant investments are also considered with a similar priority to System Access and System Renewal investments.

Within all the investment categories, there are always many more investment opportunities than the investment window afforded by approved rates is sufficient to accommodate. While ENWIN tries to maintain a consistent level of planned system investment in order to minimize effects on rates, there are occasions where the capital investment level has needed to spike upwards to accommodate mandatory investments such as the smart meter implementation and the CIS upgrade to accommodate time of use billing.

Within the established investment window, the merits of each investment project is considered and gauged using the PROSORT tool to rank investments on the basis of the value, such as risk reduction, they provide to customers per investment dollar. After consideration of dependencies and other synergies that different projects and programs may have, the investment plans for the year are established within that investment window.

5.4.3.2 Material investments

The focus of this section is on projects/programs that meet the materiality threshold set out in Chapter 2 of the Filing Requirements for Electricity Distribution Rate Applications. However, distributors are encouraged in all instances to consider the applicability of these requirements to ensure that all investments proposed for recovery in rates, including those deemed by the applicant to be distinct for any other reason (e.g. unique characteristics; marked divergence from previous trend) are supported by evidence that enables the OEB's assessment according to the evaluation criteria set out below. The level of detail filed by a distributor to support a given investment project/program should be proportional to the materiality of the investment.

5.4.3.2 Material Investments

ENWIN has developed a capital investment plan and detailed descriptions of the material plans for the Test Year are presented in *Appendix F – Material Investment Summaries*. In addition to this, ENWIN has assessed those plans through its PROSORT project prioritization tool that was described in section 5.4.1 (b). The PROSORT tool determines a relative Change in Risk Benefit Factor ("CRBF") which is the cost of the project divided by the change in risk benefit. PROSORT ranks project lowest to highest cost for a change in risks and benefits. Thus, by ranking projects, the projects that provide the least cost per unit change in risks and benefits are ranked highest as they provide the best value proposition for Customers.

Where projects are mandatory, such as most System Access expenditures, those projects are arbitrarily assigned a CRBF score of "1" which will place them at the top of the priority list as the utility must undertake these projects as a condition of license, regulatory directive, contractual commitment, etc. Additionally, ENWIN identifies certain budget line items as "reactive replacements". These reactive replacements are "break-fix" investments which are necessary in order to restore service to existing customers, such as after a storm. These investments are also categorized by ENWIN as mandatory, highest priority expenditures. They are System Renewal Expenditures and are generally budgeted based on historical expenditures in this class of expenditure. These investments too are arbitrarily assigned a CRBF of "1".

There are classes of investment which are similar yet have unique budget line items, such as for tools or vehicles. In these cases, the total expenditure for the class of investment was entered into PROSORT and a CRBF value obtained for the whole class of expenditure and the CRBF value is applied to all line items. Additionally for some smaller investments (i.e. Engineering Power Quality - $5,000) an arbitrary value of 100,000 was applied as that line item CRBF. These items are pre-judged to be of lesser importance than other line items and are arbitrarily assigned a CRBF value that will put them at the bottom of the PROSORT priority list.

The PROSORT capital investment priority list is shown below in Table 150. The list includes $1,600k for vehicle purchases. Those vehicle purchases are not included in schedule 2-AB. The list below, less the vehicle purchases, after allowances for rounding, matches the planned capital expenditures shown in Schedule 2-AB ($18,346k).

Table 150 PROSPORT Capital Investment Priority List

2020 Capital Investment by Priority List						
Project Number	2020 Capital Investment Description	Capital Investment Category	Capital Investment $ '000	Capital Contribution $ '000	PROSORT Priority $/CRBF	Cumulative Investment $ '000
1	O/H Customer Connections	System Access	535	(165)	1	370
2	U/G Customer Connections	System Access	525	(335)	1	560
3	Bridge Plaza Relocation	System Access	1,000	(1,000)	1	560
4	Ambassador Bridge Twin Span	System Access	1,000	(1,000)	1	560
5	Road Widening Projects (City Driven Specifics)	System Access	1,090	(260)	1	1,390
6	Riverside Vista Project (City Driven Specifics)	System Access	1,150	(370)	1	2,170
7	Wholesale Metering: Keith TS Feeders	System Access	475	(120)	1	2,525
8	Meter work - new customers (enhancement)	System Access	415		1	2,940
9	Meter work - end of life (sustainment)	System Renewal	35		1	2,975
10	Meter Population Replacement / Upgrade (MIST Meters)	System Access	515		1	3,490
11	Reactive Replacement of Failed Equipment (U/G, O/H)	System Renewal	180		1	3,670
12	Reactive Replacement of Failed Cable	System Renewal	90		1	3,760
13	Reactive Replacement of Transformers	System Renewal	245		1	4,005
14	Reactive Pole Replacement	System Renewal	50		1	4,055
15	Reactive Pole Pulling	System Renewal	50		1	4,105
16	Reactive Hardware Replacement Program	System Renewal	100		1	4,205
17	Reactive Manhole/Vault Rehabilitation	System Renewal	20		1	4,225
18	Retest Smart Meters	System Renewal	145		1	4,370
19	Miscellaneous TS Equipment, EOL Replacement - Reactive	System Renewal	75		1	4,445
20	Weld / Meter Shop / Stores / Garage Misc Site - Reactive	General Plant	75		1	4,520
21	Pole Sustaining Program	System Renewal	3,300		155	7,820
22	Manhole Rebuild Program	System Renewal	150		685	7,970
23	Submersible Sustainment Program	System Renewal	690		790	8,660
24	O/H 3-Phase Transformer Sustainment	System Renewal	110		1,444	8,770
25	Removal of PMH-4 & PMH-Specials	System Renewal	25		1,634	8,795
26	UG PadMount Sustaining Program	System Renewal	255		1,737	9,050
27	Switching Unit Sustaining Program	System Renewal	300		2,206	9,350
28	Radial Branch Backups (23M2 - Single Phase)	System Renewal	35		2,271	9,385
29	Sectionalizing Load Break Switches	System Service	150		2,395	9,535
30	Feeder Tie	System Service	115		3,063	9,650
31	Automating Underground Switching Units	System Service	550		3,378	10,200
32	Green Energy Plan/Walker 2 Reactors - Transfer trip pilot	System Service	200		7,380	10,400
33	Radial Branch Backups (55M1)	System Service	125		7,886	10,525
34	Meter Tank Replacement	System Renewal	110		8,593	10,635
35	Underground Cable Sustainment (Sub Division)	System Renewal	510		9,910	11,145
36	Customer SU Vault Sustainment	System Renewal	400		13,245	11,545
37	Walker Road-Foster to Airport Rd	System Renewal	750		14,778	12,295
38	Conductor Upgrade (23M2 LPT1)	System Service	350		15,338	12,645
39	Vacuum Switch Replacements	System Renewal	200		16,216	12,845
40	CPP Switch Controller Replacements	System Renewal	100		16,216	12,945
41	Conductor Upgrade (55M21 LPT1)	System Service	180		20,013	13,125
42	SCADA Misc Sustaining	System Renewal	45		20,419	13,170
43	SCADA communications Equipment	System Service	150		20,419	13,320
45	Life Cycle Upgrades	General Plant	500		21,917	13,820
46	GIS Evolution and Integration	General Plant	210		26,333	14,030
47	SAP Evolution	General Plant	100		26,333	14,130
48	Network Infrastructure Update and Cyber Security	General Plant	100		26,333	14,230
49	Customer Relationship, Billing and IVR	General Plant	240		26,333	14,470
50	Strategic Enhancements and Tools	General Plant	230		26,333	14,700
51	Feeder Reliability Improvement Project - Prince to Brock	System Service	1,200		26,351	15,900
52	25M7 Feeder Ring Project	System Service	380		29,921	16,280
53	Site Rhodes	General Plant	1,520		30,089	17,800
54	Hydro Operations Vehicles	General Plant	1,280		76,794	19,080
55	Hydro Metering Vehicles	General Plant	95		76,794	19,175
56	Hydro Engineering Vehicles	General Plant	70		76,794	19,245
57	Site Rhodes Vehicles	General Plant	120		76,794	19,365
58	Mail Room Vehicles	General Plant	35		76,794	19,400
59	SCADA FCI's	System Service	70		84,948	19,470
60	Operations Tools	General Plant	85		84,948	19,555
61	Engineering Tools	General Plant	5		84,948	19,560
62	Meter Shop Tools	General Plant	5		84,948	19,565
63	Records Management System	General Plant	330		92,222	19,895
64	Feeder Balancing	System Service	50		100,000	19,945
65	Engineering Power Quality	System Service	5		100,000	19,950

Appendix A – Kinectrics Asset Condition Assessment by Kinetrics Inc.

ENWIN UTILITIES
2017 ASSET CONDITION ASSESSMENT

Kinectrics Report: K-814066-RA-0001-R00

April 4, 2018

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without authority of client.
Kinectrics Inc.
800 Kipling Avenue
Toronto, ON
M8Z 6C4 Canada
www.kinectrics.com

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ENWIN UTILITIES
2017 ASSET CONDITION ASSESSMENT

Kinectrics Report: K-814066-RA-0001-R00

April 4, 2018

Prepared by:

Fan Wang Ph. D. P. Eng.
Senior Engineer/Scientist

Reviewed by:

Katrina Lotho B. ESc. B. Sc. P. Eng.
Senior Engineer/Scientist

Approved by:

Yury Tsimberg M. Eng. P. Eng.
Director – Asset Management

Dated: 2018-04-04

To: EnWin Utilities
4545 Rhodes Drive
Windsor, ON N9A 5T7

EXECUTIVE SUMMARY

In 2017 EnWin Utilities (EnWin) determined a need to perform a condition assessment of its key distribution assets. EnWin selected and engaged Kinectrics Inc. (Kinectrics) to assist with this work. This report presents the results of the 2017 Asset Condition Assessment (ACA) study.

Asset Categories Considered

The 2017 ACA considers 16 asset categories (or 24 asset groups when accounting for asset sub-categories) as follows:

- Power Transformers (Main Tank/LTC)
- Station Service Transformers
- Grounding Transformers
- Instrument Transformers
- Station Breakers (Stand Alone/Switchgear)
- Station Switches
- Relays
- Station PLCs
- Station Batteries
- Reclosers
- Overhead Switches (Manual/Remote)
- Poles (Wood/Concrete)
- Distribution Transformers (Pole 1-Ph/Pole 3-Ph/Pad 1-Ph/Pad 3-Ph/Submersible)
- Pad Mounted Swtichgear
- Primary Underground Cables
- Manholes

For each asset category, available data was assessed, the Health Index distribution was determined, and a condition-based Flagged for Action plan was developed.

For some of these asset groups, such as power transformers, station service transformers, grounding transformers, station breakers, station switches and station batteries, an individual asset unit must be replaced before it fails. Accordingly, a risk-based prioritized list was developed for each of these asset groups to indicate the projected 'flagged for action' year for each individual asset unit. A 'flagged for action' year is the year in which the asset unit is expected to require some form of attention. Such attention however does not necessarily mean replacement. Depending on the practical situation in a utility, there are other options that might apply, including refurbishment, continuous monitoring or no action.

Overall Health Index Distribution

An overwhelming majority of the 25 sub-categories were found to have over 70% of their asset units classified as being in "good" or "very good" condition, and most of the asset sub-categories were found to have an average Health Index score of greater than 80%.

With respect to the asset categories of concern, Station PLCs and Distribution Transformers (Submersible) had the highest percentages of units in "poor" to "very poor" condition, both having almost 40% of units classified as "poor" or "very poor".

Flagged for Action Plans

In general, the flagged for action plans for all 25 asset sub-categories show a smooth variation throughout the years.

In the short term, it was determined that Power Transformers (including both the main transformer tank and the Load Tap Changer) had the highest percentages of units flagged for action in first year, followed by Station Breakers (switchgear type) and Pad Mounted Switchgear. All these categories were found to have a substantial backlog, exceeding 10% of their population.

Furthermore, within the next 10 years, about half or more of the Pad Mounted Switchgear, Station PLCs, Manholes, Overhead Switches (manual type) and Primary Underground Cables are expected to require some action to be taken to address their condition.

Actual replacement plans may only reflect a subset of the Flagged for Action plans as replacement plans will be determined by EnWin following its review and based on application of EnWin's maintenance and replacement strategies.

Data Availability

The asset groups of Power Transformers and Station Breakers as well as the asset groups outside stations had relatively complete data sets. Primary Underground Cables and the other asset groups inside stations (the ones for service, metering, protection and control and power supply) had age information only.

Historic removal information was available for the asset groups that are outside stations and installed either overhead or underground, thus allowing build-up of their specific degradation curves.

Recommendations

For the purpose of enhancing future ACA studies, it is recommended that EnWin improve data by collecting:

- More age information for asset units of Station Switches, Overhead Switches (remote type) and Manholes;

- Historic records of asset removal for the asset groups that are underground, and all the asset groups within stations;

- Corrective maintenance records and inspection records, mainly for overhead and underground asset groups, as well as all the asset groups inside the stations;

- Values of bushing power dissipation factor tests with temperature correction for Power Transformers and Station Breakers;

- Manufacturer specification limits for contact resistance and operation cycles for Station Breakers;

- Operation cycle counts, for both the normal operation and fault interruption for Station Breakers; and

- Fault records for UG Cables on segment level.

The results presented in this study are based solely on asset condition as determined by available data. Note that there are numerous other considerations that may influence EnWin's planning process. Among these are obsolescence, system growth, corporate priorities, technological advancements, etc.

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DEFINITIONS

Terminology	Acronym	Definition
Age Limiter	AL	The final HI assigned to an individual asset may also be limited by the asset's age. The AL is generally equal to the cumulative survival probability at a given age of an asset group. If the calculated HI is less than or equal to the AL, the final HI assigned is the calculated HI. Otherwise, the final HI assigned is equal to the AL.
Asset Condition Assessment	ACA	Process of using asset information to determine the condition of assets. Condition data can include nameplate information, test results, asset inspection records, corrective maintenance records, operational experience, etc.
Condition Parameters	CP	Asset characteristics or properties that are used to derive the HI.
Condition Parameter Score	CPS	Score of an asset for a particular condition parameter. In this study, the scoring system used ranges from 0 through 4 (0 = worst; 4 = best).
Criticality		Metric used to quantify consequence of failure in this methodology.
Criticality Index	CI	Index used to determine asset Criticality. CI ranges from 0% to 100%, with 100% representing the unit with the highest possible consequence of failure.
Cumulative Distribution Function	CDF	Cumulative distribution function. Assumed in this methodology as the Weibull function representing the cumulative likelihood of removals.

Terminology	Acronym	Definition
Data Availability Indicator	DAI	A measure of the amount of condition parameter data that an asset has, as measured against the full data sets that are practically available and included in the HI formula. It is determined by the weighted ratio of the condition parameters availability of an individual unit, over the maximum condition parameters availability of an asset group.
Data Gap		A data gap is the case where none of the units in an asset group has data for a particular item as requested by "ideal" data sets. A data gap means the data is either unavailable or not in a useable format.
De-rating Multiplier	DR	Multipliers used to adjust a condition or sub-condition parameter score or calculated Health Index so as to reflect certain conditions.
Flagged for Action Plan	FFA Plan	Number of units that are expected to require attention annually.
Flagged for Action Year	FFA Year	The year that a particular unit is flagged for action.
Health Index	HI	Health Indexing quantifies equipment condition based on numerous condition parameters that are related to the factors that cumulatively lead to an asset's end of life. HI is given in terms of a percentage range of 0%-100%, with 100% representing as new condition.
Probability Density Function	PDF	Probability density function. Assumed in this methodology as the Weibull function representing the likelihood that an asset will be removed from service when its age is within a particular range.
Removal Rate		Weibull hazard function. Assumed in this methodology as the rate of removal (removals per year for given age, including failures, proactively replaced, removal for non-condition reasons).
Risk		Product of likelihood of removal and consequence of failure.
Sample Size		Subset of an asset population with enough data (i.e. age or condition data) to calculate the HI.

Terminology	Acronym	Definition
Sub-Condition Parameters	SCP	Asset characteristics or properties that are used to derive the HI. Each condition parameter can be comprised of multiple sub-condition parameters.
Sub-Condition Parameter Score	SCPS	Score of an asset for a particular sub condition parameter. In this study, the scoring system used ranges from 0 through 4 (0 = worst; 4 = best).
Weibull Distribution		Continuous function used, in this methodology to model, the removal rates of assets.
Weight of Condition Parameter	WCP	In the HI formula, condition parameters are assigned a weight that is based on t he degree of contribution or relevance to asset degradation.
Weight of Sub-Condition Parameter	WSCP	In the HI formula, condition parameters are assigned a weight that is based on t he degree of contribution or relevance to asset degradation.

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I INTRODUCTION

EnWin Utilities (EnWin) engaged Kinectrics Inc (Kinectrics) in 2017 to perform an Asset Condition Assessment (ACA) on selected distribution assets. An assessment produces a quantifiable evaluation of asset condition and also aids in prioritizing and allocating sustainment investments. This undertaking, if done continuously over time, would allow EnWin to monitor trends in the condition of its assets and to continuously improve its assessment process and asset management practices. This assessment covers EnWin's asset population as of May 2017 and presents results based on the available data.

I.1 Objective and Scope of Work

The categories and sub-categories of assets considered in this study are as follows:

Asset Category	
Power Transformers	Main Tank
	LTC
	Combined
Station Service Transformers	-
Grounding Transformers	-
Instrument Transformers	-
Station Breakers	Stand Alone
	Switchgear
Station Switches	-
Relays	-
Station PLCs	-
Station Batteries	-
Reclosers	-
Overhead Switches	Manual
	Remote
Poles	Wood
	Concrete
Distribution Transformers	Pole 1-Ph
	Pole 3-Ph
	Pad 1-Ph
	Pad 3-Ph
	Submersible
Pad Mounted Switchgear	-
Primary Underground Cables	-
Manholes	-

I.2 **Deliverables**

The deliverable in this study is a Report that includes:

- A description of the Asset Condition Assessment methodology
- For each asset category,
    - Health Index formulation
    - Age distribution
    - Health Index distribution
    - Condition-based Flagged For Action Plan
    - Prioritized risk based list of proactively maintained asset groups
    - Assessment of data availability and a Data Gap analysis
- For asset categories where replacement of individual asset units before failure is required,
    - Prioritized risk-based lists

II ASSET CONDITION ASSESSMENT METHODOLOGY

The Asset Condition Assessment (ACA) Methodology involves the process of determining asset Health Index, as well as developing a condition-based Flagged for Action Plan for each asset group. The methods used are described in the subsequent sections.

II.1 Health Index

Health Indexing quantifies equipment condition based on numerous condition parameters that are related to the degradation factors that lead to an asset's end of service life. The Health Index is an indicator of the asset's overall health and is typically given in terms of percentage, with 100% representing an asset in brand new condition. Health Indexing provides a measure of long-term degradation and thus differs from defect management, whose objective is finding defects and deficiencies that need correction or remediation in order to keep an asset operating prior to reaching its end of life.

Condition parameters are the asset characteristics or properties that are used to derive the Health Index. A condition parameter may be comprised of several sub-condition parameters. For example, a parameter called "Oil Quality" may be a composite of parameters such as "Moisture", "Acid", "Interfacial Tension", "Dielectric Strength" and "Colour".

In formulating a Health Index, condition parameters are ranked, through the assignment of *weights*, based on their contribution to asset degradation. The *condition parameter score* for a particular parameter is a numeric evaluation of an asset with respect to that parameter.

Health Index (HI), which is a function of scores and weightings, is therefore given by:

$$HI = \frac{\sum_{m=1}^{\forall m} \alpha_m (CPS_m \times WCP_m)}{\sum_{m=1}^{\forall m} \alpha_m (CPS_{m.\max} \times WCP_m)} \times DR$$

Equation 1

where

$$CPS = \frac{\sum_{n=1}^{\forall n} \beta_n (CPF_n \times WSCP_n)}{\sum_{n=1}^{\forall n} \beta_n (WSCP_n)}$$

Equation 2

CPS	Condition Parameter Score
WCP	Weight of Condition Parameter
α_m	Data availability coefficient (1 if available; 0 if not available)
CPF	Sub-Condition Parameter Score
WSCP	Weight of Sub-Condition Parameter
β_n	Data availability coefficient for sub-condition parameter (1 if available; 0 if not available)
DR	De-Rating Multiplier

The scale that is used to determine an asset's score for a particular parameter is called the *condition criteria*. For this project, a condition criteria scoring system of 0 through 4 is used. A score of 0 represents the worst score while 4 represents the best score. I.e. $CPF_{max} = 4$.
De-Rating multipliers are applied to the calculated HI. These may be used to represent the impact of non-condition issues such as design or operating environment.

II.1.1 Health Index Results

As stated previously, an asset's Health Index is given as a percentage, with 100% representing "as new" condition. The Health Index is calculated only if there is sufficient condition data. The subset of the population with sufficient data is called the *sample size*. Results are generally presented in terms of number of units and as a percentage of the sample size. If the sample size is sufficiently large and the units within the sample size are sufficiently random, the results may be extrapolated for the entire population.

The Health Index distribution given for each asset group illustrates the overall condition of the asset group. Further, the results are aggregated into five categories and the categorized distribution for each asset group is given. The Health Index categories are as follows:

Very Poor	Health Index < 25%
Poor	25 ≤ Health Index < 50%
Fair	50 ≤ Health Index <70%
Good	70 ≤ Health Index <85%
Very Good	Health Index ≥ 85%

Note that for critical asset groups, such as Power Transformers, the Health Index of each individual unit is given.

II.2 **Condition Based Flagged for Action Plan**

The condition based Flagged for Action Plan outlines the number of units that are expected to require attention in the next 20 years. The numbers of units are estimated using either a *proactive* or *reactive* approach. In the proactive approach, units are considered for action prior to failure, whereas the reactive approach is based on expected failures per year.

Both approaches consider asset removal rate and probability of failure. The removal rate is estimated using the method described in the subsequent section.

II.2.1 Removal Rate and Probability of Removal

Where removal rate data is not available, a frequency of removal that grows exponentially with age provides a good model.

Depending on its application, there have been various forms derived from the original equation. Based on Kinectrics' experience in removal rate studies of multiple power system asset groups, Kinectrics has selected the Weibull equation to model the removal curves. The Weibull function has no specific characteristic shape and, as such, can model the exponentially increasing removal rate using appropriate parameters.

The Weibull removal density function is defined as:

$$f(t) = \frac{\beta t^{\beta-1}}{\alpha^{\beta}} e^{-(\frac{t}{\alpha})^{\beta}}$$

Equation 3

f = removal rate per unit time
t = time
α, β = constant that control the scale and shape of the curve

Depending on its application, there have been various forms derived from the original equation. Based on Kinectrics' experience in removal rate studies of multiple power system asset groups, the following variation of the removal rate formula has been adopted:

The corresponding cumulative removal distribution is therefore:

$$Q(t) = 1 - R(t) = 1 - e^{-(\frac{t}{\alpha})^{\beta}}$$

Equation 4

Q(t) = cumulative failure distribution
R(t) = survival function

Finally, the removal rate function (i.e. hazard function) is then:

$$\lambda(t) = \frac{f(t)}{1 - Q(t)} = \frac{\beta t^{\beta-1}}{\alpha^{\beta}}$$

Equation 5

$\lambda(t)$ = hazard function (removals per year)

Different asset groups experience different removal rates and therefore different removal distributions. The parameters α and β are determine the shapes of these curves. For each asset group, the values of these constant parameters were selected to reflect typical useful lives for these assets.

Consider, for example, an asset class where at the ages of 40 and 75 the asset has cumulative probabilities of removal of 20% and 95% respectively. It follows that when using Equation 5, α and β are calculated as 57.503 and 4.132 respectively. The removal rate and probability of removal graphs for these parameters are as follows:

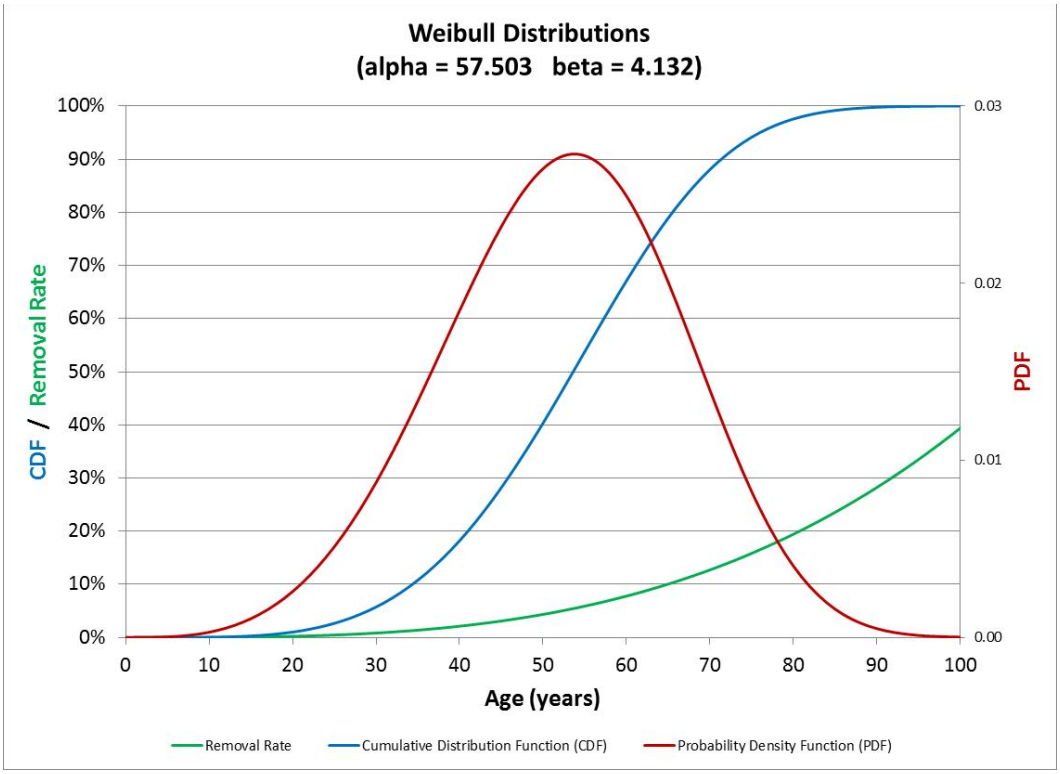

Figure 1 Removal rate vs. Age

II.2.2 Projected Flagged for Action Plan Using a Probabilistic Approach

For assets that have low consequences of failure or that are run to failure, a probabilistic approach is taken to estimate the number of units that are flagged for action in a given year.

For such asset types, the number of units expected to be replaced in a given year are determined based on the asset's removal rates. The number of failures per year is given by Equation 5.

An example of such a Flagged for Action Plan is as follows: Consider an asset distribution of 100 - 5 year old units, 20 – 10 year old units, and 50 - 20 year old units. Assume that the removal rates for 5, 10, and 20 year old units for this asset class are $\lambda_5 = 0.02$, $\lambda_{10} = 0.05$, $\lambda_{20} = 0.1$ failures / year respectively. In the current year, the total number of replacements is 100(.02) + 20(0.05) + 50(0.1) = 2 + 1 + 5 = 8.

In the following year, the expected asset distribution is, as a result, as follows: 8 – 1 year old units, 98 – 6 year old units, 19 – 11 year old units, and 45 - 21 year old units. The number of replacements in year 2 is therefore $8(\lambda_1) + 19(\lambda_6) + 45(\lambda_{11}) + 45(\lambda_{21})$.

Note that in this study the "age" used is in fact "effective age", or condition-based age if available, as opposed to the chronological age of the asset.

For the asset categories below, the probabilistic approach is used to estimate the FFA Plan. It is also important to note that the FFA gives the estimated number of assets per year that need to be addressed; the year that a specific unit needs to be addressed is not calculated.

- Instrument transformers
- Relays
- Station PLCss
- Reclosers
- Overhead switches
- Poles
- Distribution transformers
- Pad mounted switchgear
- Primary underground cables
- Manholes

II.2.3 Projected Flagged for Action Plan Using a Prioritized Risk Approach

For certain asset classes, costs of replacement and/or consequences of failure are more significant. As such, planning for replacement requires more consideration. For these assets, a risk-based approach is taken when developing the FFA Plan. This risk-based methodology considers both the asset likelihood of removal (as related to HI) and its consequence of failure (criticality). The product of likelihood or removal and consequence of failure determines asset risk.

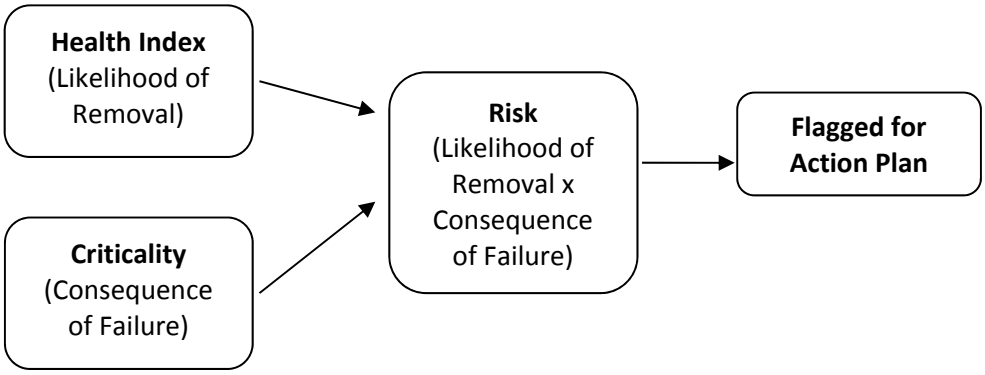

Figure 2 Risk Assessment Procedure

Relating Health Index and Probability of Removal

If there are no dominant sources, it can be assumed that the stress to which an asset is exposed is not constant and will have a somewhat normal frequency distribution. This is illustrated by the probability density curve of stress below. The vertical lines in the figure represent condition or strength (Health Index) of an asset.

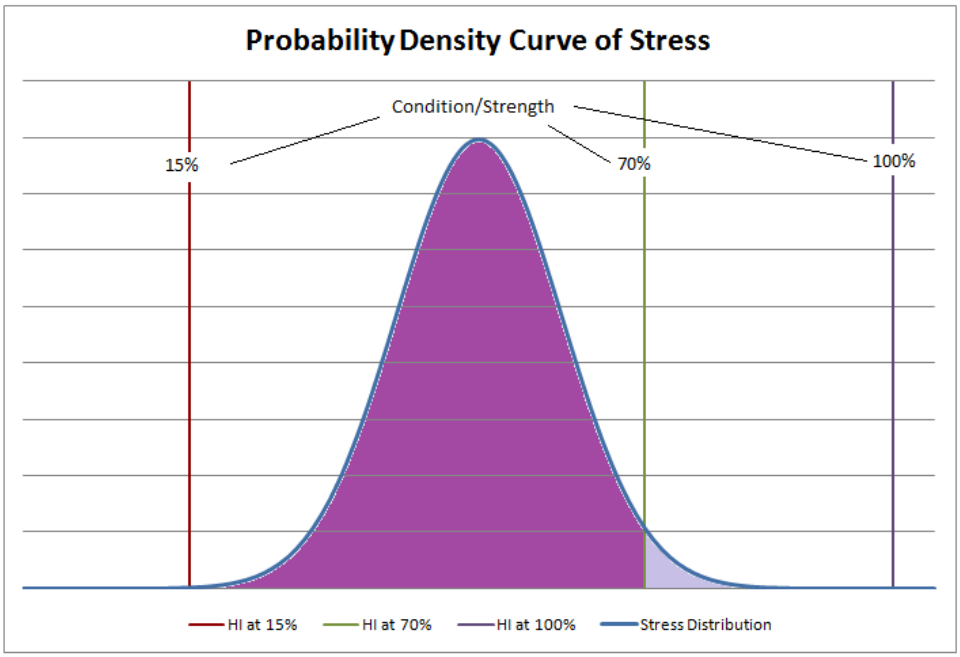

Figure 3 Stress Curve

An asset is in as-new condition (100% strength) should be able to withstand most levels of stress. As the condition of the asset deteriorates, it may be less able to withstand higher levels of stress. Consider, for example, the green vertical line that represents 70% condition/strength. The asset should be able to withstand magnitudes of stress to left of the green line. If, however, the stress is of a magnitude to the right of the green line, the asset will fail.

To create a relationship between the Health Index and likelihood of removal, assume two "points" on the stress curve that correspond to two different Health Index values. In this example, assume that an asset that has a condition/strength (Health Index) of 100% can withstand all magnitudes of stress to the left of the purple line. It then follows that probability that an asset in 100% condition will fail is the probability that the magnitude of stress is at levels to the right of the purple line. This corresponds to the area under the stress density curve to the right of the purple line. Similarly, if it assumed that an asset with a condition of 15% will fail if subjected to stress at magnitudes to the right of the red line, the probability of failure at 15% condition is the area under the stress density curve to the right of the red line.

The likelihood of removal at a particular Health Index is found from plotting the Health Index on X-axis and the area under the probability density curve to the right of the Health Index line on Y-axis, as shown on the graph of the figure below.

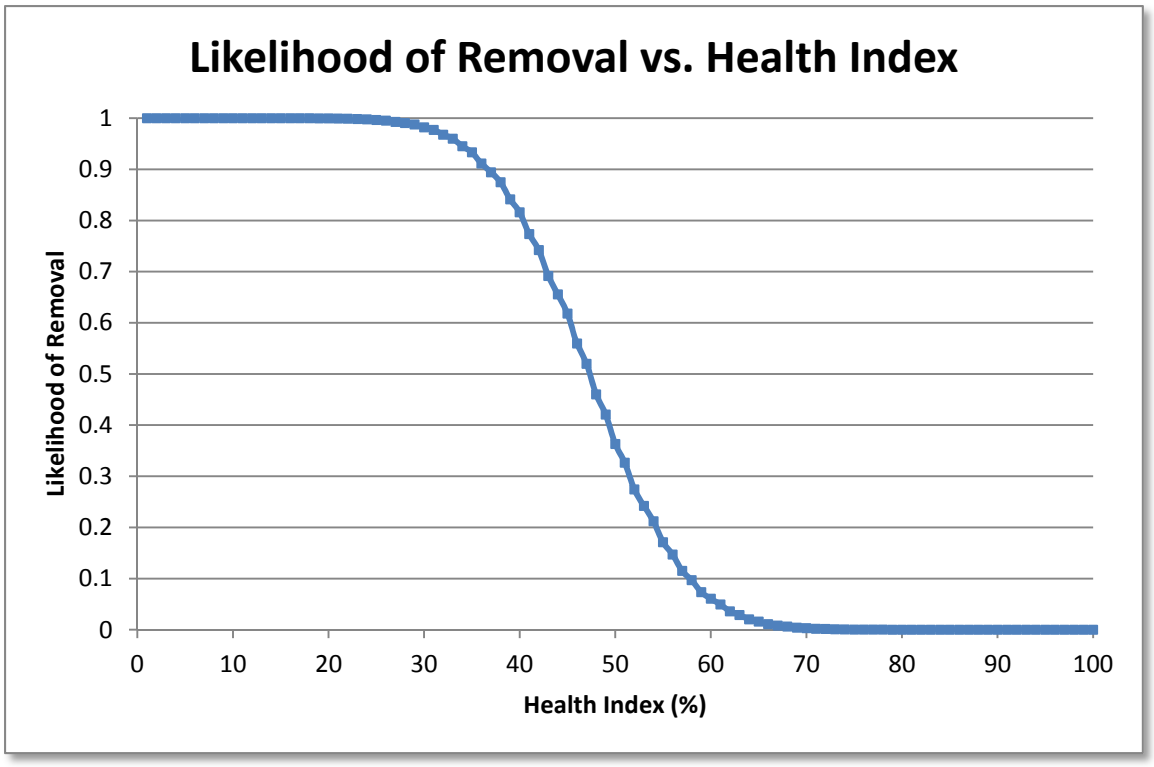

Figure 4 Likelihood of Removal vs. Health Index

Condition-Based Flagged for Action Plan

In this study, the metric used to measure consequence of failure is referred to as *Criticality*. Criticality may be determined in numerous ways, with monetary consequence or degree of risk to corporate business values being examples. The higher the criticality value assigned to a unit, the higher it's consequence of failure.

Due to the small population size for the asset groups applicable to prioritized risk based approach, in this study all the units in these asset groups were assigned of minimum criticality value.

To develop a Flagged for Action Plan, the risk of removal of each unit must be quantified. Risk is the product of a unit's likelihood of removal and its consequence of failure. An asset unit is flagged for action when the calculated risk value exceeds a pre-set threshold.

For the asset categories listed below, the risk-based approach is used to estimate the FFA Plan.

- Power transformers (main tank + LTC)
- Station service transformers
- Grounding transformers
- Station breakers
- Station switches
- Station batteries

It is also important to note with this approach, in addition to the estimated number of assets per year that need to be addressed, the FFA Year (i.e. the years that a particular unit is flagged for action) is calculated for each asset unit.

II.3 **Data Assessment**

The condition data used in this study were provided by EnWin and included the following:

- Test Results (e.g. Oil Quality, DGA)
- Inspection Records
- Loading
- Make, Model, and Type
- Age

There are two components that assess the availability and quality of data used in this study: data availability indicator (DAI) and data gap.

II.3.1 Data Availability Indicator (DAI)

The Data Availability Indicator (DAI) is a measure of the amount of condition parameter data that an asset has, as measured against the full data sets that are practically available and included in the HI formula. It is determined by the weighted ratio of the condition parameters availability of an individual unit, over the maximum condition parameters availability of an asset group. The formula is given by:

$$DAI = \frac{\sum_{m=1}^{\forall m} (DAI_{CPS\,m} \times WCP_m)}{\sum_{m=1}^{\forall m} (WCP_m)}$$

Equation 6

where

$$DAI_{CPSm} = \frac{\sum_{n=1}^{\forall n} \beta_n \times WCFn}{\sum_{n=1}^{\forall n} (WCPFn)}$$

Equation 7

DAI_{CPSm}	Data Availability Indicator for Condition Parameter m with n Condition Parameter Factors (CPF)
β_n	Data availability coefficient for sub-condition parameter (=1 when data available, =0 when data unavailable)
$WSCP_n$	Weight of Condition Parameter Factor n
DAI	Overall Data Availability Indicator for the m Condition Parameters
WCP_m	Weight of Condition Parameter m

For example, consider an asset with the following condition parameters and sub-condition parameters:

Condition Parameter		Condition Parameter Weight (WCP)	Sub-Condition Parameter		Sub-Condition Parameter Weight (WCF)	Data Available? (β = 1 if available; 0 if not)
m	Name		n	Name		
1	A	1	1	A_1	1	1
2	B	2	1	B_1	2	1
			2	B_2	4	1
			3	B_3	5	0
3	C	3	1	C_1	1	0

The Data Availability Indicator is calculated as follows:

$DAI_{CP1} = (1*1) / (1) = 1$
$DAI_{CP2} = (1*2 + 1*4 + 0*5) / (2 + 4 + 5) = 0.545$
$DAI_{CP3} = (0*1) / (1) = 0$

$DAI = (DAI_{CP1}*WCP_1 + DAI_{CP2}*WCP_2 + DAI_{CP3}*WCP_3) / (WCP_1 + WCP_2 + WCP_3)$
$= (1*1 + 0.545*2 + 0*3) / (1 + 2 + 3)$
$= 35\%$

An asset with all condition parameter data represented will, by definition, have a DAI value of 100%. In this case, an asset will have a DAI of 100% regardless of its Health Index score. Provided that the condition parameters used in the Health Index formula are of good quality and there are little data gaps, there will be a high degree of confidence that the Health Index score accurately reflects the asset's condition.

II.3.2 Data Gap

The Health Index formulations developed and used in this study are based only on EnWin's available data. There are additional parameters or tests that EnWin may not collect but that are important indicators of the deterioration and degradation of assets. While these will not be included in the HI formula, they are referred to as data gaps. I.e. A data gap is the case where none of the units in an asset group has data for a particular item as requested by "ideal" data sets. The situation where data is provided for only a sub-set of the population is not considered as a data gap.

As part of this study, the data gaps of each asset category are identified. In addition, the data items are ranked in terms of importance. There are three priority levels, the highest being most indicative of asset degradation.

Priority	Description	Symbol
High	Impactive data; most useful as an indicator of asset degradation	☆☆☆
Medium	Important data; can indicate the need for corrective maintenance or increased monitoring	☆☆
Low	Helpful data; least indicative of asset deterioration	☆

To address data gaps, it is generally recommended that data collection be initiated or enhanced for the items marked with higher priority, because such information will result in higher quality Health Index formulas.

The more impactive and important data included in the Health Index formula of a certain asset group, and the higher the Data Availability Indicator of a particular unit in that group, the higher the confidence in the Health Index calculated for the particular unit.

If an asset group has significant data gaps and lacks good quality condition, there is less confidence that the Health Index score of a particular unit accurately reflects its condition, regardless of the value of its DAI.

To facilitate the incorporation of data gap items into improved Health Index formulas for future assessments, the data gaps items are presented in this report as sub-condition parameters. For each item, the parent condition parameter is identified. Also given are the object or component addressed by the parameter, a description of what to assess for each component or object, and the possible source of data.

The following is an example for “Tank Corrosion” on a Pad-Mounted Transformer:

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Tank Corrosion	Physical Condition	☆☆	Oil Tank	Tank surface rust or deterioration due to environmental factors	Visual Inspection

III RESULTS

This section summarizes the findings of this study.

III.1 Health Index Results

A summary of the Health Index evaluation results is shown in Table 1. For each asset category the population, sample size (number of assets with sufficient data for Health Indexing), average age, age availability and average DAI are given. The average Health Index and distribution are also shown. A summary of the Health Index distribution for all asset categories are also graphically shown in Figure 5. Note that the Health Index distribution percentages are based on the asset group's sample size.

Of the 24 sub-categories, 21 were found to have over 70% of their asset units classified as being in "good" or "very good" condition. Moreover, 15 of the asset sub-categories were found to have an average Health Index score of greater than 80%.

The asset groups that were found to have over 95% of their asset units in "good" or "very good" condition included Power Transformers (Main Tank), Grounding Transformers, Instrument Transformers, Station Breakers (Stand Alone), Station Switches, Station Batteries, Reclosers, Overhead Switches (Remote), Distribution Transformers (Pad 1-Ph) and Manholes.

Station PLCs and Distribution Transformers (submersible type), were the asset groups that were found to be of greatest concern. Almost 40% of the units in each of these two asset groups were classified as being in "poor" or "very poor" condition. Another asset group that is of some concern is Power Transformers (Load Tap Changers - LTC), where about 20% of units were found to be classified as being in "poor" or "very poor" condition.

Table 1 Health Index Results Summary

Asset Category		Population	Sample Size	Average Health Index	Health Index Distribution					Average Age	Age Availability	Average DAI
					Very Poor (< 25%)	Poor (25 - <50%)	Fair (50 - <70%)	Good (70 - <85%)	Very Good (>= 85%)			
Power Transformers	Combined	10	10	71%	2	0	0	2	6	19	100%	98%
	Main tank	10	10	83%	0	0	0	7	3	19	100%	98%
	LTC	10	10	75%	2	0	0	2	6	19	100%	40%
Station Service Transformers		10	10	89%	0	0	0	2	8	19	100%	0%
Grounding Transformers		8	8	88%	0	0	0	2	6	20	100%	0%
Instrument Transformers		50	44	95%	0	0	0	0	44	20	88%	0%
Station Breakers	Stand Alone	9	9	73%	0	0	0	8	1	28	100%	89%
	Switchgear	24	23	83%	3	0	0	0	20	16	96%	58%
Station Switches		34	22	97%	0	0	0	0	22	19	65%	0%
Relays		102	102	92%	0	0	23	0	79	6	100%	0%
Station PLCs		47	47	70%	18	0	0	0	29	8	100%	0%
Station Batteries		4	4	100%	0	0	0	0	4	1	100%	0%
Reclosers		68	68	92%	0	0	3	1	64	9	100%	22%
Overhead Switches	Manual	163	125	73%	0	16	38	24	47	21	77%	0%
	Remote	52	34	97%	0	0	0	4	30	3	54%	27%
Poles	Wood	20933	20051	86%	1608	644	314	831	16654	24	96%	85%
	Concrete	4572	4351	87%	2	16	683	514	3136	23	95%	54%
Distribution Transformers	Pole 1-Ph	2978	2969	72%	141	215	328	1658	627	14	98%	97%
	Pole 3-Ph	2324	2316	73%	86	122	251	1409	448	15	98%	97%
	Pad 1-Ph	1584	1342	97%	0	1	1	159	1181	17	85%	63%
	Pad 3-Ph	482	482	78%	0	22	113	169	178	19	99%	43%
	Submersible	556	556	58%	85	131	121	132	87	24	98%	28%
Pad Mounted Switchgear		170	146	76%	7	12	15	48	64	17	81%	70%
Primary Underground Cables (km)		29.8	29.8	87%	0.6	0.0	4.9	4.0	20.3	14	100%	0%
Manholes		461	386	88%	1	3	11	189	182	49	37%	35%

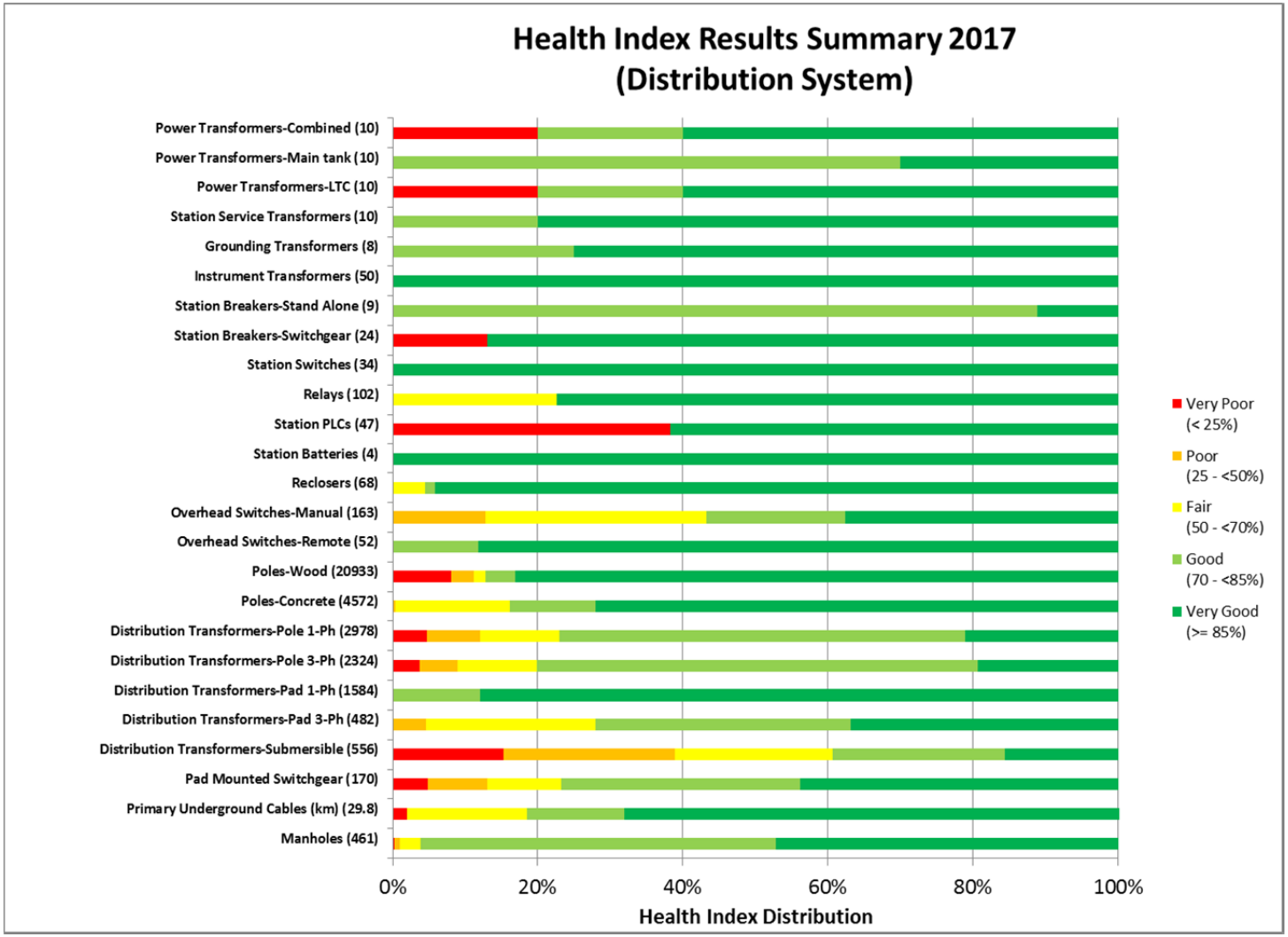

Figure 5 Health Index Results Summary

III.2 **Condition-Based Flagged for Action Plan**

The Flagged for Action Plan estimates the number of units expected to require attention in a given year.

Table 2 shows the Year 1 (current year) and 10 Year cumulative Flagged for Action Plan. Table 3 shows the 20 Year Flagged for Action Plan annually.

Table 2 Year 1 Flagged for Action

Asset Category		1st Year Action		10 Year Action in Total		Replacement Strategy
		Quantity	Percentage	Quantity	Percentage	
Power Transformers	Combined	2	20.0%	2	20.0%	Proactive
Station Service Transformers		0	0.0%	0	0.0%	Proactive
Grounding Transformers		0	0.0%	0	0.0%	Proactive
Instrument Transformers		0	0.0%	3	6.0%	Proactive/Reactive
Station Breakers	Stand Alone	0	0.0%	0	0.0%	Proactive
	Switchgear	3	12.5%	3	12.5%	Proactive
Station Switches		0.0	0.0%	0	0.0%	Proactive
Relays		5.0	4.9%	35.0	34.3%	Proactive/Reactive
Station PLCs		5	10.6%	36	76.6%	Proactive/Reactive
Station Batteries		0	0.0%	0	0.0%	Proactive
Reclosers		1	1.5%	10	14.7%	Proactive/Reactive
Overhead Switches	Manual	10	6.1%	107	65.6%	Proactive/Reactive
	Remote	0	0.0%	0	0.0%	Proactive/Reactive
Poles	Wood	673	3.2%	5682	27.1%	Proactive/Reactive
	Concrete	61	1.3%	745	16.3%	Proactive/Reactive
Distribution Transformers	Pole 1-Ph	102	3.4%	1090	36.6%	Reactive
	Pole 3-Ph	63	2.7%	689	29.6%	Reactive
	Pad 1-Ph	7	0.4%	119	7.5%	Proactive/Reactive
	Pad 3-Ph	4	0.8%	58	12.0%	Proactive/Reactive
	Submersible	28	5.0%	245	44.1%	Proactive/Reactive
Pad Mounted Switchgear		21	12.4%	141	82.9%	Proactive/Reactive
Primary Underground Cables (km)		0.9	3.0%	11.3	37.9%	Proactive/Reactive
Manholes		14	3.0%	352	76.4%	Proactive

Table 3 Twenty Year Flagged for Action Plan

Asset Category		Flagged for Action Plan by Year																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Power Transformers	Combined	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Station Service Transformers		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grounding Transformers		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Instrument Transformers		0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Station Breakers	Stand Alone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Switchgear	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Station Switches		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Relays		5	7	7	4	1	1	1	2	3	4	4	4	3	5	8	11	13	13	10	7
Station PLCs		5	4	4	3	3	3	3	4	4	3	3	4	4	4	3	4	4	4	4	3
Station Batteries		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reclosers		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Overhead Switches	Manual	10	12	12	12	12	12	10	10	9	8	8	7	5	5	4	4	3	4	4	3
	Remote	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2
Poles	Wood	673	629	593	600	541	502	490	481	620	553	560	545	541	618	600	668	682	742	737	1000
	Concrete	61	63	66	68	70	72	76	78	95	96	98	115	112	117	118	116	128	140	140	139
Distribution Transformers	Pole 1-Ph	102	105	111	111	112	109	111	112	109	108	112	112	114	116	110	106	106	107	106	107
	Pole 3-Ph	63	68	69	70	68	68	70	72	70	71	74	77	75	74	74	75	75	73	73	71
	Pad 1-Ph	7	8	9	10	11	11	14	14	17	18	19	19	23	23	28	28	30	34	36	41
	Pad 3-Ph	4	4	4	4	6	6	7	7	7	9	9	10	9	9	12	10	14	16	18	19
	Submersible	28	28	26	26	25	24	24	23	21	20	18	19	17	15	16	13	13	12	10	11
Pad Mounted Switchgear		21	19	17	17	16	15	13	10	8	5	2	1	1	1	1	1	1	1	1	2
Primary Underground Cables (km)		0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.1
Manholes		14	20	19	24	29	66	73	59	27	21	21	17	13	10	6	4	2	1	0	0

Generally, as shown in Table 3, the asset groups at EnWin have relatively smooth flagged for action plans, indicating relatively small variation or gradual ascending/descending trends, in terms of yearly flagged for action numbers. Some asset groups, such as Power Transformers (Combined) and Station Breakers (switchgear type), did show a significant percentagewise proportion of assets flagged for action in the first year than in subsequent years. This is generally the case when there is a large quantity of assets that are at or near the end of their service lives.

Presently the asset categories with a significant proportion of backlog include Power Transformers (Combined), Station Breakers (switchgear type), Station PLCs and Pad Mounted Switchgear, all having over 10% of their population flagged for immediate action. In the long run, within 10 years, about half or more of the population will be flagged for action in the asset categories of Station PLCs, Overhead Switches (manual type), Pad Mounted Switchgear, Primary Underground Cables and Manholes.

It is important to note that the Flagged for Action plan suggested in this study is based solely on asset condition. It uses a probabilistic, non-deterministic, approach and as such can only show expected failures or probable number of units that are expected to be candidates for replacement or other action. While this condition-based Flagged for Action Plan can be used as a guide or input to EnWin's distribution system plan, it is not expected that it be followed directly or as the final deciding factor in making sustainment capital decisions. There are numerous other factors and considerations that will influence EnWin's Asset Management decisions, such as obsolescence, system expansion, regulatory requirements, municipal demand and customer preferences.

III.3 **Data Assessment Results**

Data assessment determines the data availability of each asset group, as well as identifying the data gaps for each asset group. Data availability is a measure of the amount of data that an individual unit has in comparison with the set of data currently available in for its respective asset category. Data gaps are items that are indicators of asset degradation, but are currently not collected or available for any asset in an asset category. The fewer the data gaps, the higher the quality of available condition data and Health Index formulas.

Data for Power Transformers (main tank) included age, oil and insulation test results, and loading. Data gaps were historic removal records and corrective maintenance records.

Data for Power Transformers (LTCs) included age and oil test results. Data gaps were historic removal records and corrective maintenance results.

Data for Station Breakers (both stand alone and switchgear types) included age and contact resistance test results. Data gaps were historic removal records, corrective maintenance results, bushing insulation test results, timing test results, operating cycle count and manufacturer specification limits on contact resistance and operating cycle.

All the other asset groups inside stations had age only. Common data gaps for these asset groups were historic removal records and corrective maintenance records. On top of this, the other data gaps included, for Station Service Transformers and Grounding Transformers, the oil and insulation test results, while for Station Batteries, the battery cell test results.

Data for Reclosers included age, historic removal records and corrective maintenance records (follow up notifications) at unit level. Data gaps were corrective maintenance records at condition parameter level and recloser test results.

Data for Overhead Switches (manual) included age and historic removal records, while data for Overhead Switches (remote) included age, historic removal records and corrective maintenance records (follow up notifications) at unit level. Data gaps were corrective maintenance records at condition parameter level and switch test results.

Data for Poles (both wood and concrete types) included age, historic removal records, pole strength measurements and inspection results on individual condition parameters. There were no major data gaps.

Data for Distribution Transformers (pole top 1-phase, pole top 3-phase, pad mounted 1-phase) included age, historic removal records and loadings. Data gaps were corrective maintenance records at condition parameter level.

Data for Distribution Transformers (pad mounted 3-phase and submersible) included age, historic removal records, loadings and inspection records at condition parameter level. There were no major data gaps.

Data for Pad Mounted Switchgear included age, historic removal records and inspection records at condition parameter level. There were no major data gaps.

Data for UG Cables included age only. Data gaps included corrective maintenance results, failure statistics on segment level, as well as historic removal records.

Data for manholes included age and inspection records at condition parameter level. Data gaps were historic removal records.

IV CONCLUSIONS AND RECOMMENDATIONS

This section presents 1) Kinectrics' general observations based on itsinteviews with EnWin's experts, review of certain EnWin documentation including its Planning Guide, and the results of the ACA study, as well as 2) Kinectrics' specific findings based on the ACA study results.

GENERAL OBSERVATIONS

1. EnWin is implementing a Risk Prioritztion tool that will allow the utility to prioritize investments across different investment categories using an approach that minimizes total risk to its established Corporate Business Values within its prescribed investment envelopes.

2. The Flagged-for-Action Plan for each of the asset categories should serve as a guide in determining required investment levels within the System Renewal investment category. While for some asset categories, such as pole mounted transformers, replacement is the only viable option and sufficient funds should be set aside to replace the number of flagged-for-action units estimated, for other asset categories, such as station power transformers, replacement is not the only option and an economically based decision should be made by EnWin as to what the appropriate action should be in order to determine associated capital and/or O&M fundings requirements. This approach will enable EnWin to establish appropriate sufficiency and prudency of investments needed to sustain the existing asset base as well as their pacing.

3. EnWin's Planning Guide is a viable document that provides specific planning criteria and design considerations used in determining investment requirements for expanding system capabilities and improving system operability.

4. EnWin currently has under way a number of initiatives that should improve its system performance, such as initiatives to replacie undersized conductors, install new feeder ties and fault detection devices, sectionalize radial feeders, etc. Although it is not possible to quantify the exact impact these initatvies are expected to have on system reliability, it is reasonable to expect that they will result in improved system performance.

5. Based on the Asset Condition Assessment results, the majority of EnWin's assets are in good condition with a fairly high average Health Index. This indicates that the asset categories that require maintenance are subjected to appropriate levels of preventative maintenance.

6. EnWin has indicated its intention to close the identified data gaps and improve data availblility for some of the asset categories. This will require EnWin to undertake and record the findings from more testing and inspection tasks, as well as ensure that the results are properly stored for future use.

ACA SPECIFIC OBSERVATIONS

1. An Asset Condition Assessment was conducted for sixteen of EnWin's distribution asset categories (twenty four sub-categories). For each asset category, the Health Index distribution was determined and a condition-based Flagged for Action plan was developed.

2. Risk based prioritized lists were developed for Power Transformers (Combined), Station Service Transformers, Grounding Transformers, Station Breakers, Station Switches and Station Batteries. These lists indicate the projected flagged for action year for individual asset units.

3. In general, the asset units in most of EnWin's asset groups were found to be in good condition - 22 out of 24 sub-categories had over 70% of their units in "good" or "very good" condition, while 15 out of 24 sub-categories had an average Health Index score of greater than 80%.

4. Among all the asset groups, Power Transformers (main tank), Grounding Transformers, Instrument Transformers, Station Breakers (stand alone type), Station Switches, Station Batteries, Reclosers, Distribution Transformers (Pad Mounted 3-phase) and Manholes were found to be in the best condition, each having over 95% of units classified as "good" or "very good".

5. With respect to the asset groups that were found to be of concern, Station PLCs and Distribution Transformers (submersible type) were found to be of greatest concern, with almost 40% of the asset units classified as being in "poor" or "very poor" condition, and Power Transformers (LTCs), having about 20% of units classified as "poor" or "very poor", were found to be of some concern.

6. In terms of flagged-for-action plans, EnWin's asset groups were found to have relatively smooth flagged for action plans throughout the years.

7. For the asset groups having a high backlog percentage at present, Power Transformers (Combined) were found to have 20% of their units needing to be addressed in the first year. This was followed by Station Breakers (switchgear type) and Pad Mounted Switchgear, both having over 10% of the units as the backlog.

8. For 10-year long term flagged-for-action plans, Pad Mounted Switchgear, Station PLCs, Manholes, Overhead Switches (manual type) and Primary Underground Cables had the highest percentage of the population to be addresses, with over 50% of their population being flagged for action.

9. The asset groups that had relatively complete data sets included Power Transformers (main tank and LTC), Reclosers, Overhead Switches (remote type), Poles (both wood and concrete types), Distribution Transformers (all types), Pad Mounted Switchgear and Manholes.

10. Reclosers, Overhead Swicthes (manual type), Poles (concrete type), Distribution Transformers (all types) and Pad Mounted Switchgear had historic removal information available, thus allowing build-up of their specific degradation curves.

11. Station Breakers (both stand alone and switchgear types) had age and contact resistance test results.

12. All the other asset groups had age information only.

13. It is important to note that the Flagged for Action plan presented in this study is based solely on asset condition and that there are numerous other considerations that may influence EnWin's Asset Management Plan, such as obsolescence, system growth, regulatory requirements, municipal initiatives and customer preferences.

14. More age information should be collected for asset units of Station Switches, Overhead Switches (remote type) and Manholes.

15. Historic records of asset removal should be collected for Primary Underground Cables, Manholes, and all the asset groups within stations.

16. Corrective maintenance records should be collected for Overhead Switches (manual type), Primary Underground Cables, as well as all the asset groups in inside the stations.

17. Corrected values of bushing power dissipation factor tests should be collected for Power Transformers and Station Breakers.

18. Specification limits for contact resistance and operation cycles should be collected for Station Breakers the manufacturer.

19. Operation cycle counts should be collected for Station Breakers the, for both the normal operation and fault interruption.

20. Fault records should be collected for UG Cables on segment level.

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V APPENDIX A: RESULTS FOR EACH ASSET CATEGORY

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1 POWER TRANSFORMERS

1.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

1.1.1 Condition and Sub-Condition Parameters

Main Tank

Table 1-1 Condition Parameter and Weights – Main Tank

m	Condition Parameter	WCP_m	Sub-Condition Parameters
1	Insulation	2	Table 1-2
2	Service Record	1	Table 1-3
	Age Limiting	Overall Multiplier	Figure 1-1

Table 1-2 Insulation Sub-Condition Parameters and Weights (m=1) – Main Tank

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Oil Quality	3	Table 1-6
2	Oil DGA	6	Table 1-7
3	Winding Dissipation	6	Table 1-8
4	Bushing Dissipation	1	Table 1-8

Table 1-3 Service Record Sub-Condition Parameters and Weights (m=5) – Main Tank

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Loading	1	Table 1-9

LTC

Table 1-4 Condition Parameters and Weights – LTC

n	Condition Parameter	WCP_m	Condition Criteria Table
1	Oil Quality	3	Table 1-6
2	Oil DGA	4	Table 1-7
	Age Limiting	Overall Multiplier	Figure 1-1

The combined Health Index score is calculated as per the formula in the following table.

Table 1-5 Power Transformers Combined Health Index Formula

If (***Transformer has LTC***)	If ($HI_{Main\ Tank} < 50\%$) then $HI_{COM} = HI_{Main\ Tank}$
	ElseIf ($HI_{LTC} < 50\%$) then $HI_{COM} = HI_{LTC}$
	Else $HI_{COM} = 60\%HI_{Main\ Tank} + 40\%HI_{LTC}$
Else	$HI_{COM} = HI_{Main\ Tank}$

1.1.2 Condition Criteria

Oil Quality

The "Oil Quality" parameter is a composite of the following oil properties: moisture, dielectric strength, interfacial tension, color, and acidity.

Table 1-6 Oil Quality Test Criteria - Power Transformers

Score	Description
4	Overall Factor is less than 1.2
3	Overall Factor between 1.2 and 1.5
2	Overall Factor is between 1.5 and 2.0
1	Overall Factor is between 2.0 and 3.0
0	Overall Factor is greater than 3.0

Where the Overall factor is the weighted average of the following gas scores:

$$\text{Overall Factor} = \frac{\sum Score_i \times Weight_i}{\sum Weight}$$

Oil Quality Test	Voltage Class [kV]	Scores				
		1	2	3	4	Weight
Water Content (D1533) [ppm]	V ≤ 69	< 30	30-35	35-40	> 40	5
	69 < V < 230	< 20	20-25	25-30	>30	
	V ≥ 230	< 15	15-20	20-25	> 25	
Dielectric Strength (D1816 - 2 mm gap) [kV]	V ≤ 69	> 40	35-40	30-35	< 30	4
	69 < V < 230	> 47	42-47	35-42	< 35	
	V ≥ 230	> 50	50-45	40-45	< 40	
Dielectric Strength (D877) [kV]	All	> 40	30-40	20-30	< 20	
IFT (D971) [dynes/cm]	V ≤ 69	> 25	20-25	15-20	< 15	4
	69 < V < 230	> 30	23-30	18-23	< 18	
	V ≥ 230	> 32	25-32	20-25	< 20	
Color	All	< 1.5	1.5-2.0	2.0-2.5	> 2.5	1
Acid Number (D974) [mg KOH/g]	V ≤ 69	< 0.05	0.05-0.1	0.1-0.2	> 0.2	4
	69 < V < 230	< 0.04	0.04-0.1	0.1-0.15	> 0.15	
	V ≥ 230	< 0.03	0.03-0.07	0.07-0.1	> 0.1	
Dissipation Factor (D924 - 25C)	All	< 0.5%	0.5%-1%	1-2%	> 2%	5
Dissipation Factor (D924 - 100C)	All	< 5%	5%-10%	10%-20%	> 20%	

Oil DGA

Table 1-7 DGA Criteria - Power Transformers

Score	Description
4	DGA overall factor is less than 1.2
3	DGA overall factor between 1.2 and 1.5
2	DGA overall factor is between 1.5 and 2.0
1	DGA overall factor is between 2.0 and 3.0
0	DGA overall factor is greater than 3.0

In the case of a score other than 4, check the variation rate of DGA parameters. If the maximum variation rate (among all the parameters) is greater than 30% for the latest 3 samplings or 20% for the latest 5 samplings, overall Health Index is multiplied by 0.9 for score 3, 0.85 for score 2, 0.75 for score 1 and 0.5 for score 0.

Where the DGA overall factor is the weighted average of the following gas scores:

--- Main Tank

Transformers								
	Dissolved Gas (X)	Scores						
		1	2	3	4	5	6	Weight
	H2 (Hydrogen)	X ≤ 70	70 < X ≤ 100	100 < X ≤ 200	200 < X ≤ 400	400 < X ≤ 1000	X >1000	4
	CH4 (Methane)	X ≤ 70	70 < X ≤ 120	120 < X ≤ 200	200 < X ≤ 400	400 < X ≤ 600	X > 600	3
	C2H6 (Ethane)	X ≤ 75	75 < X ≤ 100	100 < X ≤ 150	150 < X ≤ 250	250 < X ≤ 500	X > 500	3
	C2H4 (Ethylene)	X ≤ 60	60 < X ≤ 100	100 < X ≤ 150	150 < X ≤ 250	250 < X ≤ 500	X > 500	3
	C2H2 (Acetylene)	X ≤ 3	3 < X ≤ 7	7 < X ≤ 35	35 < X ≤ 50	50 < X ≤ 100	X > 100	5
	CO (Carbon Monoxide)	X ≤ 750	750 < X ≤ 1000	1000 < X ≤ 1300	1300 < X ≤ 1500	1500 < X ≤ 1700	X > 1700	2*
	CO2 (Carbon Dioxide)	X ≤ 7500	7500 < X ≤ 8500	8500 < X ≤ 9000	9000 < X ≤ 12000	12000 < X ≤ 15000	X > 15000	2*
	CO2/CO (Ratio)	>20	15 to 20	10 to 15	7 to 10	3 to 7	0 to 3	4*

*If CO ≥ 500 ppm and CO2 ≥ 5000 ppm, use CO2/CO ratio (i.e. CO weight = CO2 weight = 0, CO2/CO weight = 4)
Else, use CO2 and CO limits (i.e. CO weight = CO2 weight = 2, CO2/CO weight = 0)

--- LTC

Dissolved Gas (X)	Scores					Weight
	1	2	3	4	5	
X = C2H4/C2H2	X < 0.33	0.33 ≤ X < 0.67	0.67 ≤ X < 1	1 ≤ X < 1.33	X ≥ 1.33	3
X = C2H6/CH4	X < 0.20	0.2 ≤ X < 0.4	0.4 ≤ X < 0.6	0.6 ≤ X < 0.8	X ≥ 0.80	2
H2	X < 70	70 ≤ X < 500	500 ≤ X < 1000	1000 ≤ X < 1500	X ≥ 1500	1

Note: Overall Factor =1.2 when ALL the following conditions meet

- H2 (hydrogen)< 1500 ppm
- C2H4 (Ethylene) < 1000 ppm
- C2H2 (Acetylene) < 1000 ppm

A test must have been conducted within the past 5 years to be considered.

$$\text{Overall Factor} = \frac{\sum Score_i \times Weight_i}{\sum Weight}$$

Power Dissipation Factor

Table 1-8 Power Dissipation Factor Test Criteria - Power Transformers

Score	Description
4	PF < 0.05%
3	0.05% < PF < 0.5%
2	0.5% < PF < 1%
1	1% < PF < 2%
0	PF >2%

Loading History

Table 1-9 Loading History - Power Transformers

Data: S1, S2, S3, …, SN recorded data (average daily loading)
SB= rated MVA NA=Number of Si/SB which is lower than 0.6 NB= Number of Si/SB which is between 0.6 and 0.8 NC= Number of Si/SB which is between 0.8 and 1.0 ND= Number of Si/SB which is between 1 and 1.2 NE= Number of Si/SB which is greater than 1.2 Score = $\frac{NA \times 4 + NB \times 3 + NC \times 2 + ND \times 1}{N}$
Note: If there are 2 numbers in NA to NE greater than 1.5, then Score should be multiplied by 0.6 to show the effect of overheating.

Age Limiting Factor

In this project, age was used as a limiting factor to reflect the degradation of asset unit as time passed by.

The calculated overall HI result (after taking into account all the possible de-rating multipliers) is then compared with an age limiting factor.

$$Final\ overall\ HI = \begin{cases} HI_{calculated} & if\ HI_{calculated} <= Age_Limiter \\ Age_limiter & if\ HI_{calculated} > Age_Limiter \end{cases}$$

The age derating is the Weibull survival function (1 – cumulative distribution function), assuming it could be modeled by the Weibull distribution.

$$Age_Derating = S_f = e^{-(\frac{x}{\alpha})^{\beta}}$$

Equation 6

S_f = survivor function
x = age in years
α = *constant that controls scale of function*
β = *constant that controls shape of function*

In this project, the parameters of Power Transformers (both main tank and LTC) age limiting curve are shown in the following table, based on industry practice.

Table 1-10 Age Limiting Curve Parameters - Power Transformers

Asset Type	α	β
Main Tank / LTC	**79.275**	**2.5865**

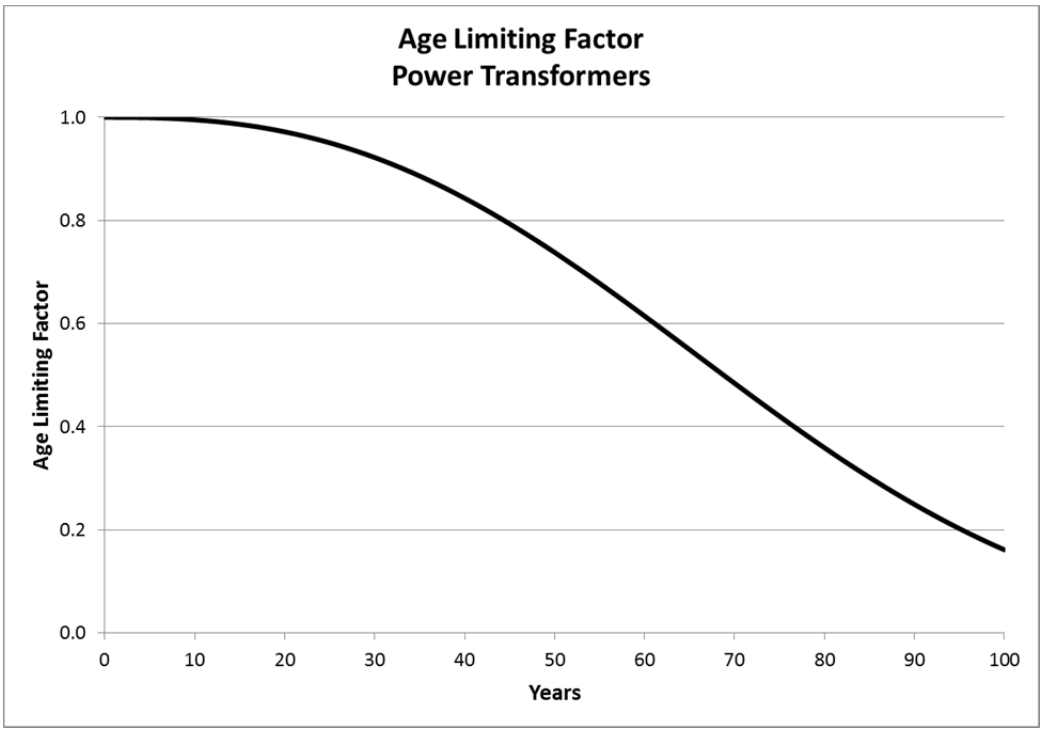

Figure 1-1 Age Limiting Factor Criteria - - Power Transformers

1.2 Age Distribution

The average age was 19, for both main tank and LTC of Power Transformers. The age distribution was as follows.

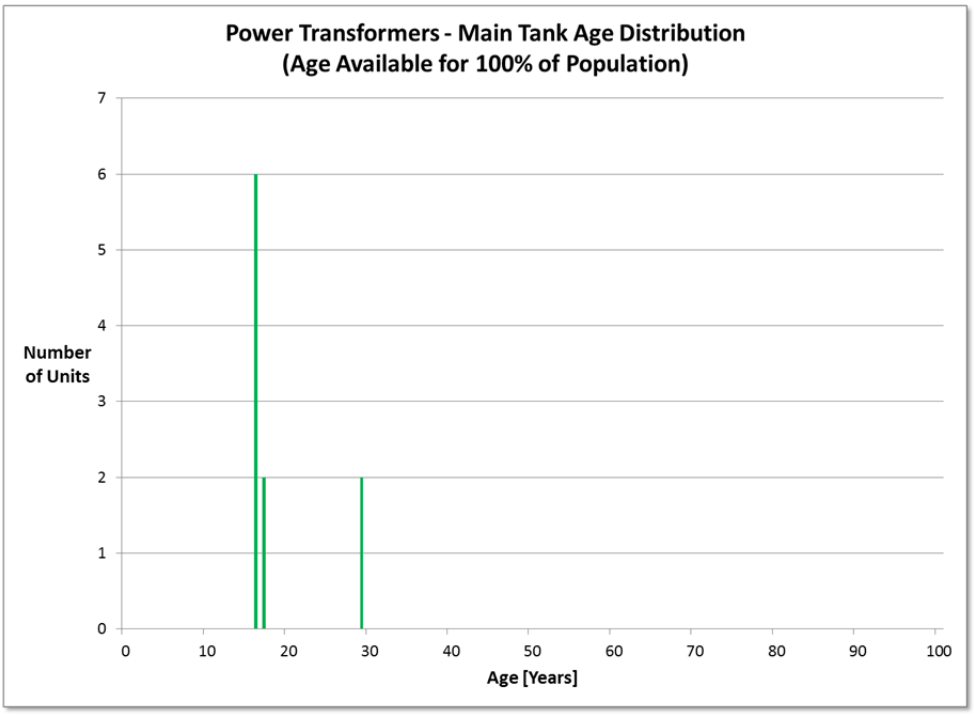

Figure 1-2 Age Distribution –Power Transformers (Main Tank)

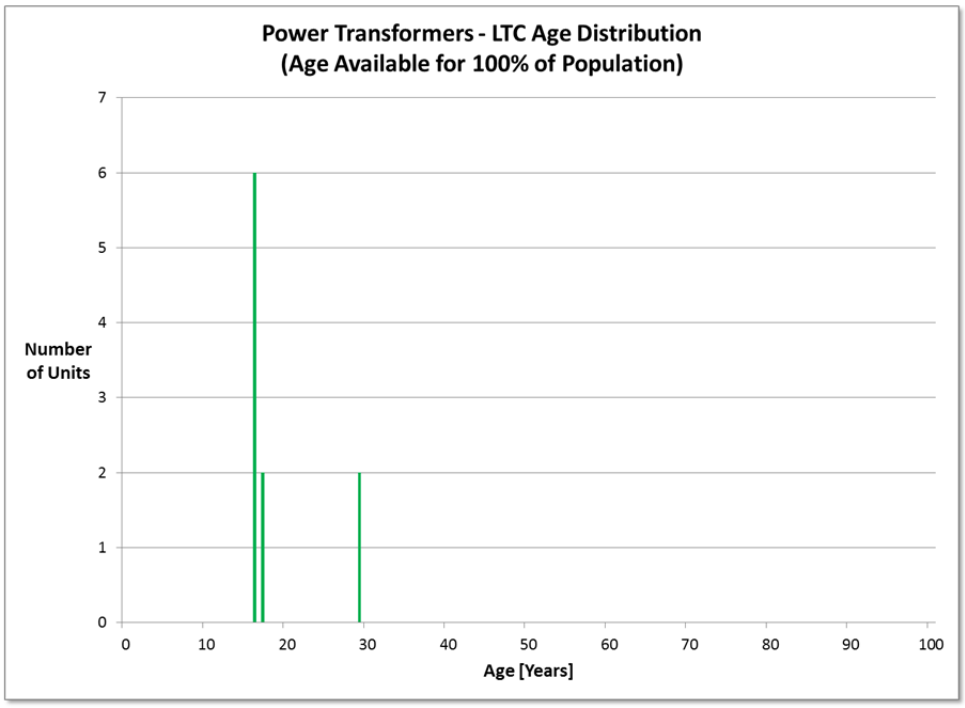

Figure 1-3 Age Distribution –Power Transformers (LTC)

1.3 Health Index Results

There were 10 units of Power Transformers at EnWin, each with 1 main tank and 1 LTC. All of them had sufficient data for a Health Indexing.

The average Health Index was 83% and 75% for main tank and LTC asset units respectively.

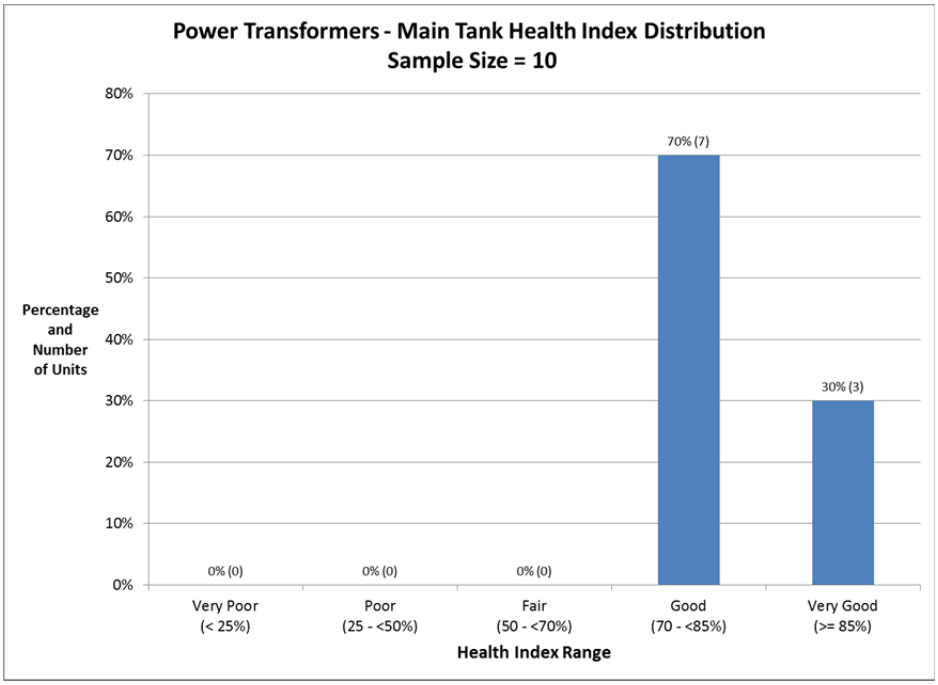

Figure 1-4 Health Index Distribution –Power Transformers (Main Tank)

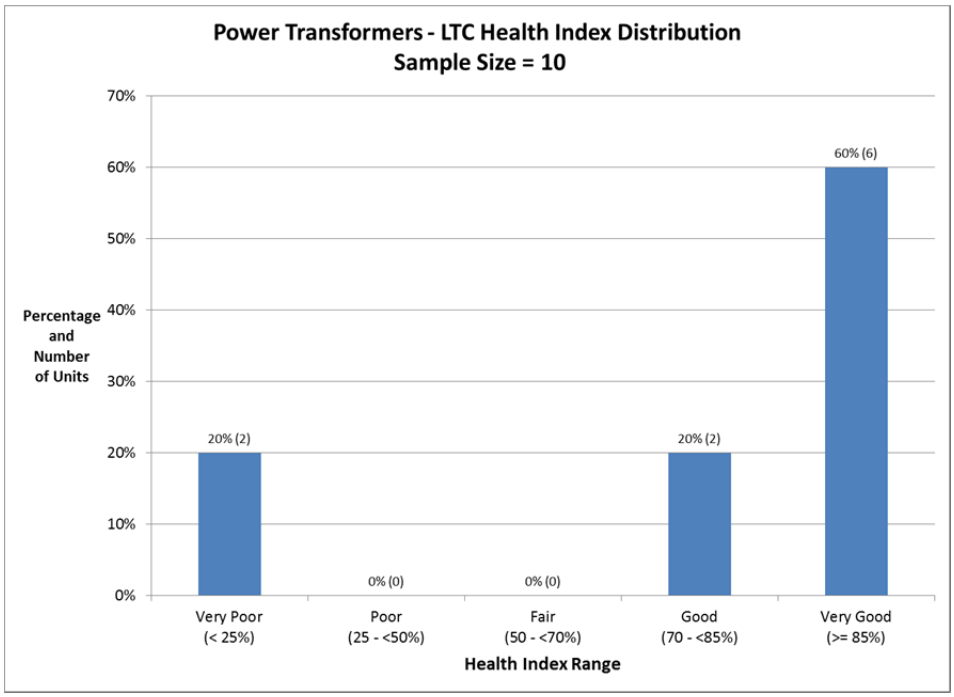

Figure 1-5 Health Index Distribution – Power Transformers (LTC)

1.4 Flagged for Action Plan

The flagged for action plans for Power Transformers (Combined) were as follows:

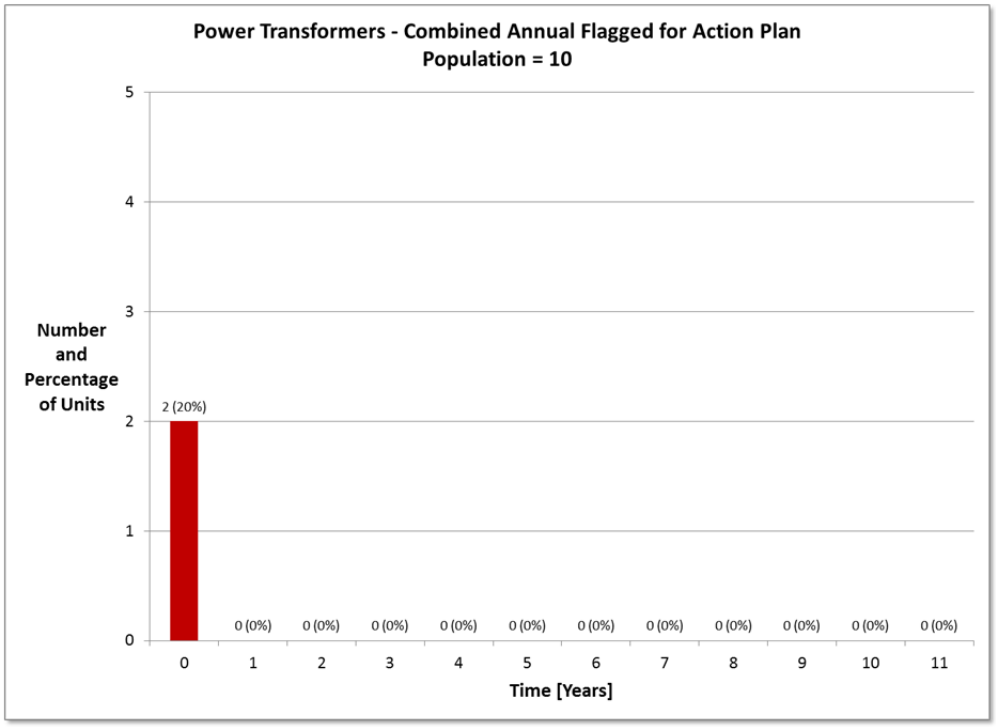

Figure 1-6 Flagged for Action Plan – Power Transformers (Combined)

1.5 Risk Based Prioritized List

The following table shows the risk based prioritization lists, for 66 kV and below 66 kV asset units respectively.

Table 1-11 Risk Based Prioritization List - Power Transformers (Combined)

Rank	ID	Location	Associated Transformer ID	Age	DAI	HI (TX)	HI (LTC)	HI (TX+LTC)	HI Category	Criticality Index	Risk Index 100%=Most Risk 0% = Least Risk	FFA Year
1	55T1	HST-WK2-SWYD-TF01	Westinghouse	29	95.8%	73.6	0.0	0.0	Very Poor	0%	83.3%	0
2	55T2	HST-WK2-SWYD-TF02	Westinghouse	29	95.8%	78.4	5.4	5.4	Very Poor	0%	83.3%	0
3	4T2	HST-GMC-SWYD-TF02	Ferranti Packard	16	100.0%	80.2	78.6	79.6	Good	0%	1.5%	>20
4	31T2	HST-FAX-SWYD-TF02	G E Prolec	16	100.0%	74.1	98.6	83.9	Good	0%	0.7%	>20
5	4T1	HST-GMC-SWYD-TF01	Ferranti Packard	16	100.0%	92.7	78.6	87.1	Very Good	0%	0.3%	>20
6	2T1	HST-CHY-SWYD-TF01	Ferranti Packard	17	100.0%	80.5	98.4	87.6	Very Good	0%	0.3%	>20
7	2T2	HST-CHY-SWYD-TF02	Ferranti Packard	17	100.0%	80.3	98.4	87.6	Very Good	0%	0.3%	>20
8	31T1	HST-FAX-SWYD-TF01	G E Prolec	16	87.5%	83.3	98.6	89.5	Very Good	0%	0.2%	>20
9	5T2	HST-FPH-SWYD-TF02	Ferranti Packard	16	100.0%	92.7	98.6	95.1	Very Good	0%	0.0%	>20
10	5T1	HST-FPH-SWYD-TF01	Ferranti Packard	16	100.0%	92.7	98.6	95.1	Very Good	0%	0.0%	>20

1.6 Data Gaps

Data for Power Transformers (main tank) included age, oil and insulation test results, and loading. Data gaps were historic removal records and corrective maintenance records.

Table 1-12 Data Gap for Power Transformers (Main Tank)

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
Cooling	Cooling	☆ ☆	Temperature beyond limit	Maintenance and/or Inspection records
Gasket	Sealing & Connection	☆ ☆	Sealing issue	
Leakage		☆ ☆	Leakage of oil	
Oil Conservator		☆ ☆	Oil conservator corrosion	
Grounding		☆	Defect in bonding and grounding	
Connection		☆ ☆	Defect due to installation	
Historic Removal Record		☆ ☆ ☆	Age at removal	Inventory Database

Data for Power Transformers (LTCs) included age and oil test results. Data gaps were historic removal records and corrective maintenance results.

Table 1-13 Data Gap for Power Transformers (LTC)

Data Gap (Sub-Condition Parameter)	Parent Condition Parameter	Priority	Description	Source of Data
Rotary switch	Operating Mechanism	★★	Worn-out and carbon deposit	Maintenance and/or Inspection records
Control breakers/fuses		★★	Raise/lower function issue	
Cabinet heaters		★	Control cabinet physical defects	
Tap selector (type dependent)		★	Worn-out and carbon deposit	
Change-over selector(type dependent)		★	Worn-out and carbon deposit	
Number of Operation	Service Record	★★	Overall operating limits	Counter
Oil seal	Arc Extinction	★	Leakage	Maintenance and/or Inspection records
Bottle (vacuum type)		★	Vacuum status check	
Contact		★★	Switching contact worn-out	
Reactor		★	Degradation due to current limiting	
Resistor		★	Degradation due to current limiting	
Historic Removal Record		★★★	Age at removal	Inventory Database

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2 STATION SERVICE TRANSFORMERS

2.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Station Service Transformers age limiting curve are shown in the following table, based on industry practice.

Table 2-1 Age Limiting Curve Parameters - Station Service Transformers

Asset Type	α	β
Station Service Transformer	**56.4249**	**2.005**

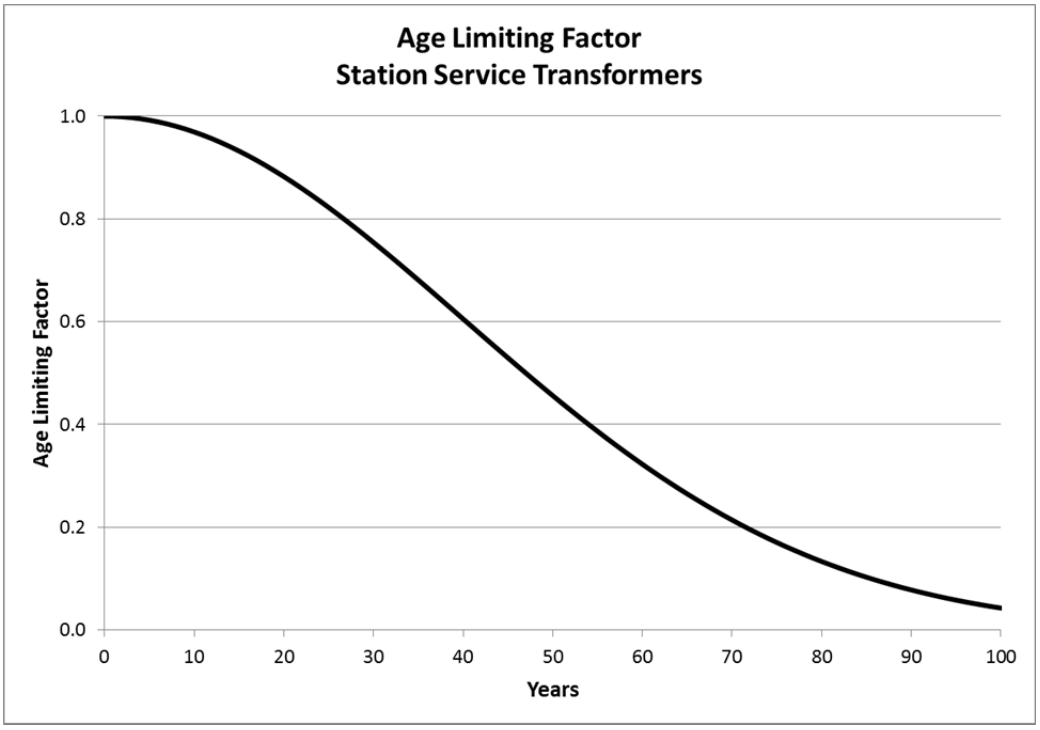

Figure 2-1 Age Limiting Factor Criteria - - Station Service Transformers

2.2 Age Distribution

The average age of all in service units was 16. The age distribution for Station Service Transformers was as follows.

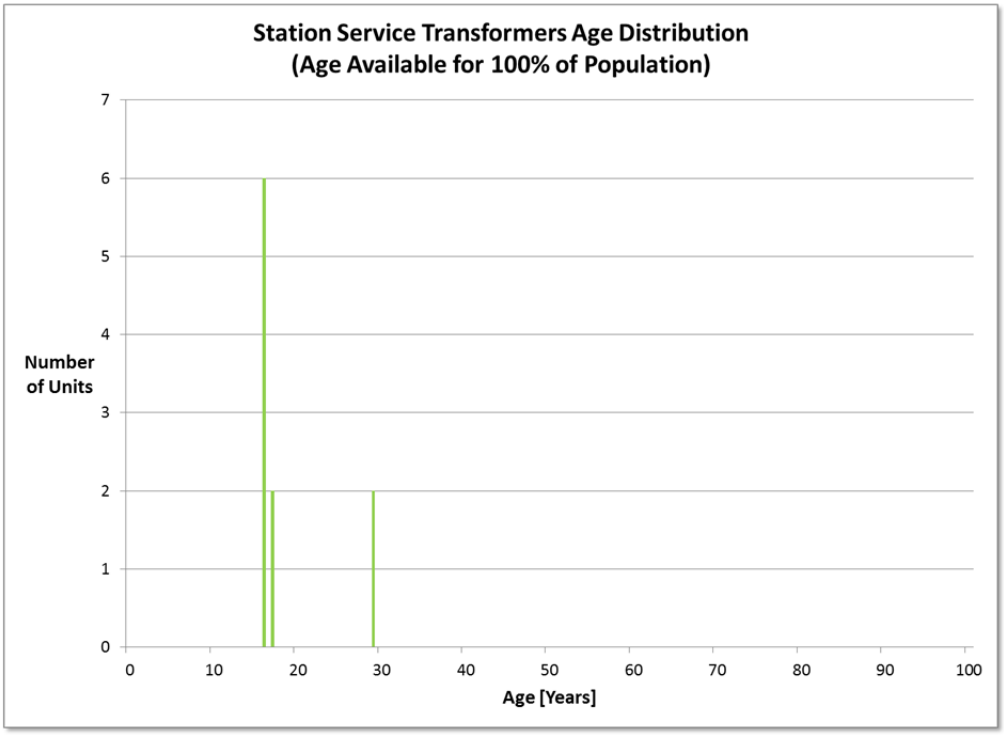

Figure 2-2 Age Distribution - Station Service Transformers

2.3 Health Index Results

There were 10 Station Service Transformers at EnWin. All of them had age data for a Health Indexing.

The average Health Index for this asset group was 89%.

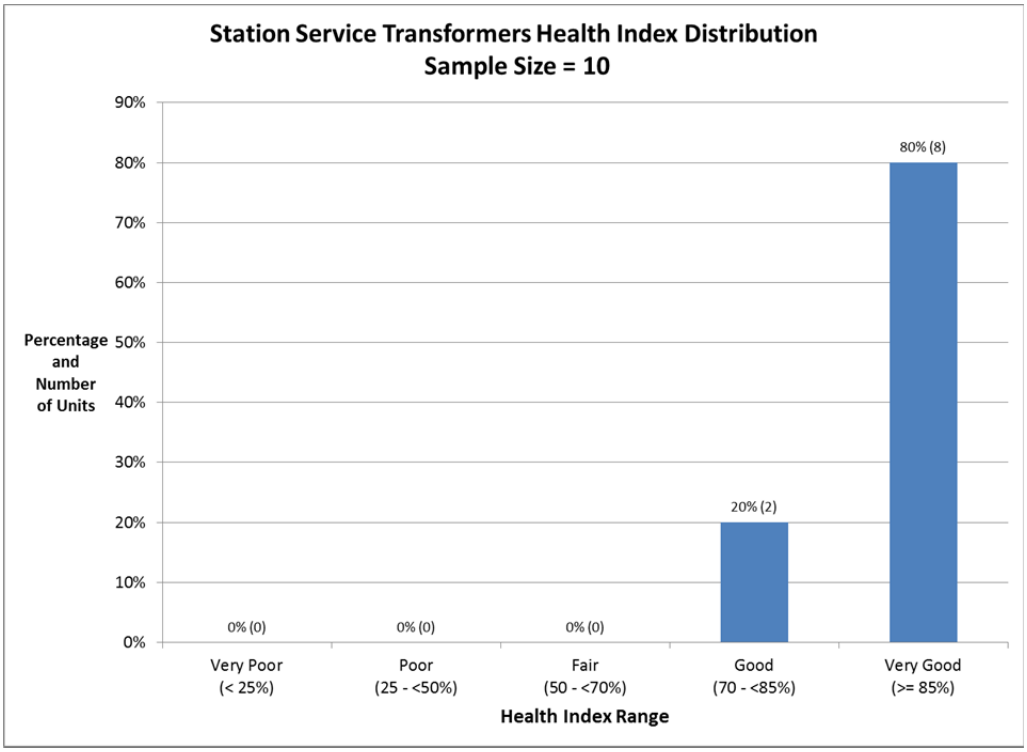

Figure 2-3 Health Index Distribution - Station Service Transformers

2.4 Flagged for Action Plan

As per study, there was no asset unit flagged for action in the next 10 years for Station Service Transformers.

2.5 Risk Based Prioritized List

The following table shows the risk based prioritization lists for each asset unit.

Table 2-2 Risk Based Prioritization List - Station Service Transformers

Rank	ID	Description	Age	DAI	HI (Final)	Criticality Percentage	FFA Year
1	HST-WK2-SWYD-AUX1	Fayetteville Transformer Co.	29	0.0%	76.9	0%	>20
2	HST-WK2-SWYD-AUX2	Fayetteville Transformer Co.	29	0.0%	76.9	0%	>20
3	HST-CHY-SWYD-AUX1	Moloney Electric	17	0.0%	91.4	0%	>20
4	HST-CHY-SWYD-AUX2	Moloney Electric	17	0.0%	91.4	0%	>20
5	HST-FAX-SWYD-AUX1	Carte International	16	0.0%	92.3	0%	>20
6	HST-FAX-SWYD-AUX2	Carte International	16	0.0%	92.3	0%	>20
7	HST-GMC-SWYD-AUX1	Moloney Electric	16	0.0%	92.3	0%	>20
8	HST-GMC-SWYD-AUX2	Moloney Electric	16	0.0%	92.3	0%	>20
9	HST-FPH-SWYD-AUX1	Moloney Electric	16	0.0%	92.3	0%	>20
10	HST-FPH-SWYD-AUX2	Moloney Electric	16	0.0%	92.3	0%	>20

2.6 Data Gaps

The data for in service Station Service Transformers included age only.

The data gaps for this asset category are as follows:

Table 2-3 Data Gap for Station Service Transformers

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
DGA Oil Analysis	Insulation	☆☆☆	Insulation degradation or defects	Testing
Oil Quality Analysis		☆☆☆		
Power Dissipation Factor Test		☆☆☆		
Cooling	Cooling	☆☆	Temperature beyond limit	Maintenance and/or Inspection records
Gasket	Sealing & Connection	☆☆	Sealing issue	
Leakage		☆☆	Leakage of oil	
Oil Conservator		☆☆	Oil conservator corrosion	
Grounding		☆	Defect in bonding and grounding	
Connection		☆☆	Defect due to installation	
Loading	Service Records	☆☆	Impact due to overloading	Operation records
Historic Removal Record		☆☆☆	Age at removal	Inventory Database

3 GROUNDING TRANSFORMERS

3.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Grounding Transformers age limiting curve are shown in the following table, based on industry practice.

Table 3-1 Age Limiting Curve Parameters - Grounding Transformers

Asset Type	α	β
Station Service Transformer	**56.4249**	**2.005**

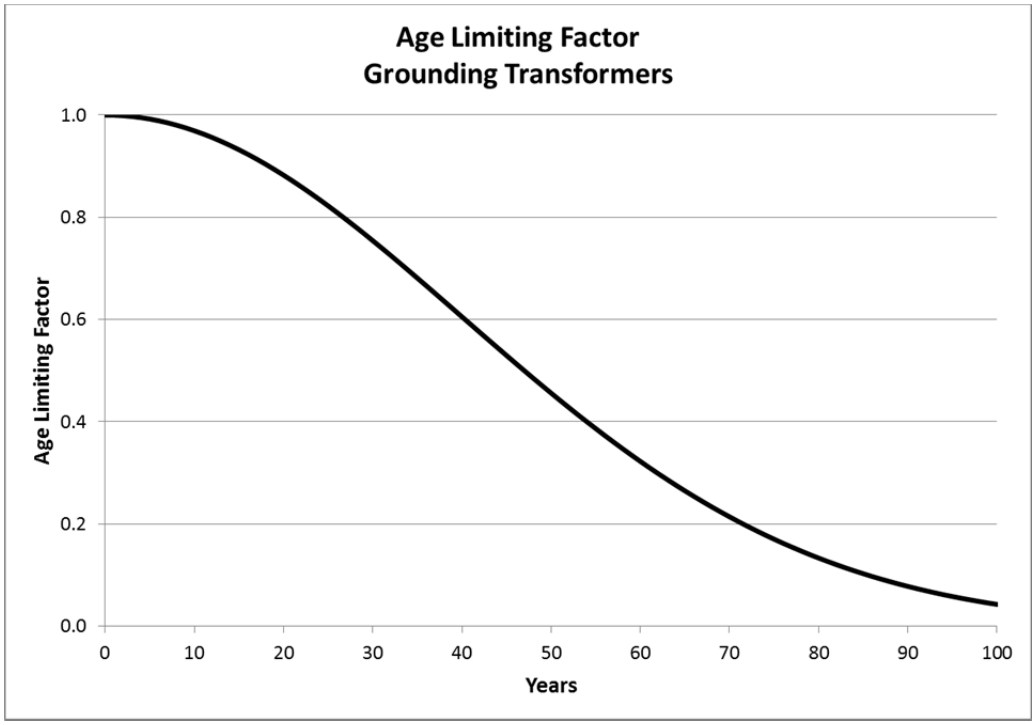

Figure 3-1 Age Limiting Factor Criteria - - Grounding Transformers

3.2 Age Distribution

The average age of all in service units was 20. The age distribution for Grounding Transformers was as follows.

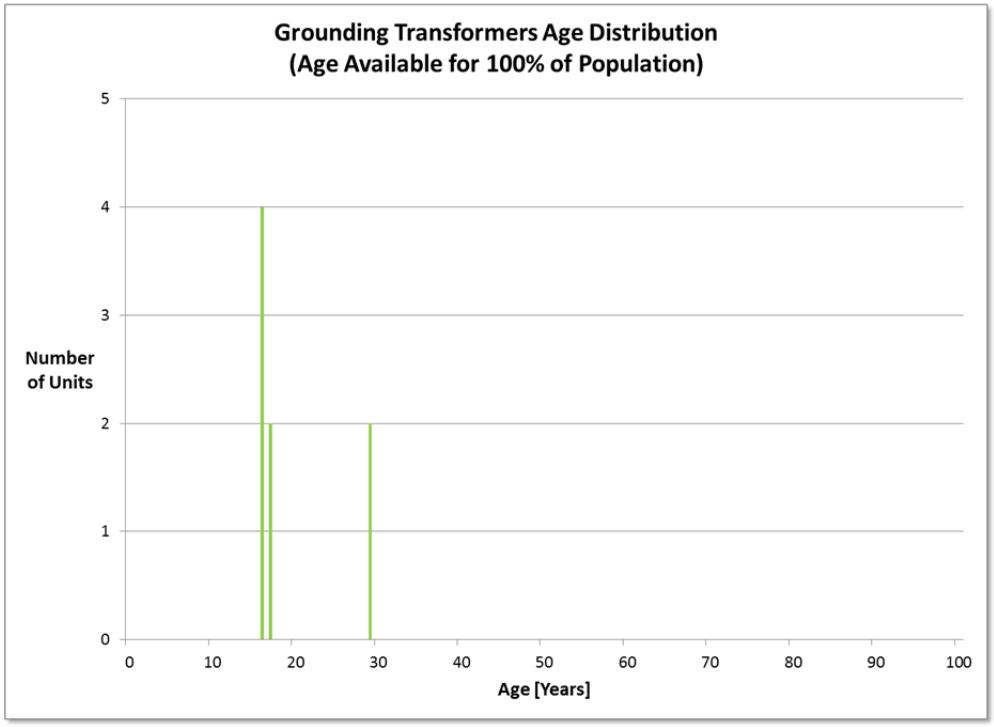

Figure 3-2 Age Distribution - Grounding Transformers

3.3 Health Index Results

There were 8 Grounding Transformers at EnWin. All of them had age data for a Health Indexing.

The average Health Index for this asset group was 88%.

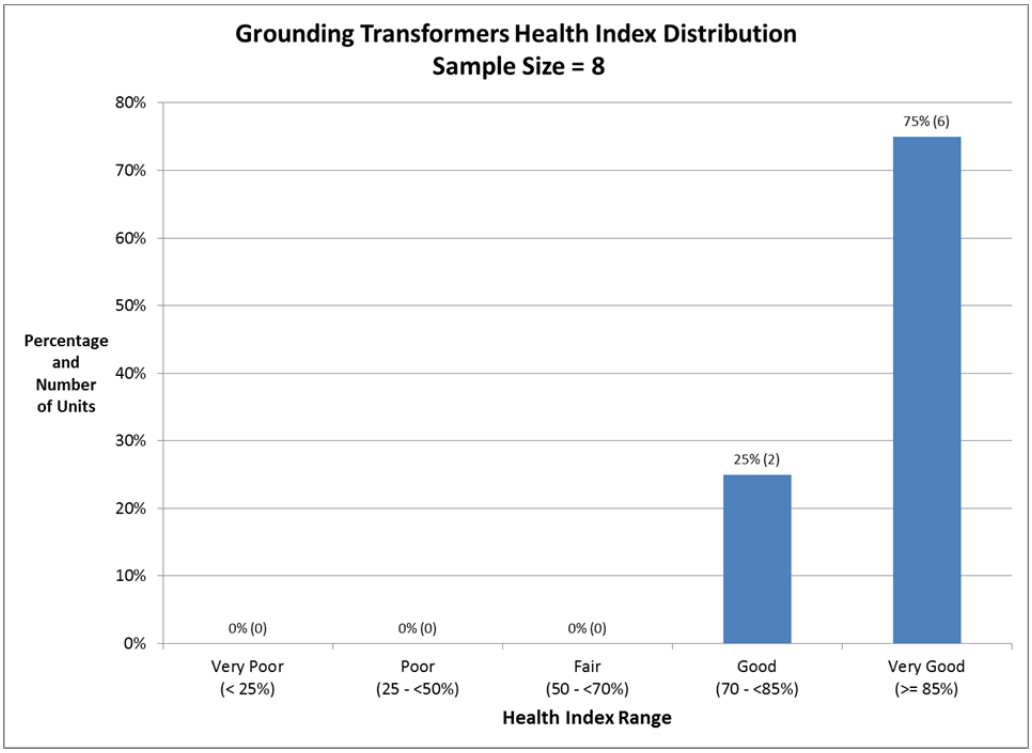

Figure 3-3 Health Index Distribution - Grounding Transformers

3.4 Flagged for Action Plan

As per study, there was no asset unit flagged for action in the next 10 years for Grounding Transformers.

3.5 Risk Based Prioritized List

The following table shows the risk based prioritization lists for each asset unit.

Table 3-2 Risk Based Prioritization List - Grounding Transformers

Rank	ID	Description	Age	DAI	HI (Final)	Criticality Percentage	FFA Year
1	HST-WK2-SWYD-AUX1	Fayetteville Transformer Co.	29	0.0%	76.9	0%	>20
2	HST-WK2-SWYD-AUX2	Fayetteville Transformer Co.	29	0.0%	76.9	0%	>20
3	HST-CHY-SWYD-ZIG1-TRNF	Pioneer	17	0.0%	91.4	0%	>20
4	HST-CHY-SWYD-ZIG2-TRNF	Pioneer	17	0.0%	91.4	0%	>20
5	HST-GMC-SWYD-ZIG1-TRNF	Pioneer	16	0.0%	92.3	0%	>20
6	HST-GMC-SWYD-ZIG2-TRNF	Pioneer	16	0.0%	92.3	0%	>20
7	HST-FPH-SWYD-ZIG1-TRNF	Pioneer	16	0.0%	92.3	0%	>20
8	HST-FPH-SWYD-ZIG2-TRNF	Pioneer	16	0.0%	92.3	0%	>20

3.6 Data Gaps

The data for in service Grounding Transformers included age only.

The data gaps for this asset category are as follows:

Table 3-3 Data Gap for Grounding Transformers

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
DGA Oil Analysis	Insulation	★★★	Insulation degradation or defects	Testing
Oil Quality Analysis		★★★		
Power Dissipation Factor Test		★★★		
Cooling	Cooling	★★	Temperature beyond limit	Maintenance and/or Inspection records
Gasket	Sealing & Connection	★★	Sealing issue	
Leakage		★★	Leakage of oil	
Oil Conservator		★★	Oil conservator corrosion	
Grounding		★	Defect in bonding and grounding	
Connection		★★	Defect due to installation	
Historic Removal Record		★★★	Age at removal	Inventory Database

4 INSTRUMENT TRANSFORMERS

4.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Instrument Transformers age limiting curve are shown in the following table, based on industry practice.

Table 4-1 Age Limiting Curve Parameters - Instrument Transformers

Asset Type	α	β
Station Service Transformer	**55.207**	**3.2131**

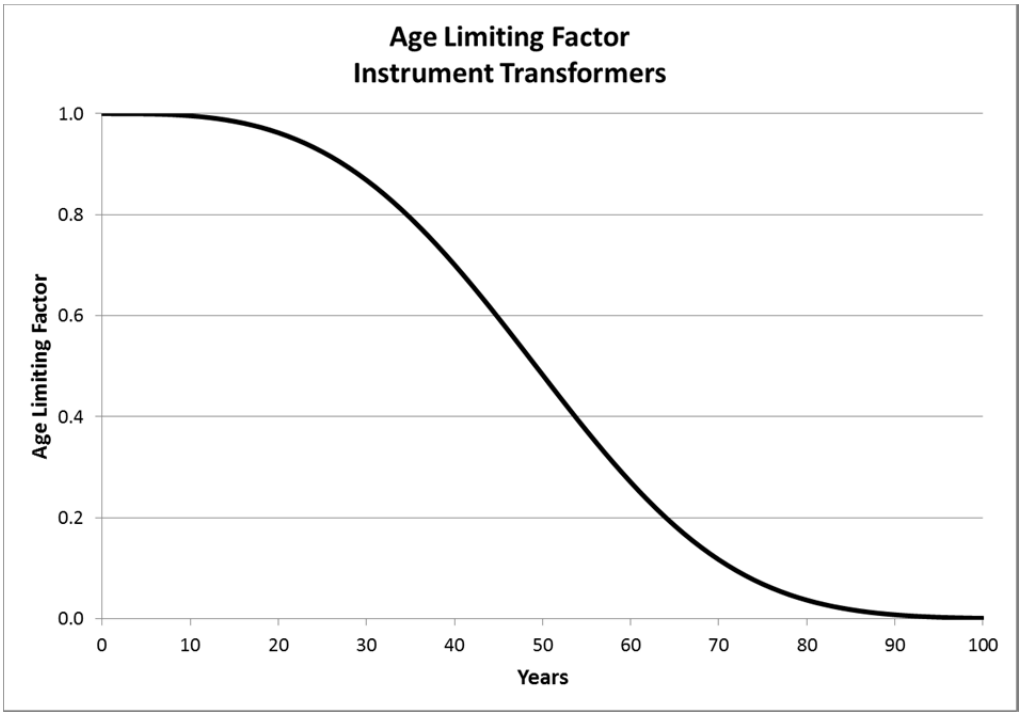

Figure 4-1 Age Limiting Factor Criteria - - Instrument Transformers

4.2 Age Distribution

The average age of all in service units was 20. The age distribution for Instrument Transformers was as follows.

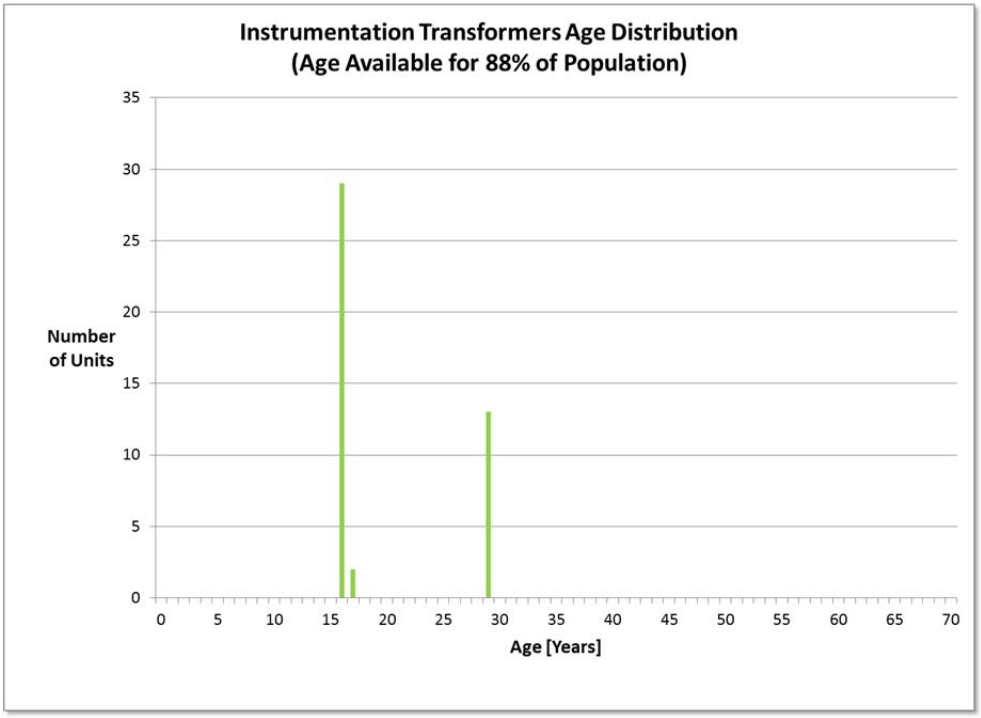

Figure 4-2 Age Distribution - Instrument Transformers

4.3 Health Index Results

There were 50 Instrument Transformers at EnWin. Among of them, 44 units had age data for a Health Indexing.

The average Health Index for this asset group was 95%.

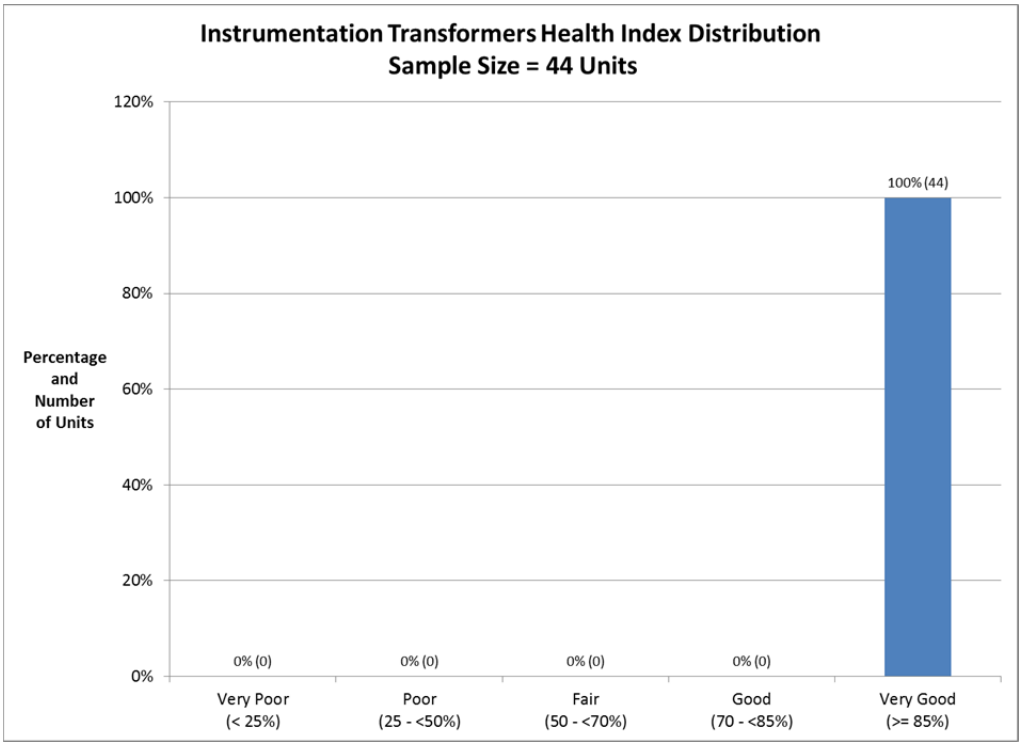

Figure 4-3 Health Index Distribution - Instrument Transformers

4.4 Flagged for Action Plan

The flagged for action plan for Instrument Transformers was based on the data from sample size and extrapolated to the entire population.

The flagged for action Plan was as follows:

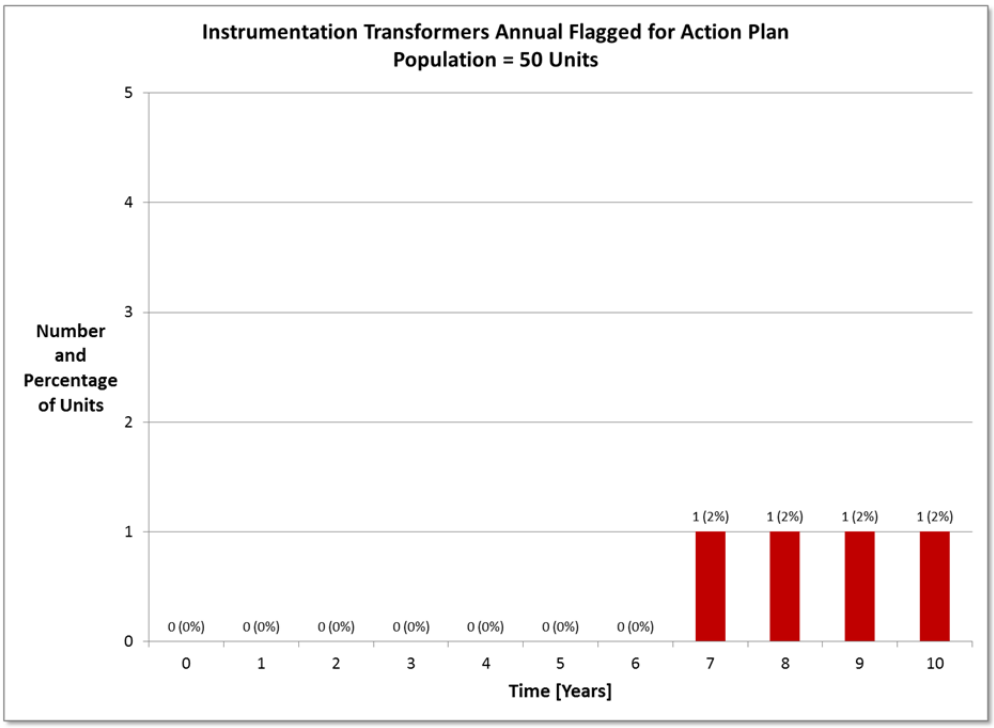

Figure 4-4 Flagged for Action Plan – Instrument Transformers

4.5 Data Gaps

The data for in service Instrument Transformers included age only.

The data gaps for this asset category are as follows:

Table 4-2 Data Gap for Instrument Transformers

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
DGA Oil Analysis	Insulation	★★★	Insulation degradation or defects	Testing
Oil Quality Analysis		★★★		
Power Dissipation Factor Test		★★★		
Gasket	Sealing & Connection	★★	Sealing issue	Maintenance and/or Inspection records
Leakage		★★	Leakage of oil	
Grounding		★	Defect in bonding and grounding	
Connection		★★	Defect due to installation	
Historic Removal Record		★★★	Age at removal	Inventory Database

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5 STATION BREAKERS

5.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

5.1.1 Condition and Sub-Condition Parameters

Table 5-1 Condition Parameter and Weights – Station Breakers

m	Condition Parameter	WCP_m	Sub-Condition Parameters
1	Contact Performance	1	Table 5-2
	Age Limiting	Overall Multiplier	Figure 5-1

Table 5-2 Contact Performance Sub-Condition Parameters and Weights (m=1) – Station Breakers

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Contact Resistance	1	Table 5-3

5.1.2 Condition Criteria

Contact Resistance

Contact resistance test results of breaker are checked against the maximum allowable specification limits.

Table 5-3 Contact Resistance Results Criteria - Station Breakers

Score	Description (for SF6 Breakers)
4	< 120 uOhm
3	120 – 150 uOhm
1	150 – 180 uOhm
0	> 180 uOhm

Age Limiting Factor

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Station Breakers (both stand alone and switchgear) age limiting curve are shown in the following table, based on industry practice.

Table 5-4 Age Limiting Curve Parameters - Station Breakers

Asset Type	α	β
Stand Alone/Switchgear	**39.632**	**3.4437**

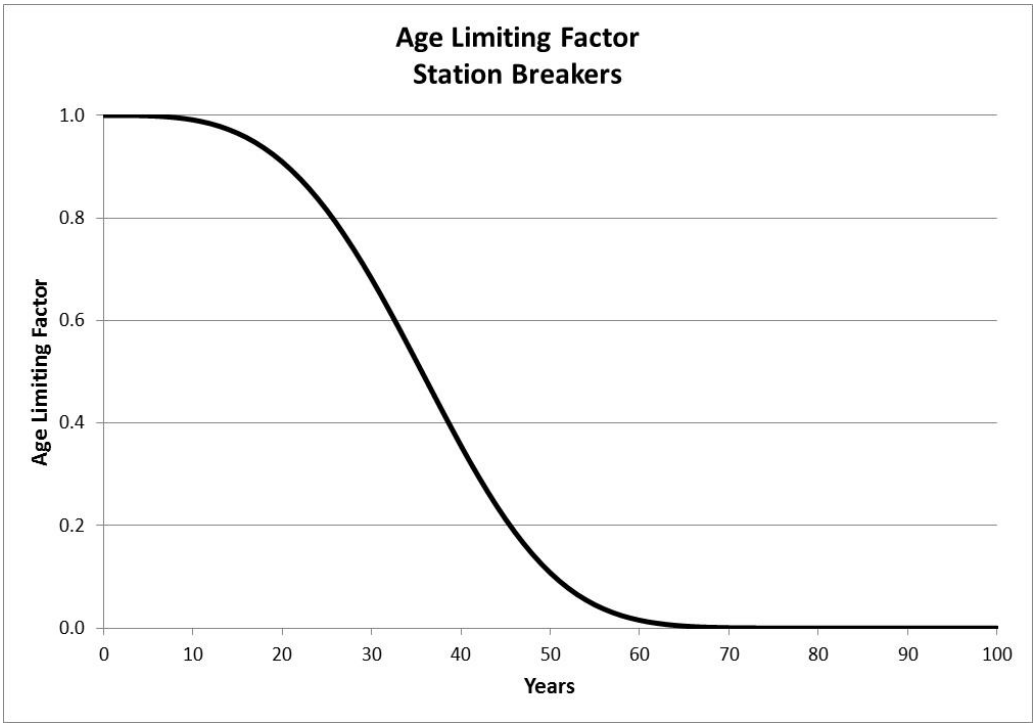

Figure 5-1 Age Limiting Factor Criteria - - Station Breakers

5.2 Age Distribution

The average ages were 28 and 16, for stand alone type and switchgear type Station Breakers respectively. The age distributions were as follows.

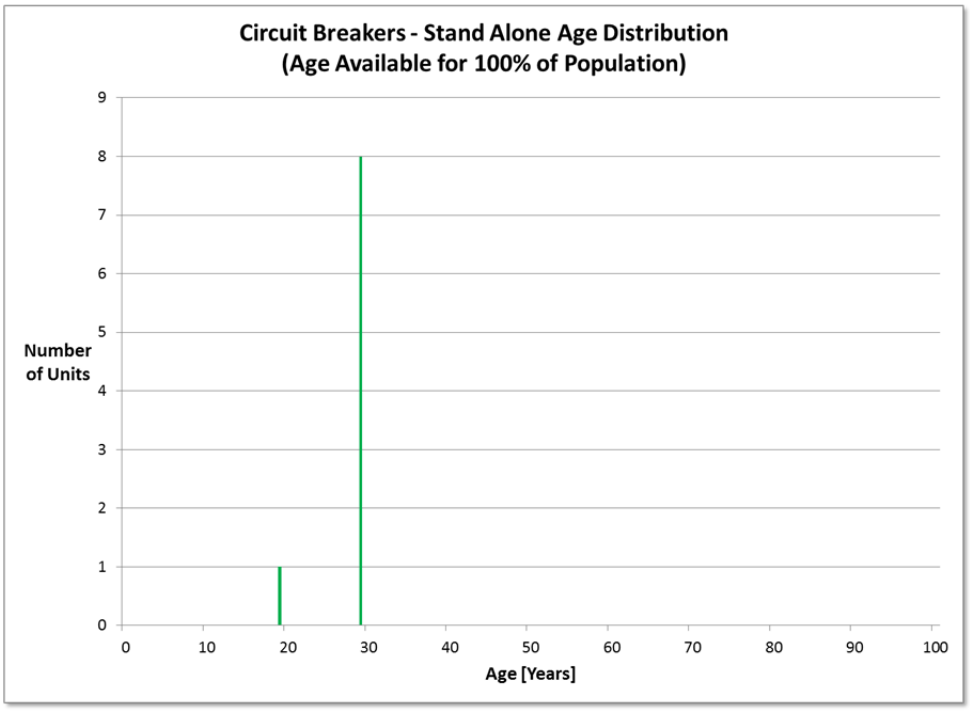

Figure 5-2 Age Distribution –Station Breakers (Stand Alone)

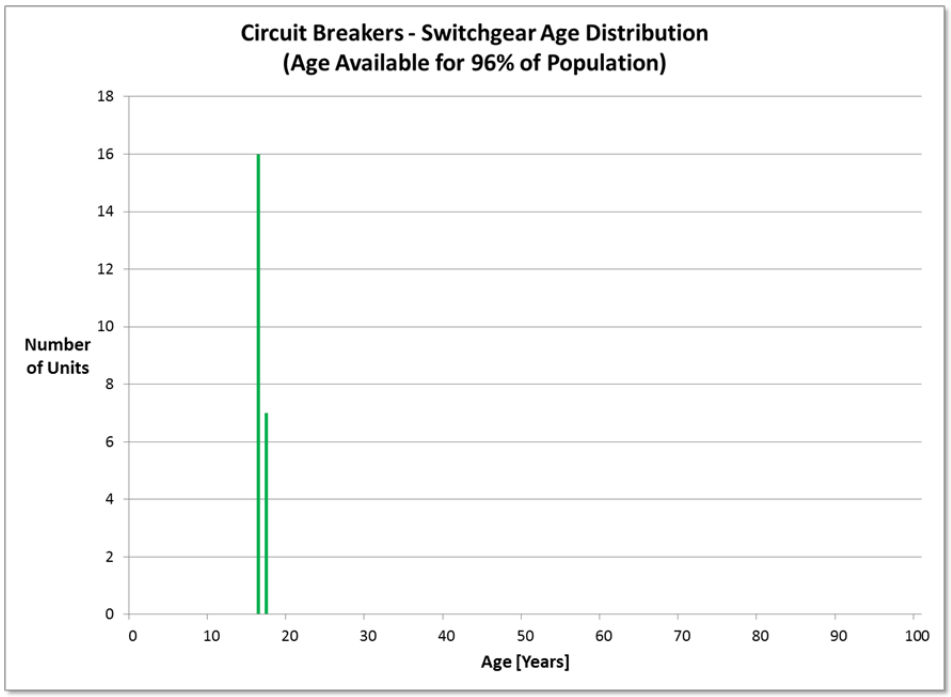

Figure 5-3 Age Distribution –Station Breakers (Switchgear)

5.3 Health Index Results

There were 9 units of stand alone Station Breakers at EnWin. All of them had sufficient data for a Health Indexing.

There were 24 units of switchgear Station Breakers at EnWin. Among them, 23 units had sufficient data for a Health Indexing.

The average Health Index was 73% and 83% for stand alone and switchgear asset units respectively.

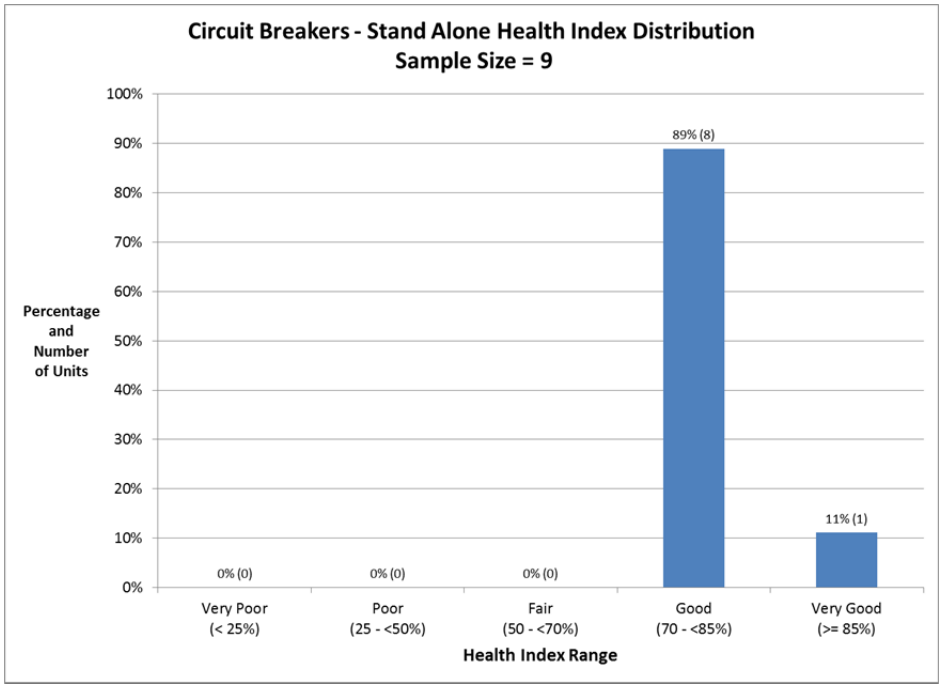

Figure 5-4 Health Index Distribution –Station Breakers (Stand Alone)

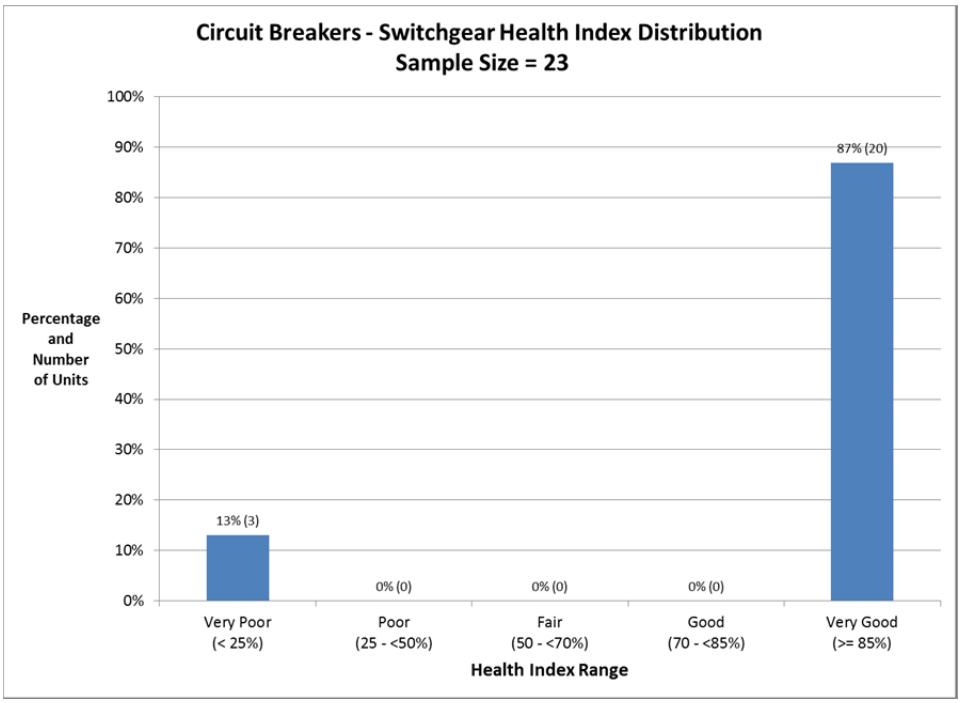

Figure 5-5 Health Index Distribution – Station Breakers (Switchgear)

5.4 Flagged for Action Plan

As per study, there was no asset unit flagged for action in the next 10 years, for stand alone Station Breakers.

The flagged for action plans for switchgear Station Breakers were as follows:

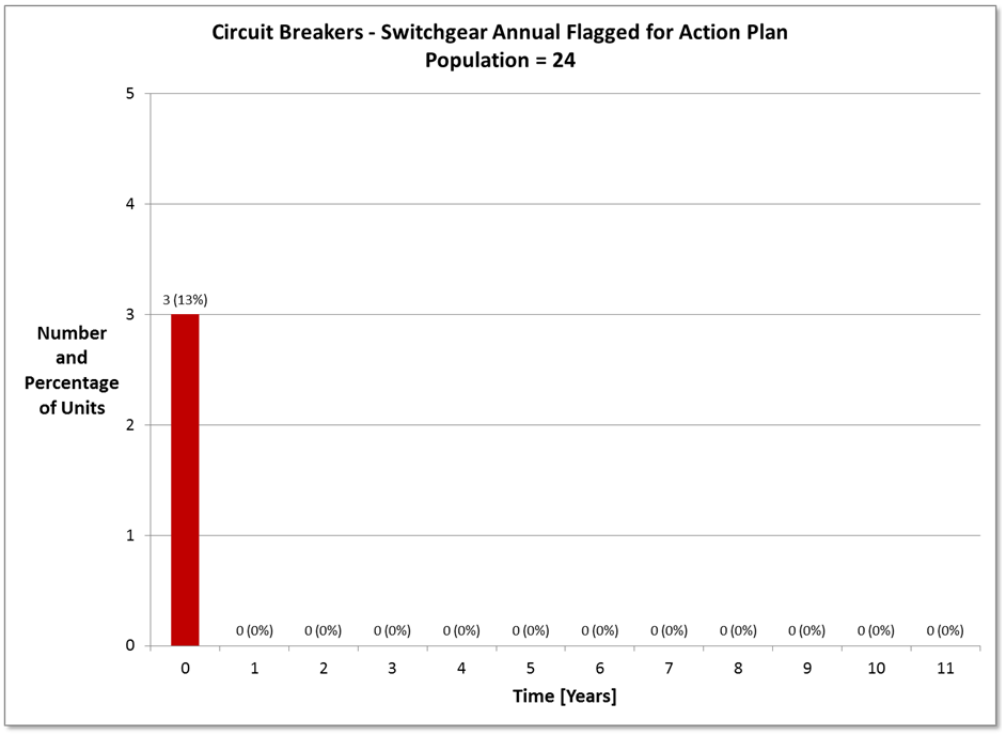

Figure 5-6 Flagged for Action Plan – Station Breakers (Switchgear)

5.5 Risk Based Prioritized List

The following table shows the risk based prioritization lists, for stand alone and switchgear asset units respectively.

Table 5-5 Risk Based Prioritization List - Station Breakers (Stand Alone)

Rank	ID	Location	Sub-Category	Interruption Medium	Age	DAI	HI (Final)	HI Category	Criticality Index	Risk Index 100%=Most Risk 0% = Least Risk	FFA Year
1	55M22	HST-WK2-SWYD-CB22-BK01	Stand Alone	SF6	29	100.0%	71.1	Good	0%	6.2%	>20
2	55T1B	HST-WK2-SWYD-CB1B-BK01	Stand Alone	SF6	29	100.0%	71.1	Good	0%	6.2%	>20
3	55BY	HST-WK2-SWYD-CBBY-BK01	Stand Alone	SF6	29	100.0%	71.1	Good	0%	6.2%	>20
4	55T2Y	HST-WK2-SWYD-CB2Y-BK01	Stand Alone	SF6	29	100.0%	71.1	Good	0%	6.2%	>20
5	55M21	HST-WK2-SWYD-CB21-BK01	Stand Alone	SF6	29	100.0%	71.1	Good	0%	6.2%	>20
6	55M23	HST-WK2-SWYD-CB23-BK01	Stand Alone	SF6	29	100.0%	71.1	Good	0%	6.2%	>20
7	55M24	HST-WK2-SWYD-CB24-BK01	Stand Alone	SF6	29	100.0%	71.1	Good	0%	6.2%	>20
8	55M25	HST-WK2-SWYD-CB25-BK01	Stand Alone	SF6	29	100.0%	71.1	Good	0%	6.2%	>20
9	55SC1	HST-WK2-SWYD-CBSC-BK01	Stand Alone	SF6	19	0.0%	92.4	Very Good	0%	0.1%	>20

Table 5-6 Risk Based Prioritization List - Station Breakers (Switchgear)

Rank	ID	Location	Sub-Category	Interruption Medium	Age	DAI	HI (Final)	HI Category	Criticality Index	Risk Index 100%=Most Risk 0% = Least Risk	FFA Year
1	31M1	HST-FAX-BULD-SWGR-C103	Switchgear	SF6	16	100.0%	0.0	Very Poor	0%	83.3%	0
2	31T1B	HST-FAX-BULD-SWGR-C105	Switchgear	SF6	16	100.0%	0.0	Very Poor	0%	83.3%	0
3	5T2Y	HST-FPH-BULD-SWGR-C009	Switchgear	SF6	16	100.0%	0.0	Very Poor	0%	83.3%	0
4	2M3	HST-CHY-BULD-SWGR-C002	Switchgear	SF6	17	100.0%	94.7	Very Good	0%	0.0%	>20
5	2M1	HST-CHY-BULD-SWGR-C003	Switchgear	SF6	17	100.0%	94.7	Very Good	0%	0.0%	>20
6	2T1B	HST-CHY-BULD-SWGR-C004	Switchgear	SF6	17	100.0%	94.7	Very Good	0%	0.0%	>20
7	2M2	HST-CHY-BULD-SWGR-C010	Switchgear	SF6	17	100.0%	94.7	Very Good	0%	0.0%	>20
8	2M4	HST-CHY-BULD-SWGR-C011	Switchgear	SF6	17	100.0%	94.7	Very Good	0%	0.0%	>20
9	2BY	HST-CHY-BULD-SWGR-C006	Switchgear	SF6	17	100.0%	94.7	Very Good	0%	0.0%	>20
10	2T2Y	HST-CHY-BULD-SWGR-C009	Switchgear	SF6	17	100.0%	94.7	Very Good	0%	0.0%	>20
11	31M3	HST-FAX-BULD-SWGR-C102	Switchgear	SF6	16	0.0%	95.7	Very Good	0%	0.0%	>20
12	31BY	HST-FAX-BULD-SWGR-C107	Switchgear	SF6	16	0.0%	95.7	Very Good	0%	0.0%	>20
13	31M2	HST-FAX-BULD-SWGR-C110	Switchgear	SF6	16	0.0%	95.7	Very Good	0%	0.0%	>20
14	31M4	HST-FAX-BULD-SWGR-C111	Switchgear	SF6	16	0.0%	95.7	Very Good	0%	0.0%	>20
15	4M1	HST-GMC-BULD-SWGR-C002	Switchgear	SF6	16	0.0%	95.7	Very Good	0%	0.0%	>20
16	4BY	HST-GMC-BULD-SWGR-C005	Switchgear	SF6	16	0.0%	95.7	Very Good	0%	0.0%	>20
17	5M1	HST-FPH-BULD-SWGR-C003	Switchgear	SF6	16	0.0%	95.7	Very Good	0%	0.0%	>20
18	5M2	HST-FPH-BULD-SWGR-C010	Switchgear	SF6	16	0.0%	95.7	Very Good	0%	0.0%	>20
19	5BY	HST-FPH-BULD-SWGR-C006	Switchgear	SF6	16	0.0%	95.7	Very Good	0%	0.0%	>20
20	31T2Y	HST-FAX-BULD-SWGR-C108	Switchgear	SF6	16	100.0%	95.7	Very Good	0%	0.0%	>20
21	4T1B	HST-GMC-BULD-SWGR-C003	Switchgear	SF6	16	100.0%	95.7	Very Good	0%	0.0%	>20
22	4T2Y	HST-GMC-BULD-SWGR-C008	Switchgear	SF6	16	100.0%	95.7	Very Good	0%	0.0%	>20
23	5T1B	HST-FPH-BULD-SWGR-C004	Switchgear	SF6	16	100.0%	95.7	Very Good	0%	0.0%	>20
24	4M2	HST-GMC-BULD-SWGR-C009	Switchgear	SF6		0.0%			0%		

5.6 Data Gaps

Data for Station Breakers (both stand alone and switchgear) included age and contact resistance tes results.

The following table shows the data gaps.

Table 5-7 Data Gap for Station Breakers

Data Gap (Sub-Condition Parameter)	Parent Condition Parameter	Priority	Description	Source of Data
Lubrication	Operating Mechanism	★★	Mechanism not properly lubricated	Inspection/ Maintenance Records
Linkage		★★	Mechanical operability issue	
Cabinet		★	Control loop abnormal	
Timing Test Results	Contact Performance	★★★	Close time too long	Testing
Contact Over-Travel		★★	Contact travel distance insufficient	
Arc Contact		★	Contact erosion	Visual inspection or on-site testing
Heater	Arc Extinction	★	Heater malfunction risking oil condensation	Inspection/ Maintenance Records
Leakage		★★	Arc extinction medium leakage	
Interrupter		★★	Arc extinction medium issue	Testing
Power Dissipation Factor Test	Insulation	★★	Insulation damage	Inspection/ Maintenance Records
Operating Count	Service Record	★★	Usage	Operation record
Historic Removal Record		★★★	Age at removal	Inventory Database

6 STATION SWITCHES

6.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Station Switches age limiting curve are shown in the following table, based on industry practice.

Table 6-1 Age Limiting Curve Parameters - Station Switches

Asset Type	α	β
Station Switches	**60.265**	**3.3492**

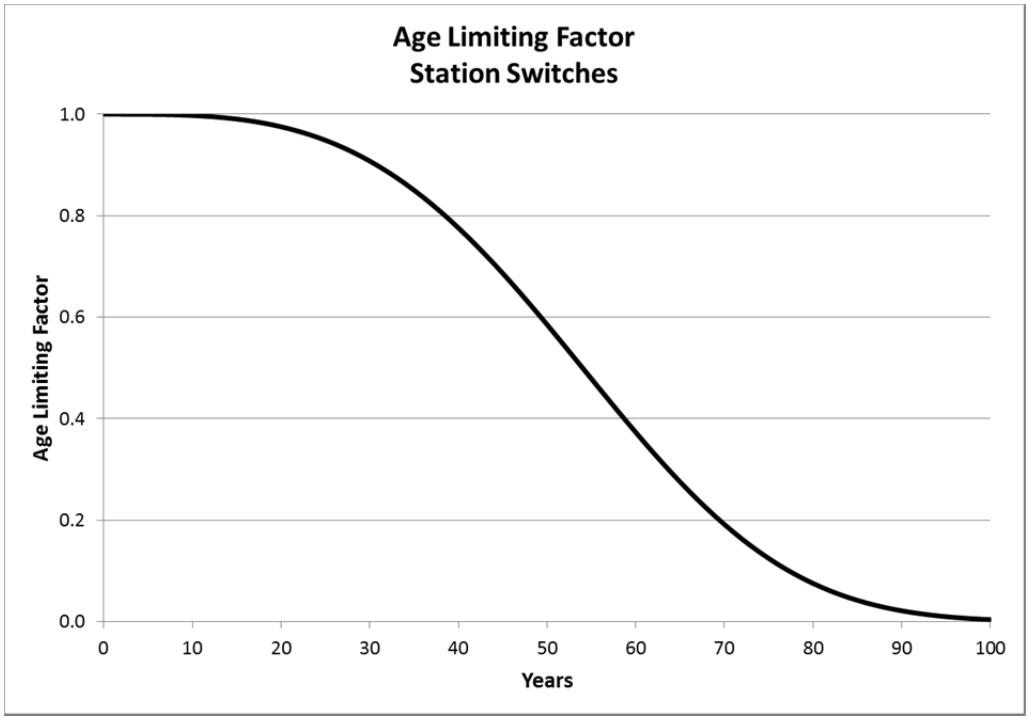

Figure 6-1 Age Limiting Factor Criteria - - Station Switches

6.2 Age Distribution

The average age of all in service units was 19. The age distribution for Station Switches was as follows.

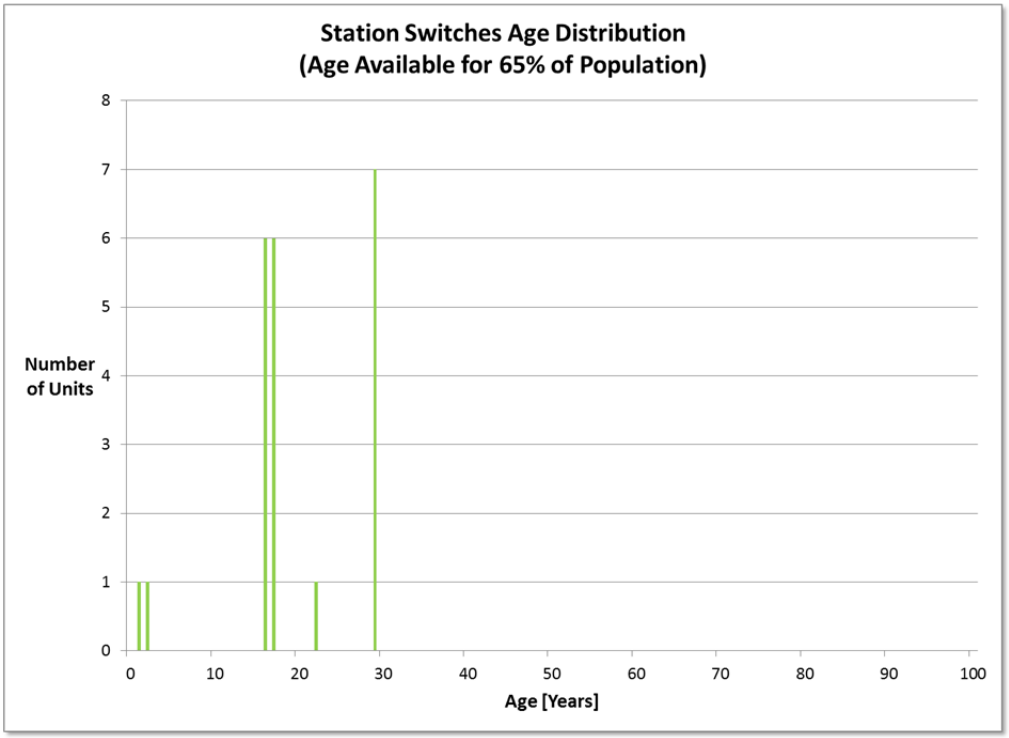

Figure 6-2 Age Distribution - Station Switches

6.3 Health Index Results

There were 34 Station Switches at EnWin. Among them, 22 units had age data for a Health Indexing.

The average Health Index for this asset group was 97%.

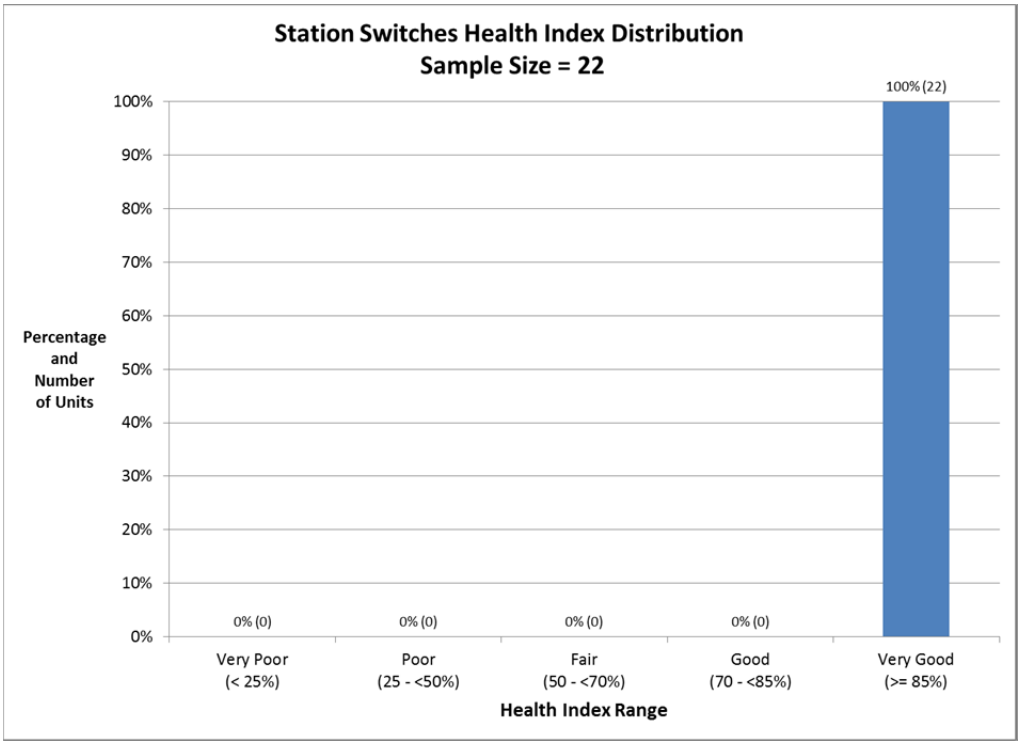

Figure 6-3 Health Index Distribution - Station Switches

6.4 Flagged for Action Plan

As per study, there was no asset unit flagged for action in the next 10 years for Station Switches.

6.5 Risk Based Prioritized List

The following table shows the risk based prioritization lists for each asset unit.

Table 6-2 Risk Based Prioritization List - Station Switches

Rank	ID	Description	Age	DAI	HI (Final)	Criticality Percentage	FFA Year
1	HST-WK2-SWYD-CB1B-DS01	Kearney	29	0.0%	91.7	0%	>20
2	HST-WK2-SWYD-CB2Y-DS01	Kearney	29	0.0%	91.7	0%	>20
3	HST-WK2-SWYD-CBBY-DS01	Kearney	29	0.0%	91.7	0%	>20
4	HST-WK2-SWYD-CBBY-DS02	Kearney	29	0.0%	91.7	0%	>20
5	HST-WK2-SWYD-DS01	Dominion Cutout	29	0.0%	91.7	0%	>20
6	HST-WK2-SWYD-DS02	Dominion Cutout	29	0.0%	91.7	0%	>20
7	HST-WK2-SWYD-DS03	Dominion Cutout	29	0.0%	91.7	0%	>20
8	HST-WK2-SWYD-CBSC-DS01	S & C Electric	22	0.0%	96.6	0%	>20
9	HST-CHY-SWYD-BUS1-DS01	S & C Electric	17	0.0%	98.6	0%	>20
10	HST-CHY-SWYD-BUS1-DS02	S & C Electric	17	0.0%	98.6	0%	>20
11	HST-CHY-SWYD-BUS2-DS01	S & C Electric	17	0.0%	98.6	0%	>20
12	HST-CHY-SWYD-BUS2-DS02	S & C Electric	17	0.0%	98.6	0%	>20
13	HST-CHY-SWYD-CS01-HVUT	S & C Electric	17	0.0%	98.6	0%	>20
14	HST-CHY-SWYD-CS02-HVUT	S & C Electric	17	0.0%	98.6	0%	>20
15	HST-FAX-SWYD-CS01-HVUT	S & C Electric	16	0.0%	98.8	0%	>20
16	HST-FAX-SWYD-CS02-HVUT	S & C Electric	16	0.0%	98.8	0%	>20
17	HST-FPH-SWYD-CS01-HVUT	S & C Electric	16	0.0%	98.8	0%	>20
18	HST-FPH-SWYD-CS02-HVUT	S & C Electric	16	0.0%	98.8	0%	>20

Rank	ID	Description	Age	DAI	HI (Final)	Criticality Percentage	FFA Year
19	HST-GMC-SWYD-CS01-HVUT	S & C Electric	16	0.0%	98.8	0%	>20
20	HST-GMC-SWYD-CS02-HVUT	S & C Electric	16	0.0%	98.8	0%	>20
21	HST-WK2-SWYD-DS02-HVUT	Southers States	2	0.0%	100.0	0%	>20
22	HST-WK2-SWYD-DS01-HVUT	Southers States	1	0.0%	100.0	0%	>20
23	HST-WK2-SWYD-CB21-DS01	S & C Electric		0.0%		0%	
24	HST-WK2-SWYD-CB21-DS02	S & C Electric		0.0%		0%	
25	HST-WK2-SWYD-CB22-DS01	S & C Electric		0.0%		0%	
26	HST-WK2-SWYD-CB22-DS02	S & C Electric		0.0%		0%	
27	HST-WK2-SWYD-CB23-DS01	S & C Electric		0.0%		0%	
28	HST-WK2-SWYD-CB23-DS02	S & C Electric		0.0%		0%	
29	HST-WK2-SWYD-CB24-DS01	S & C Electric		0.0%		0%	
30	HST-WK2-SWYD-CB24-DS02	S & C Electric		0.0%		0%	
31	HST-WK2-SWYD-CB25-DS01	S & C Electric		0.0%		0%	
32	HST-WK2-SWYD-CB25-DS02	S & C Electric		0.0%		0%	
33	HST-WK2-SWYD-CB26-DS01	S & C Electric		0.0%		0%	
34	HST-WK2-SWYD-CB26-DS02	S & C Electric		0.0%		0%	

6.6 Data Gaps

The data for in service Station Switches included age only.

The data gaps for this asset category are as follows:

Table 6-3 Data Gap for Station Switches

Data Gap (Sub-Condition Parameter)	Parent Condition Parameter	Priority	Description	Source of Data
Lubrication	Operating Mechanism	☆☆	Mechanism not properly lubricated	Inspection/ Maintenance Records
Linkage		☆☆	Switching functionality	
Cabinet		☆	Control cabinet issue	
Blade	Contact Performance	☆☆☆	Surface contamination /worn-out	
Latch		☆☆	Alignment issue	
Arc Horn	Arc Extinction	☆	Surface worn-out	
Interrupter		☆☆		
Insulator	Insulation	☆☆	Insulator defect	
Operating Count	Service Record	☆☆	Usage	Operation record
Historic Removal Record		☆☆☆	Age at removal	Inventory Database

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7 RELAYS

7.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Relays age limiting curve are shown in the following table, based on industry practice.

Table 7-1 Age Limiting Curve Parameters - Relays

Asset Type	α	β
Relays	**17.7112**	**9.0278**

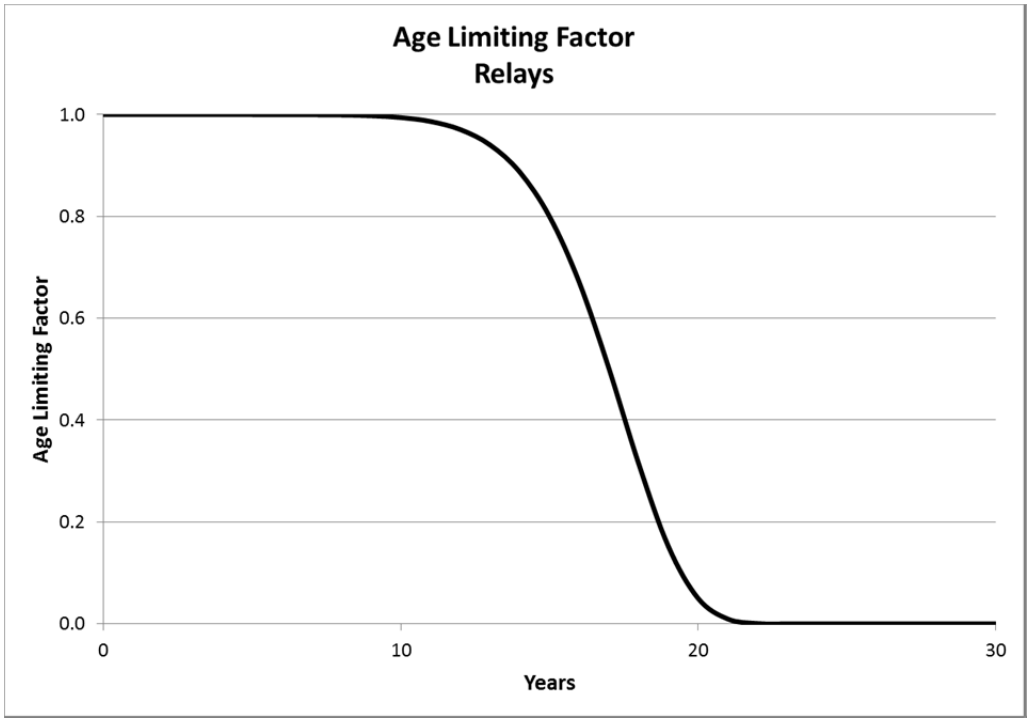

Figure 7-1 Age Limiting Factor Criteria - - Relays

7.2 Age Distribution

The average age of all in service units was 6. The age distribution for Relays was as follows.

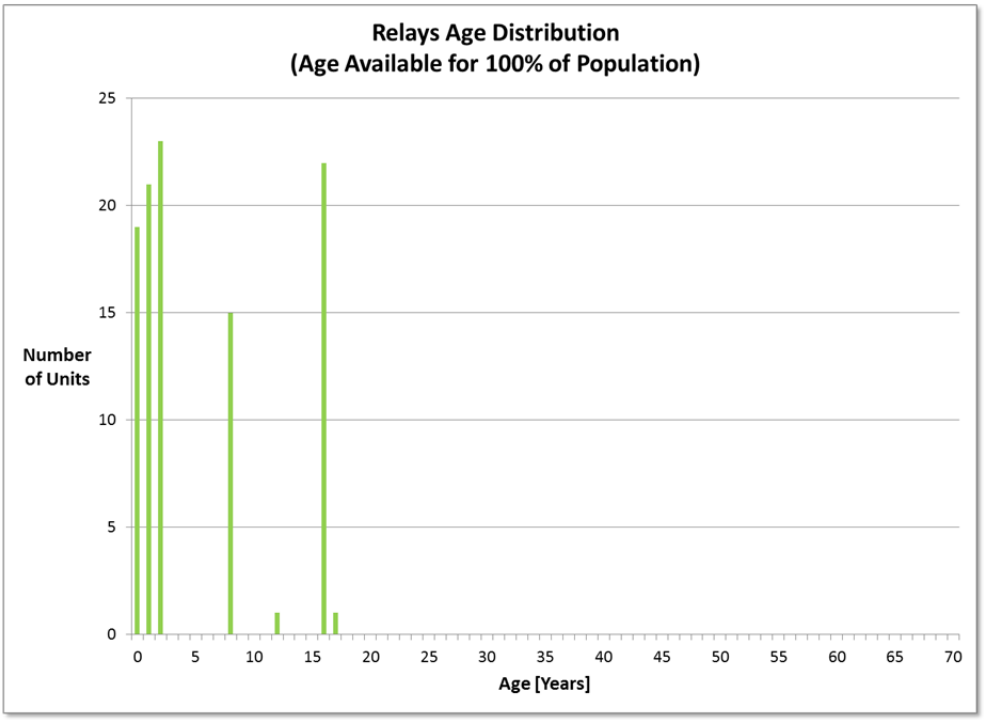

Figure 7-2 Age Distribution - Relays

7.3 Health Index Results

There were 102 Relays at EnWin. All of them had age data for a Health Indexing.

The average Health Index for this asset group was 92%.

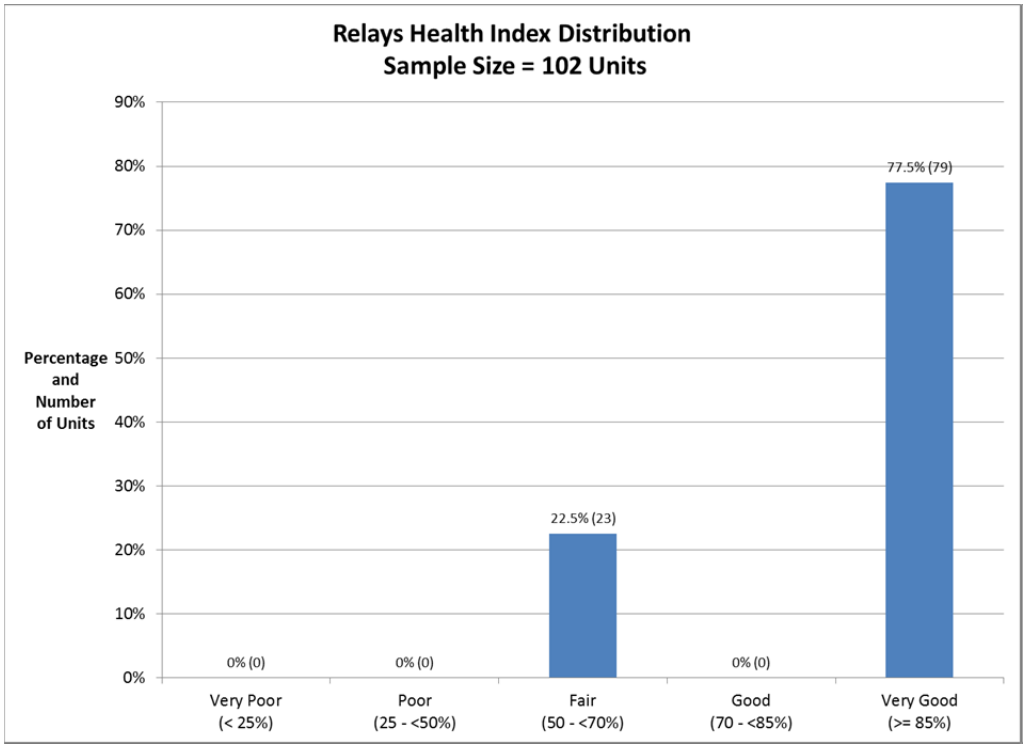

Figure 7-3 Health Index Distribution - Relays

7.4 Flagged for Action Plan

The flagged for action Plan was as follows:

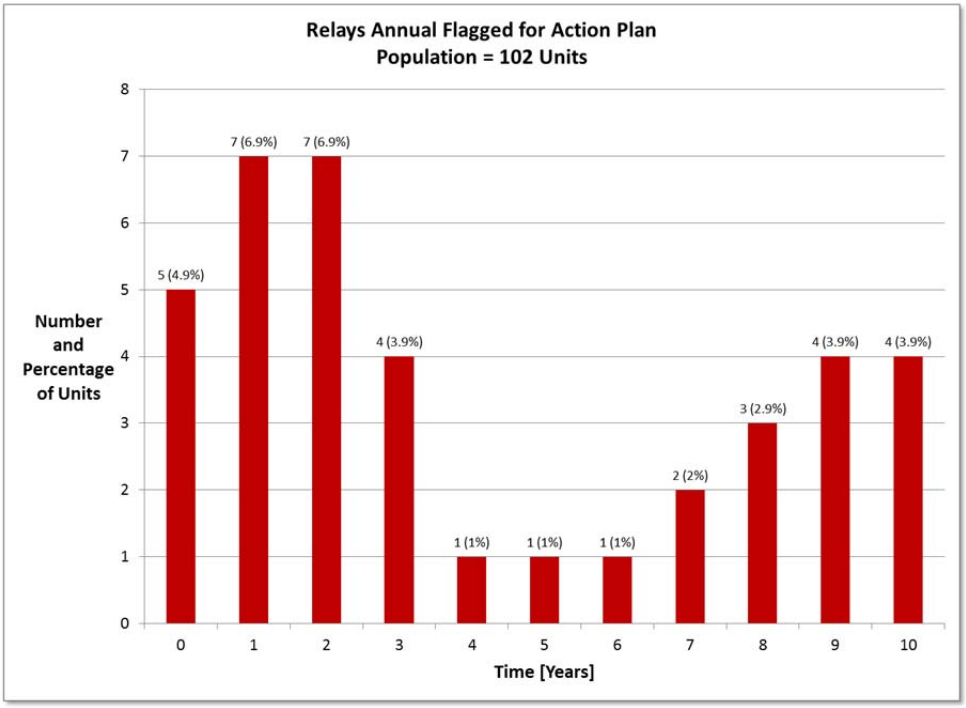

Figure 7-4 Flagged for Action Plan – Relays

7.5 Data Gaps

The data for in service Relays included age only.

The data gaps for this asset category are as follows:

Table 7-2 Data Gap for Relays

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
Power Supply	Functionality	★★	Power supply module defect	Maintenance and/or Inspection records
Insulation		★	Insulation degradation	
Connection		★	Wiring issue	
Calibration Count	Calibration	★★	Intervention count	
Historic Removal Record		★★★	Age at removal	Inventory Database

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8 STATION PLCS

8.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Station PLCs age limiting curve are shown in the following table, based on industry practice.

Table 8-1 Age Limiting Curve Parameters - Station PLCs

Asset Type	α	β
Station PLCs	**13.8317**	**2.5801**

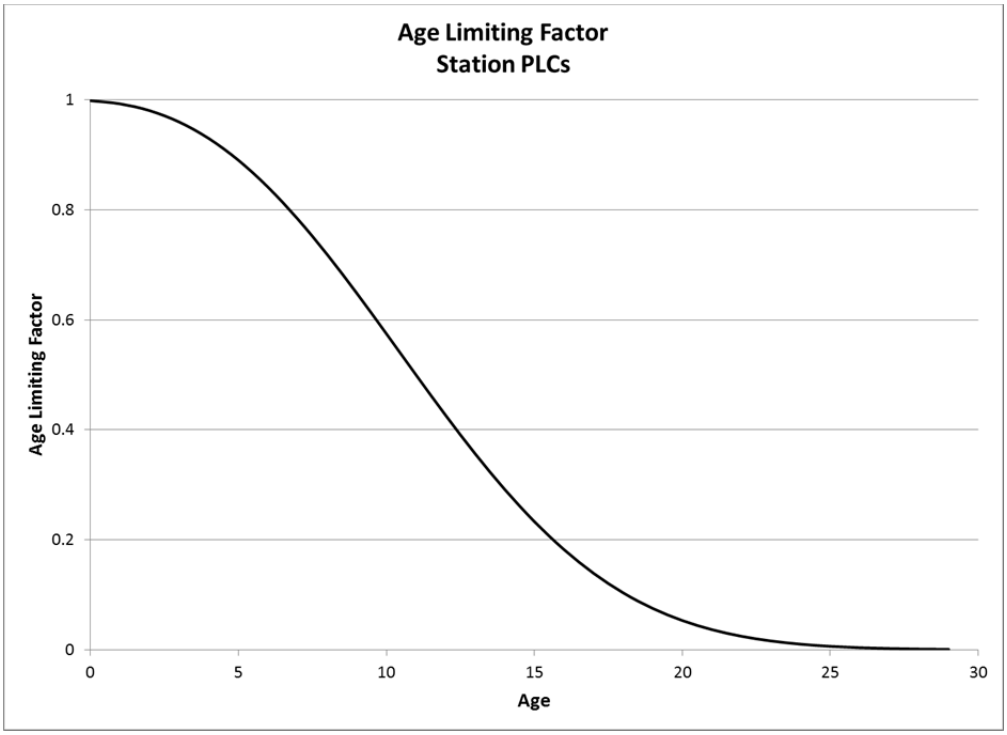

Figure 8-1 Age Limiting Factor Criteria - - Station PLCs

8.2 Age Distribution

The average age of all in service units was 8. The age distribution for Station PLCs was as follows.

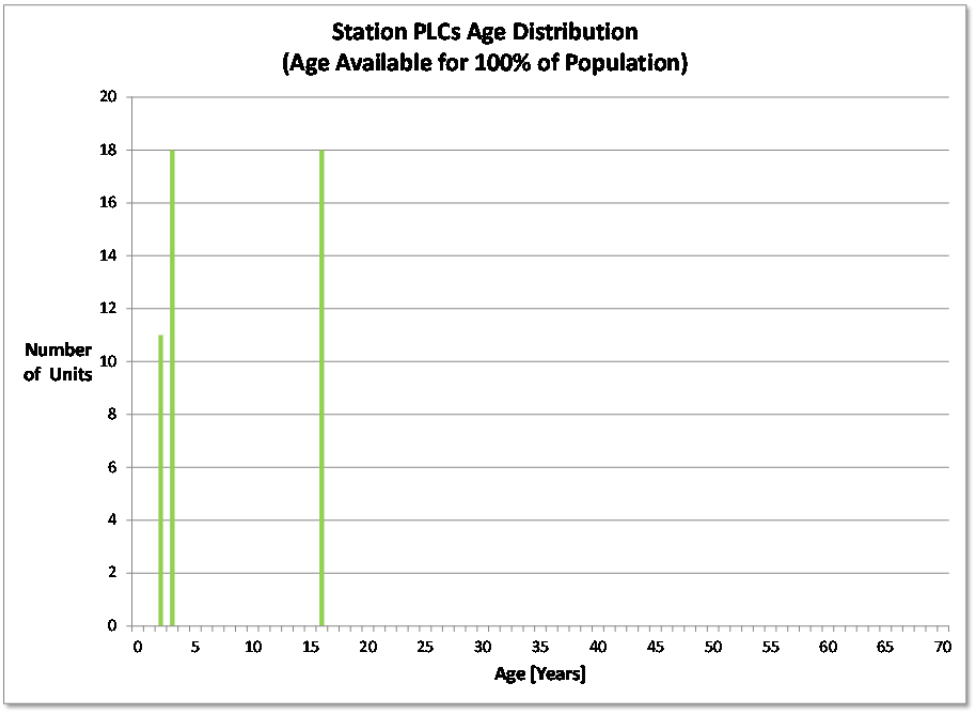

Figure 8-2 Age Distribution - Station PLCs

8.3 Health Index Results

There were 47 Station PLCs at EnWin. All of them had age data for a Health Indexing.

The average Health Index for this asset group was 70%.

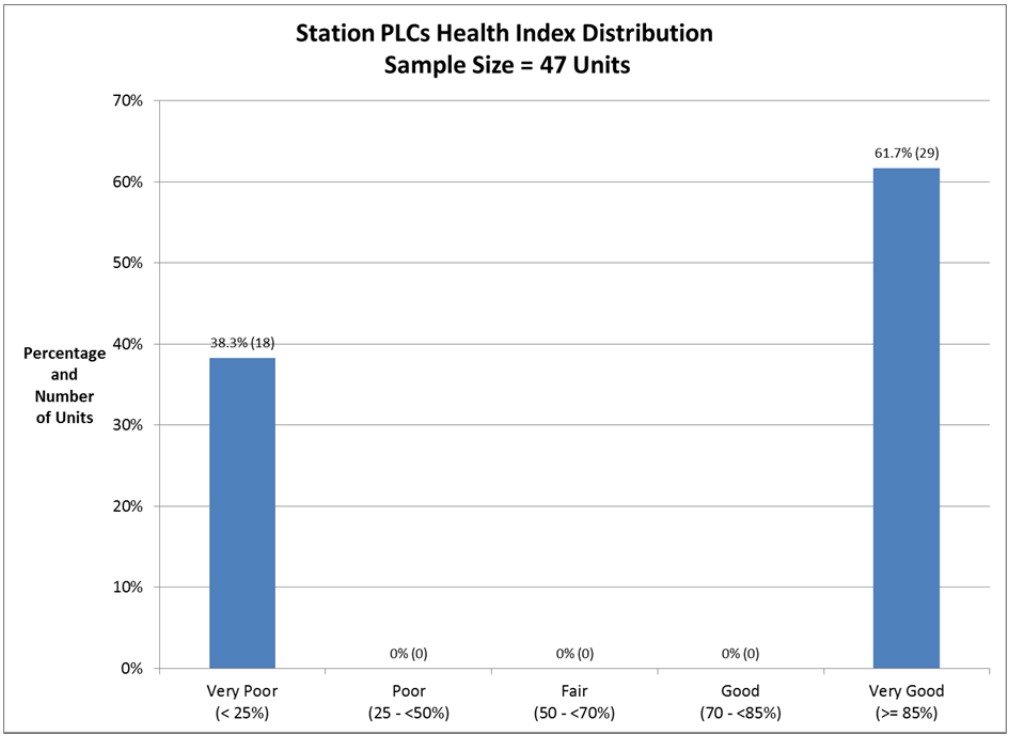

Figure 8-3 Health Index Distribution - Station PLCs

8.4 Flagged for Action Plan

The flagged for action plan was as follows:

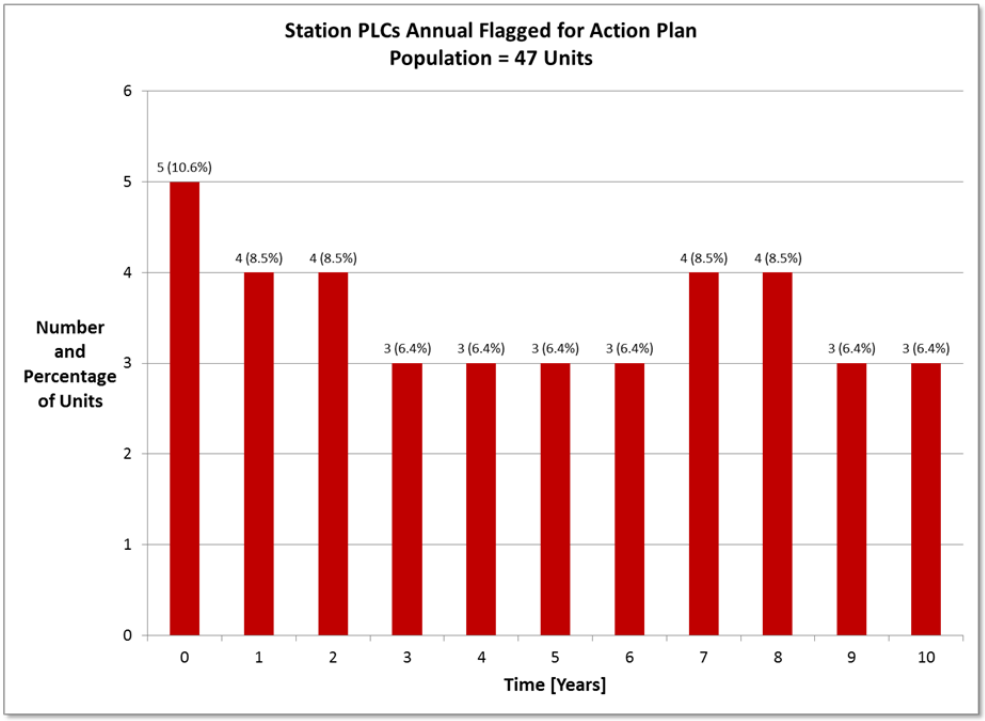

Figure 8-4 Flagged for Action Plan – Station PLCs

8.5 Data Gaps

The data for in service Station PLCs included age only.

The data gaps for this asset category are as follows:

Table 8-2 Data Gap for Station PLCs

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
WO Count	Service Record	☆☆	Number of corrective maintenance work orders	Operation records
Historic Removal Record		☆☆☆	Age at removal	Inventory Database

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9 STATION BATTERIES

9.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Station Batteries age limiting curve are shown in the following table, based on industry practice.

Table 9-1 Age Limiting Curve Parameters - Station Batteries

Asset Type	α	β
Station Batteries	**14.7121**	**2.662**

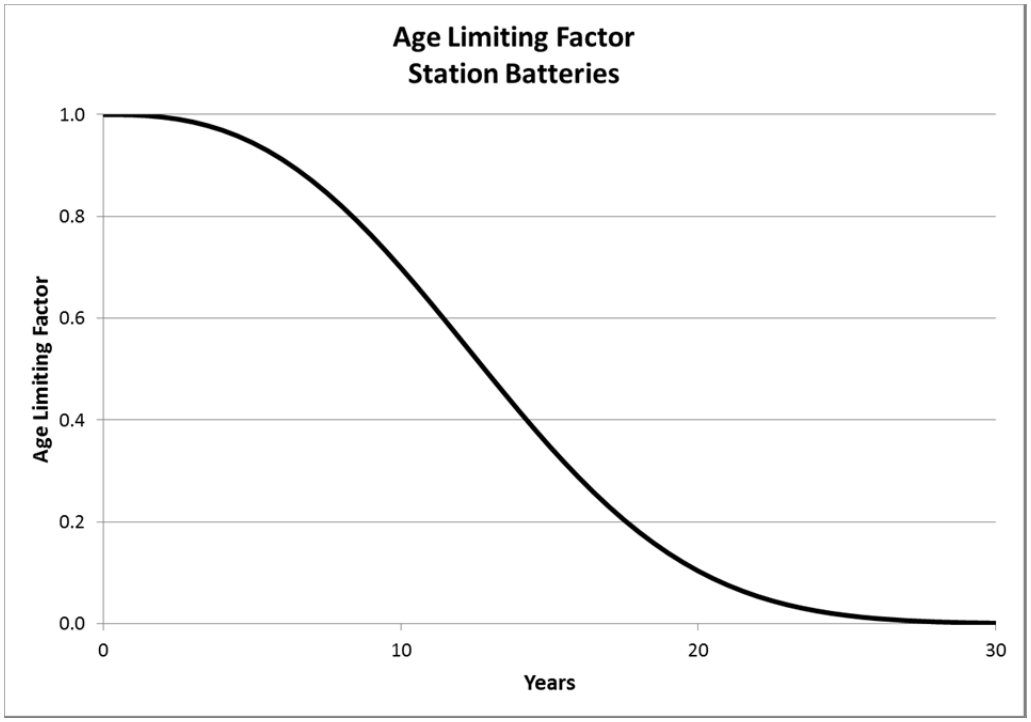

Figure 9-1 Age Limiting Factor Criteria - - Station Batteries

9.2 Age Distribution

The average age of all in service units was 1. The age distribution for Station Batteries was as follows.

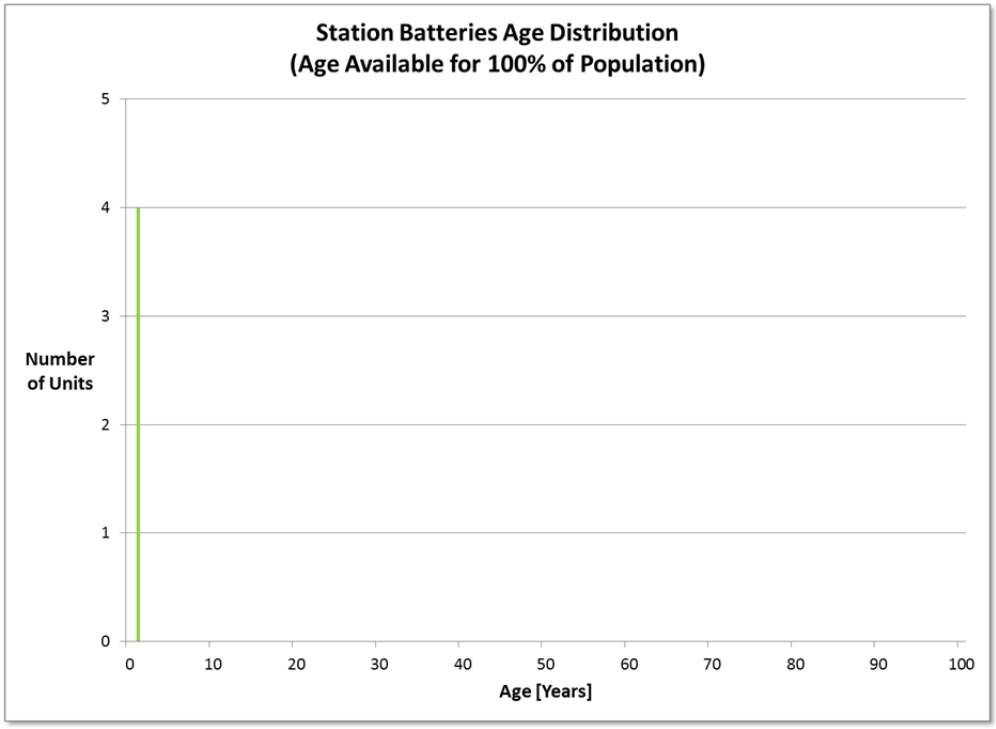

Figure 9-2 Age Distribution - Station Batteries

9.3 Health Index Results

There were 4 Station Batteries at EnWin. All of them had age data for a Health Indexing.

The average Health Index for this asset group was 100%.

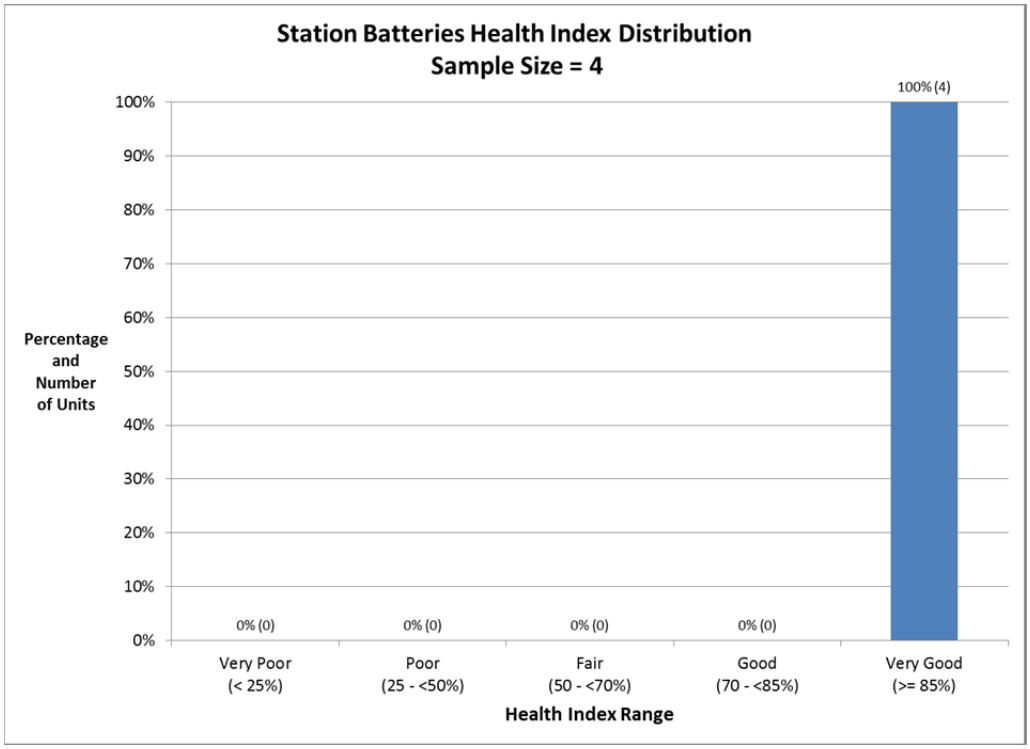

Figure 9-3 Health Index Distribution - Station Batteries

9.4 Flagged for Action Plan

As per study, there was no asset unit flagged for action in the next 10 years for Station Batteries.

9.5 Risk Based Prioritized List

The following table shows the risk based prioritization lists for each asset unit.

Table 9-2 Risk Based Prioritization List - Station Batteries

Rank	ID	Description	Age	DAI	HI (Final)	Criticality Percentage	FFA Year
1	HST-CHY-BULD-CHGR-BATT	C-Can Power System Inc	1	0.0%	99.9	0%	>20
2	HST-FAX-BULD-CHGR-BATT	C-Can Power System Inc	1	0.0%	99.9	0%	>20
3	HST-GMC-BULD-CHGR-BATT	Enersys	1	0.0%	99.9	0%	>20
4	HST-FPH-BULD-CHGR-BATT	Enersys	1	0.0%	99.9	0%	>20

9.6 Data Gaps

The data for in service Station Batteries included age only.

The data gaps for this asset category are as follows:

Table 9-3 Data Gap for Station Batteries

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
DC Ground	Physical Condition	☆	Grounding connection issue	Maintenance and/or Inspection records
Wire Connection		☆☆	Connection issue	
Inter-cell Resistance		☆☆☆	Connection between cells	Testing
Cell Impedance	Battery Condition	☆☆☆	Cell internal impedance change	
Bank Capacity		☆☆☆	Low capacity	
Cell Leaking		☆☆	Leakage	Maintenance and/or Inspection records
Cell corrosion		☆	Surface damage	
Charger	Charger Condition	☆	Charger operation abnormal	
Temperature	Operation Environment	☆☆	Storage temperature beyond limits	Testing
Float Voltage		☆☆	Cell voltage low	
Specific Gravity		☆☆	Low specific gravity	
Electrolyte Level		☆	Cell chemical liquid loss	On-site inspection
Equalizing Charge		☆	Maintenance issue	Service record
Cell Replacement %	Service record	☆☆	Replacement frequency	Service record
Historic Removal Record		☆☆☆	Age at removal	Inventory Database

10 RECLOSERS

10.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

10.1.1 Condition and Sub-Condition Parameters

Table 10-1 Condition Parameter and Weights – Reclosers

m	Condition Parameter	WCP_m	Sub-Condition Parameters
1	Service Record	1	Table 10-2
	Age Limiting	Overall Multiplier	Figure 10-1

Table 10-2 Service Record Sub-Condition Parameters and Weights (m=1) – Reclosers

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Overall Maintenance	1	Table 10-3

10.1.2 Condition Criteria

Overall Maintenance

Table 10-3 Overall Maintenance Count Criteria - Reclosers

Score	"Notification Count" Value
4	Notification Count <3*
3	3 ≤ Notification Count < 6
2	6 ≤ Notification Count < 9
1	9 ≤ Notification Count < 12
0	Notification Count ≥ 12

Where "Notification Count" is calculated as below:

Year	Severity Score 1	2	3	4	Weight
2017	Low	Medium	High	Critical	1
2016					0.9
2015					0.8
2014					0.7
2013					0.6
2012					0.5
2011					0.4
2010					0.3
2009					0.2
2008					0.1

Notification Count = $\sum Score_i \times Weight_i$

Where *i* refers to the year the CM was conducted

In case no severity information is available, a notification is assigned a default severity of 3

Age Limiting Factor

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Reclosers age limiting curve are shown in the following table, based on industry practice.

Table 10-4 Age Limiting Curve Parameters - Reclosers

Asset Type	α	β
Recloser	**44.9657**	**1.789**

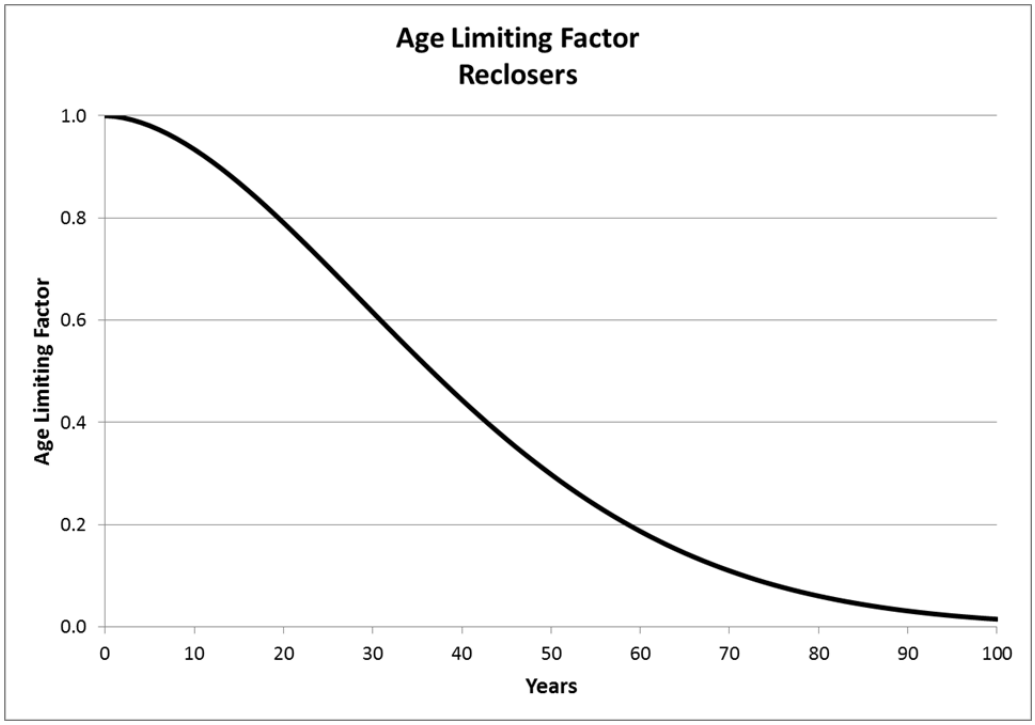

Figure 10-1 Age Limiting Factor Criteria - - Reclosers

10.2 Age Distribution

The average age was 9 for Reclosers. The age distributions were as follows.

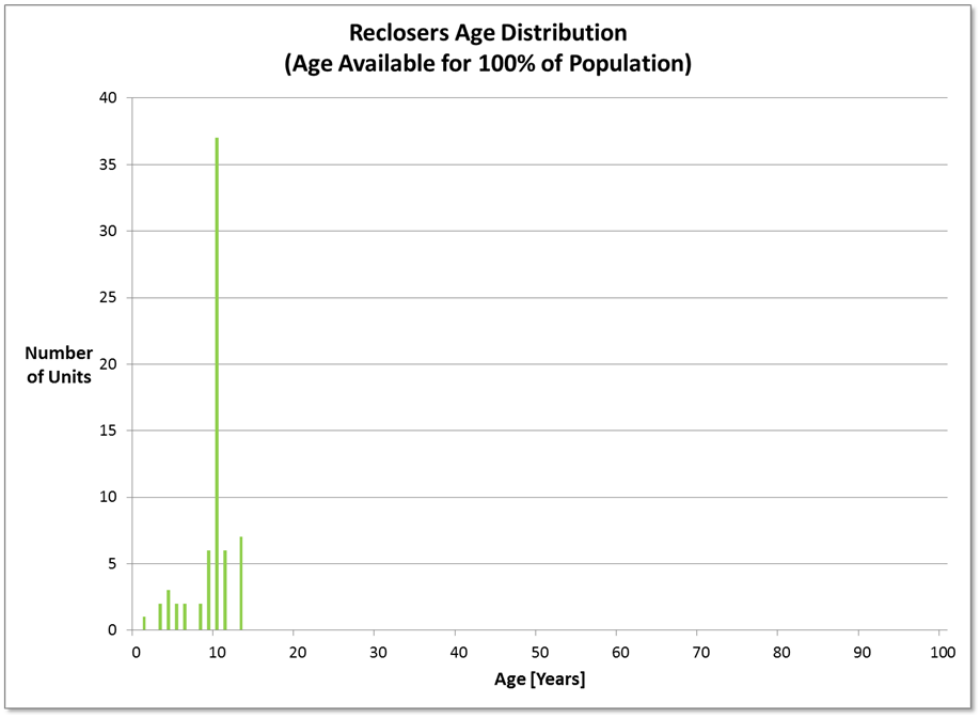

Figure 10-2 Age Distribution –Reclosers

10.3 Health Index Results

There were 68 units of Reclosers at EnWin. All of them had sufficient data for a Health Indexing.

The average Health Index was 92% for the asset units.

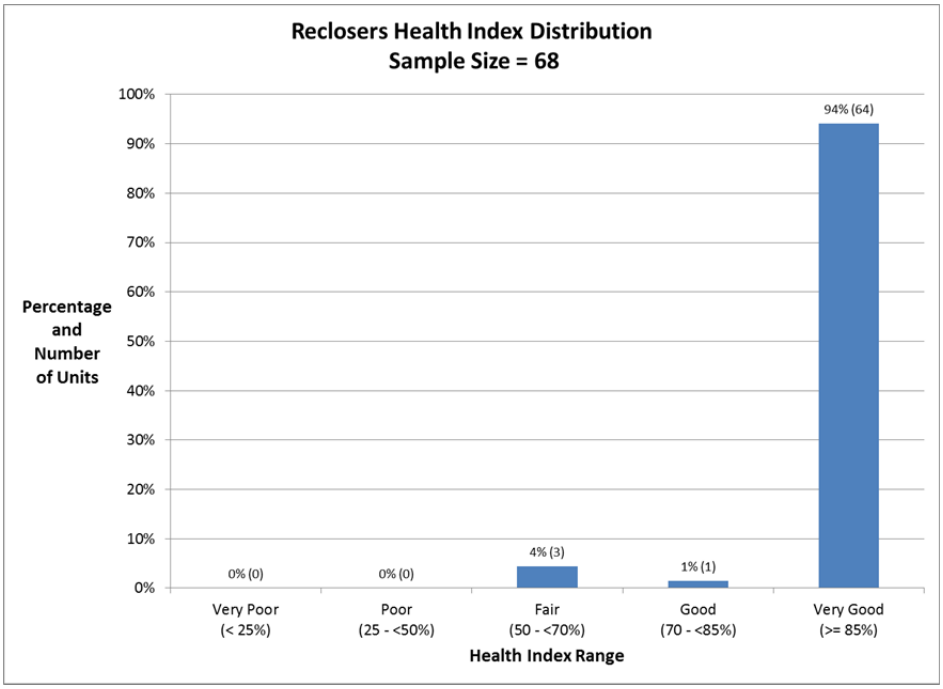

Figure 10-3 Health Index Distribution –Reclosers

10.4 Flagged for Action Plan

The flagged for action plan was as follows:

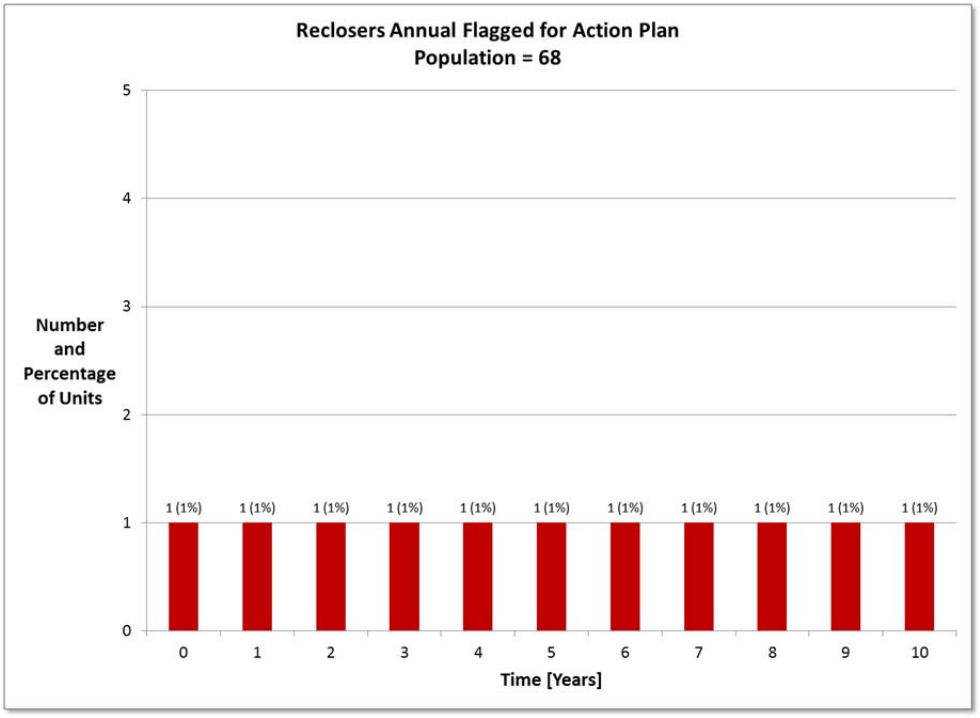

Figure 10-4 Flagged for Action Plan – Reclosers

10.5 Data Gaps

Data for Reclosers included age and overall count of notifications.

The following table shows the data gaps.

Table 10-5 Data Gap for Reclosers

Data Gap (Sub-Condition Parameter)	Parent Condition Parameter	Priority	Description	Source of Data
Linkage	Operating Mechanism	☆☆	Mechanical operability issue	Inspection/ Maintenance Records
Cabinet		☆	Control loop abnormal	
Leakage	Arc Extinction	☆☆	Arc extinction medium leakage	
Interrupter		☆☆	Arc extinction medium issue	
Insulator	Insulation	☆☆	Insulation damage	
Operating Count	Service Record	☆☆	Usage	Operation record
Historic Removal Record		☆☆☆	Age at removal	Inventory Database

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11 OVERHEAD SWITCHES

11.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

11.1.1 Condition and Sub-Condition Parameters

Table 11-1 Condition Parameter and Weights – Overhead Switches

m	Condition Parameter	WCP_m	Sub-Condition Parameters
1	Service Record	1	Table 11-2
	Age Limiting	Overall Multiplier	Figure 11-1

Table 11-2 Service Record Sub-Condition Parameters and Weights (m=1) – Overhead Switches

n	Sub-Condition Parameter	$WCPF_n$	Condition Criteria Table
1	Overall Maintenance	1	Table 11-3

11.1.2 Condition Criteria

Overall Maintenance

Table 11-3 Overall Maintenance Count Criteria - Overhead Switches

Score	"Notification Count" Value
4	Notification Count <3*
3	3 ≤ Notification Count < 6
2	6 ≤ Notification Count < 9
1	9 ≤ Notification Count < 12
0	Notification Count ≥ 12

Where "Notification Count" is calculated as below:

Year	Severity Score 1	2	3	4	Weight
2017	Low	Medium	High	Critical	1
2016					0.9
2015					0.8
2014					0.7
2013					0.6
2012					0.5
2011					0.4
2010					0.3
2009					0.2
2008					0.1

Notification Count = $\sum Score_i \times Weight_i$

Where *i* refers to the year the CM was conducted

In case no severity information is available, a notification is assigned a default severity of 3

Age Limiting Factor

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Overhead Switches age limiting curve are shown in the following table, based on EnWin historic removal records.

Table 11-4 Age Limiting Curve Parameters - Overhead Switches

Asset Type	α	β
Recloser	**29.4403**	**4.701**

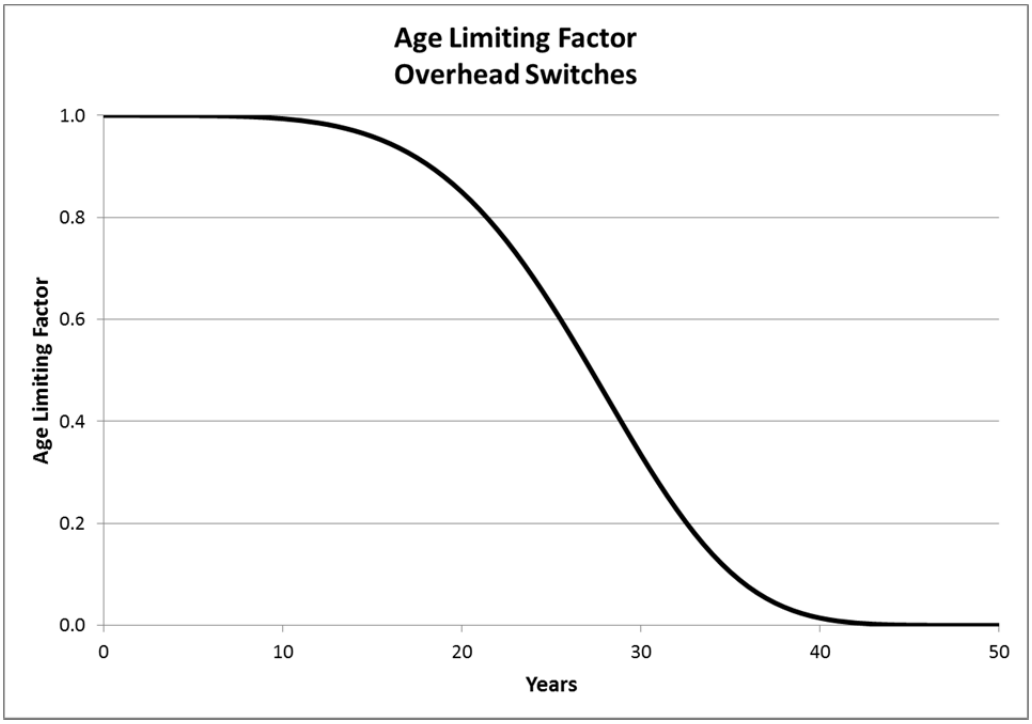

Figure 11-1 Age Limiting Factor Criteria - - Overhead Switches

11.2 Age Distribution

The average ages were 21 and 3, for manual and remote Overhead Switches respectively. The age distributions were as follows.

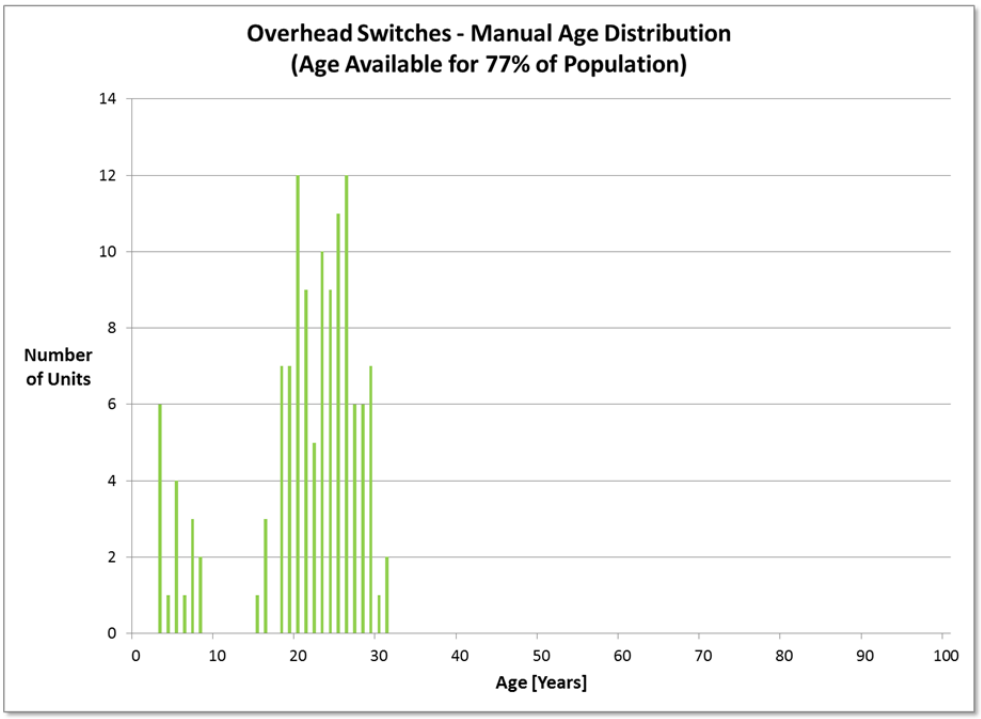

Figure 11-2 Age Distribution –Overhead Switches (Manual)

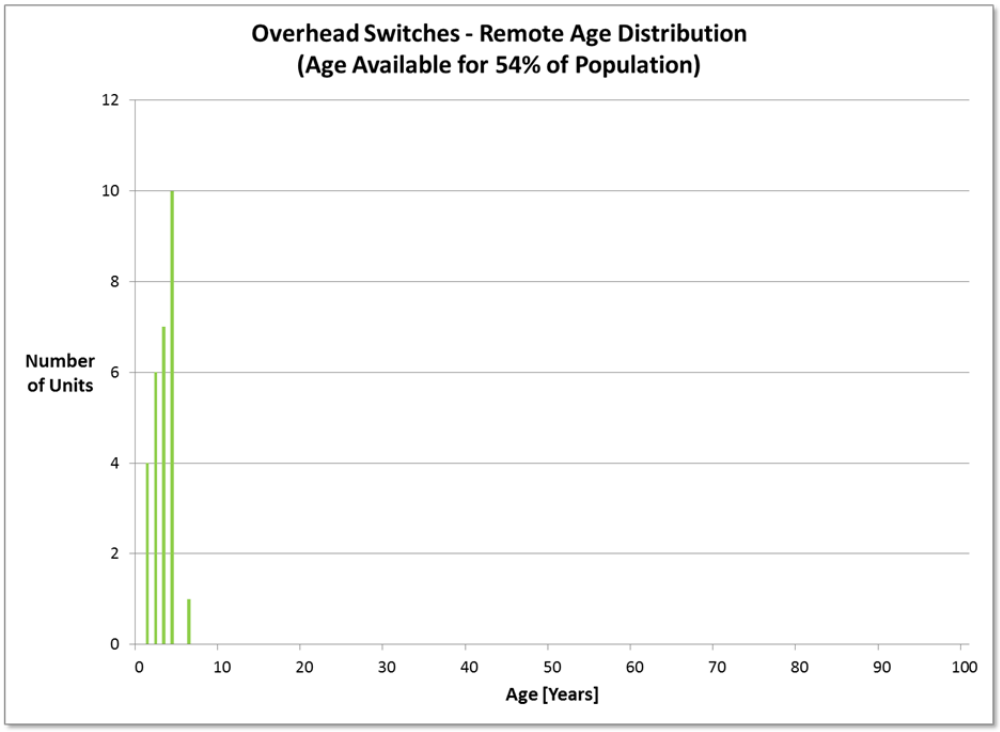

Figure 11-3 Age Distribution –Overhead Switches (Remote)

11.3 Health Index Results

There were 163 units of manual Overhead Switches at EnWin. Among them, 125 units had sufficient data for a Health Indexing.

There were 52 units of remote Overhead Switches at EnWin. Among them, 34 units had sufficient data for a Health Indexing.

The average Health Index was 73% and 97%, for manual and remote asset units respectively.

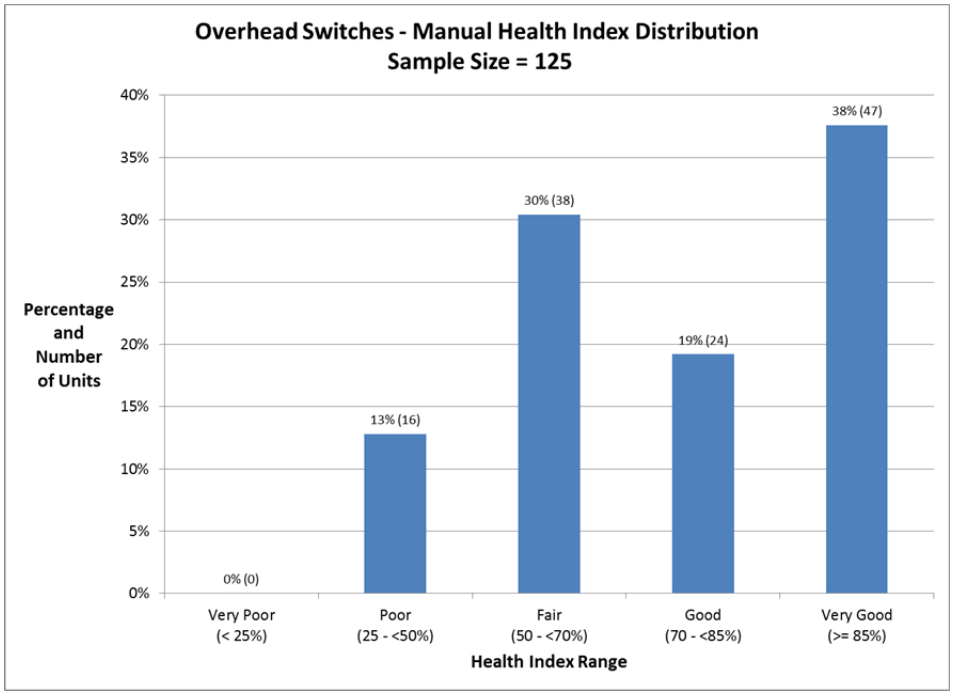

Figure 11-4 Health Index Distribution –Overhead Switches (Manual)

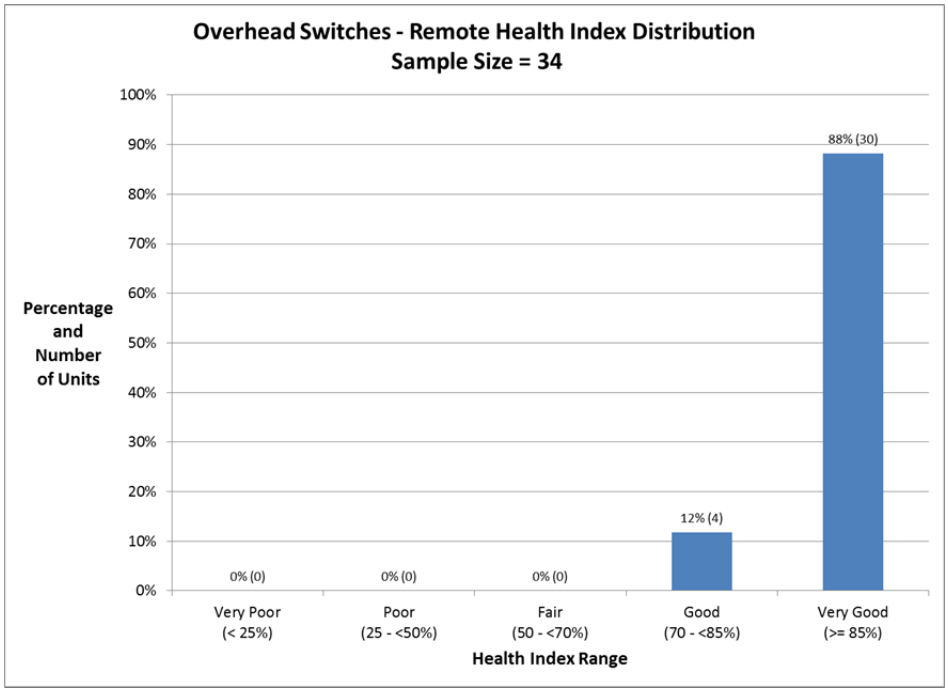

Figure 11-5 Health Index Distribution –Overhead Switches (Remote)

11.4 Flagged for Action Plan

The flagged for action plan for Overhead Switches were based on the data from sample size and extrapolated to the entire population.

The flagged for action plan for manual Overhead Switches was as follows:

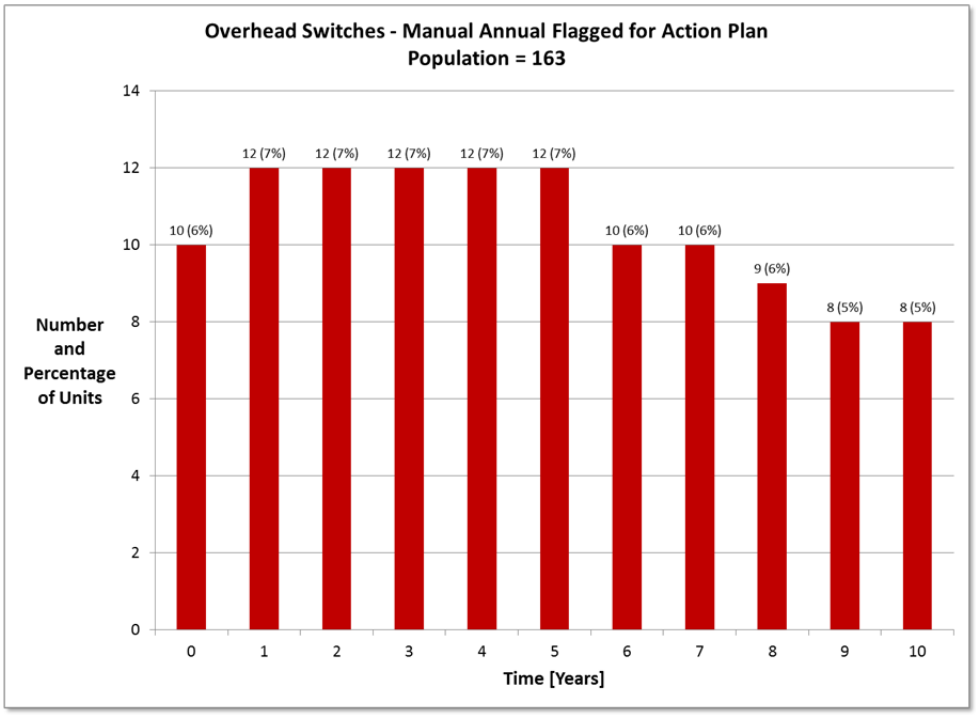

Figure 11-6 Flagged for Action Plan – Overhead Switches (Manual)

As per study, there was no asset unit flagged for action in the next 10 years for remote Overhead Switches.

11.5 Data Gaps

Data for manual Overhead Switches included age and historic removal records.

Data for remote Overhead Switches included age and overall count of notifications.

The following table shows the data gaps.

Table 11-5 Data Gap for Overhead Switches

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Description**	**Source of Data**
Motor Mechanism	Operation Mechanism	☆☆☆	Mechanical part and linkage issue	Inspection/ Maintenance Records
Switch Mounting		☆	Loose installation	
Arc Horn	Arc Extinction	☆	Arc horn surface worn-out	
Arc Interrupter		☆☆	Arc extinction part surface worn-out	
Insulator	**Insulation**	☆	Crack	
Historic Removal Record *		☆☆☆	Age at removal	Inventory Database

* For remote Overhead Switches

12 POLES

12.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

12.1.1 Condition and Sub-Condition Parameters

Table 12-1 Condition Parameter and Weights - Poles

m	Condition parameter	WCP_m	Sub-Condition Parameters
1	Physical Condition	5	Table 12-2
2	Auxiliary Accessories	3	Table 12-3
3	Service Record	6	Table 12-4
	Age Limiting Factor		Figure 12-1

Table 12-2 Physical Condition Sub-Condition Parameters and Weights (m=1) - Poles

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Top	2	Table 12-5
2	Rot	2	Table 12-5
3	Pocket	3	Table 12-5
4	Damage	1	Table 12-5

Table 12-3 Auxiliary Accessories Sub-Condition Parameters and Weights (m=2) - Poles

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Guy	2	Table 12-5
2	Grounding	1	Table 12-5
3	Lean	4	Table 12-5

Table 12-4 Service Record Sub-Condition Parameters and Weights (m=3) - Poles

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Overall	1	Table 12-5

12.1.2 Condition Criteria

All the condition scores are based on EnWin's strength test values (within the range of 0 to 1).

Table 12-5 Strength Criteria - Poles

Score	Description
Score = 4 * EnWin_strength_value	

Age Limiting Factor

In this project, age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Principle of applying the degradation survival curve is described in Equation 6 of Section 1.1.2.

In this project, the parameters of Poles age limiting curve are shown in the following table, based on industry experience and EnWin historic removal records.

Table 12-6 Age Limiting Curve Parameters - Poles

Asset Type	α	β
Wood Poles *	**56.4157**	**5.7668**
Concrete Poles **	**55.3547**	**2.9066**

* Industry practice
** EnWin historic removal records

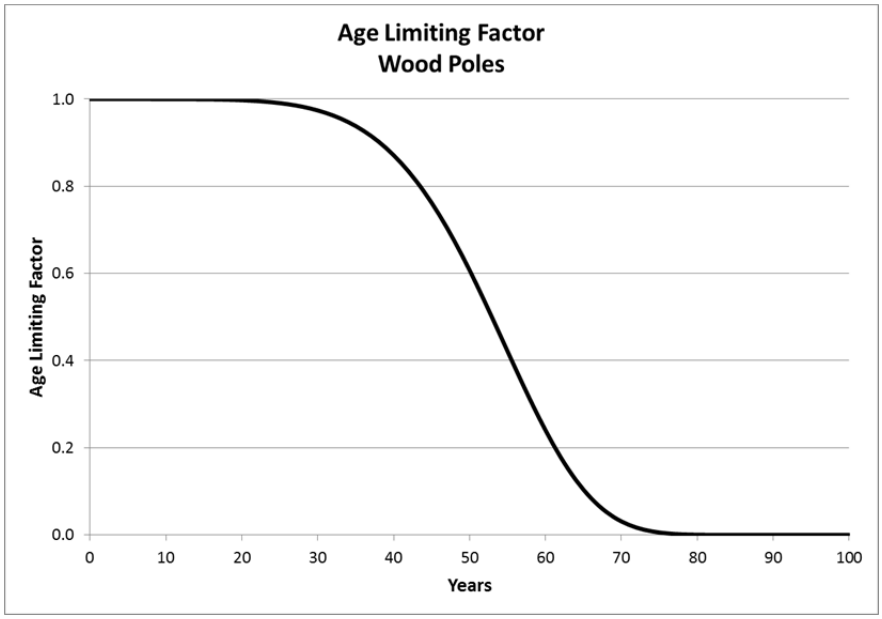

Figure 12-1 Age Limiting Factor Criteria - - Poles (Wood)

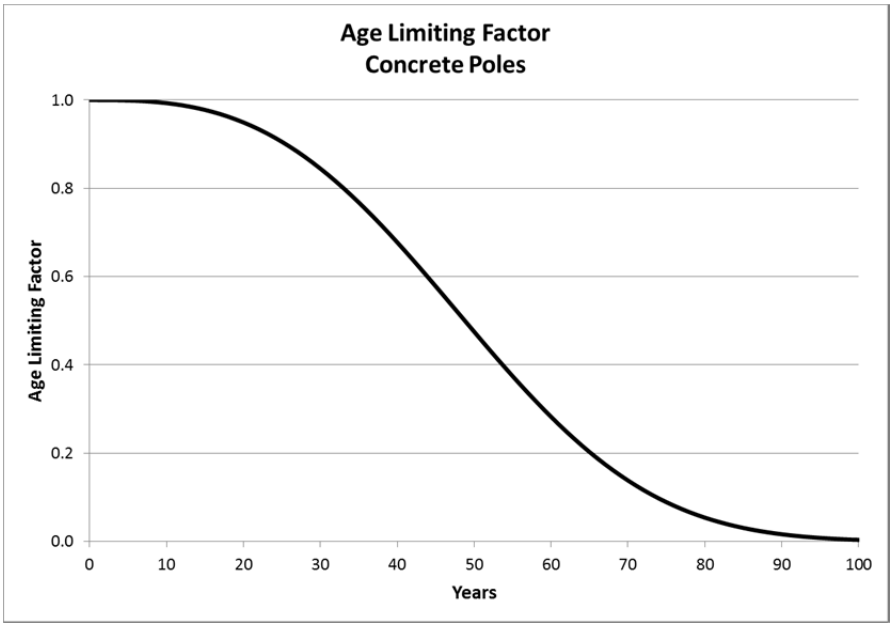

Figure 12-2 Age Limiting Factor Criteria - - Poles (Concrete)

12.2 Age Distribution

The average age of all units was 24 and 23 years, for wood and concrete Poles respectively.

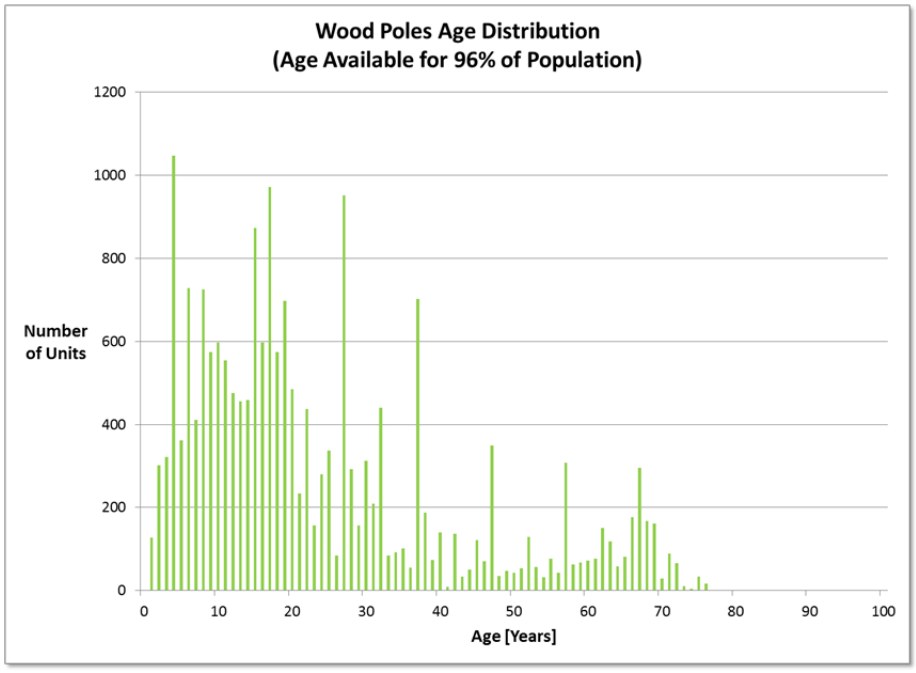

Figure 12-3 Age Distribution – Poles (Wood)

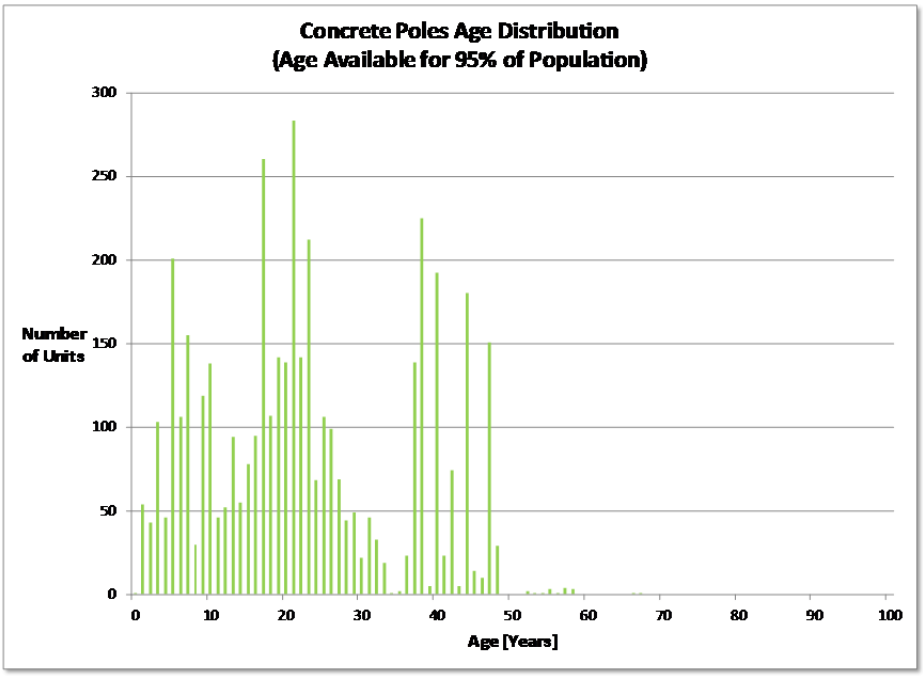

Figure 12-4 Age Distribution – Poles (Concrete)

12.3 Health Index Results

There were 20933 wood Poles at EnWin. Among them, 20051 units had sufficient data for a Health Indexing.

There were 4572 concrete Poles at EnWin. Among them, 4351 units had sufficient data for a Health Indexing.

The average Health Index was 86% and 87%, for wood and concrete Poles respectively.

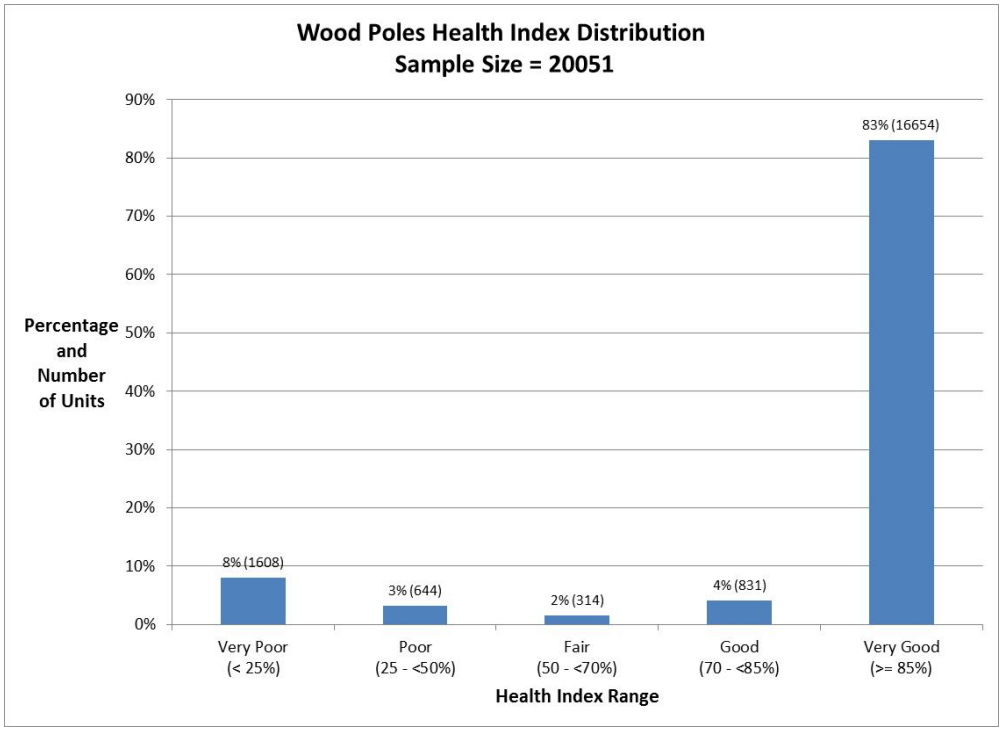

Figure 12-5 Health Index Distribution - Poles (Wood)

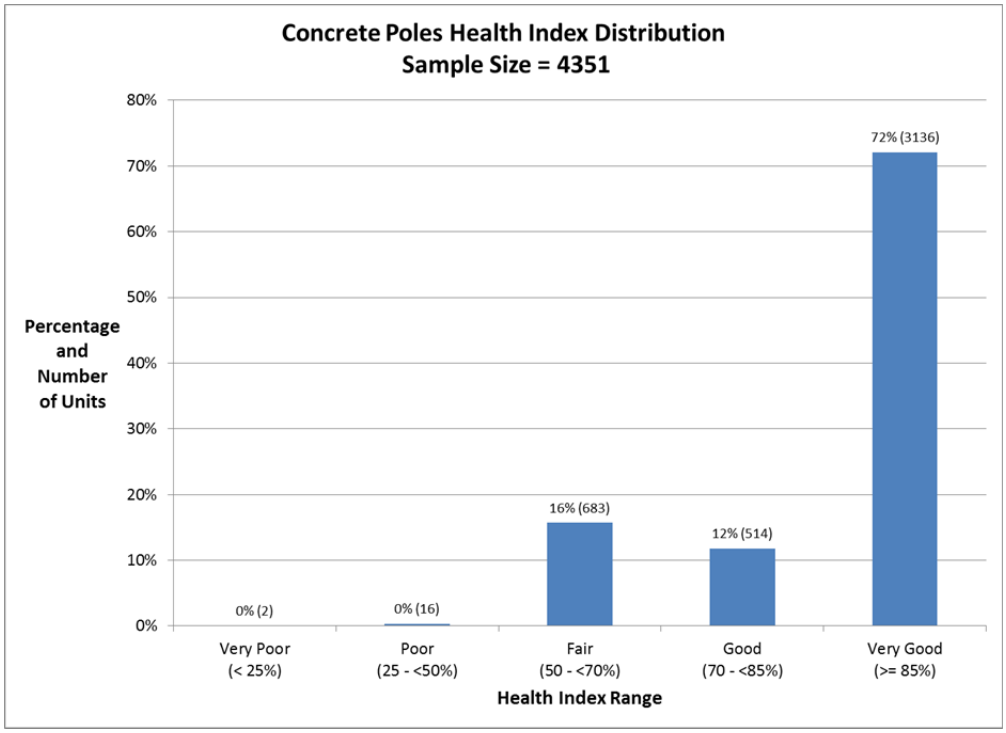

Figure 12-6 Health Index Distribution - Poles (Concrete)

12.4 Flagged for Action Plan

The flagged for action plan of Poles was based on the asset removal rate.

The flagged for action plans for Poles were based on the data of the entire population. The flagged for action plans for Poles were based on the data from sample size and extrapolated to the entire population. The following diagrams show the flagged for action plans:

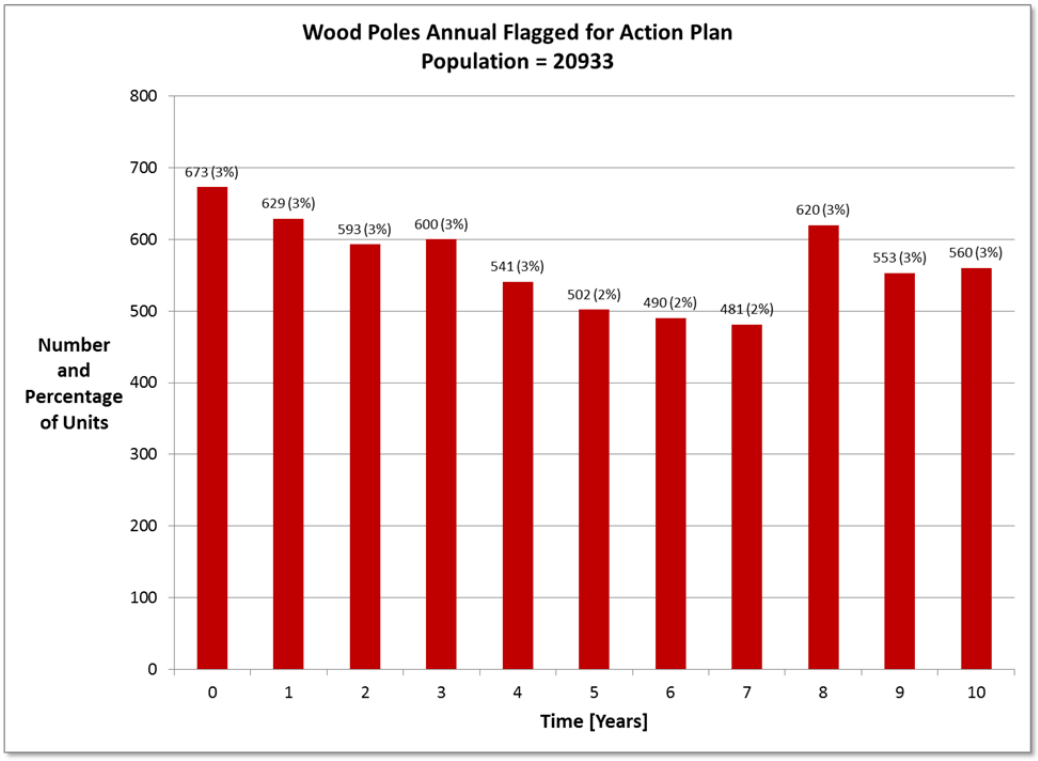

Figure 12-7 Flagged for Action Plan - Poles (Wood)

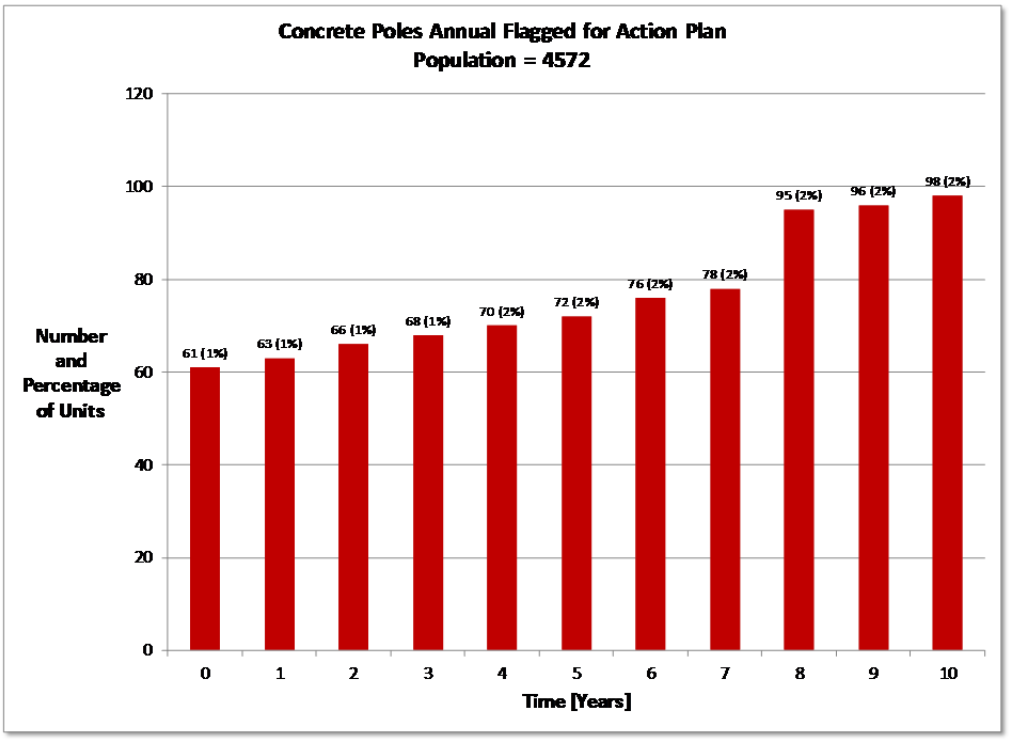

Figure 12-8 Flagged for Action Plan - Poles (Concrete)

12.5 Data Gaps

The data used for Poles assessment included age, pole strength, and historic removal records.

There was no major data gap for this asset group.

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13 DISTRIBUTION TRANSFORMERS

13.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

13.1.1 Condition and Sub-Condition Parameters

Table 13-1 Condition Parameter and Weights - Distribution Transformers

m	Condition parameter	WCP_m	Sub-Condition Parameters
1	Physical Condition	3	Table 13-2
2	Connection	5	Table 13-3
3	Service Record	5	Table 13-4
	Age Limiting Factor		Table 13-7

Table 13-2 Physical Condition Sub-Condition Parameters and Weights (m=1) - Distribution Transformers

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Tank Corrosion	3	Table 13-5
2	Dirt *	1	Table 13-5
3	Access *	1	Table 13-5
4	Base *	2	Table 13-5

* Applicable to pad mounted and submersible types only

Table 13-3 Connection Sub-Condition Parameters and Weights (m=2) - Distribution Transformers

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Oil Leak	2	Table 13-5
2	Elbow *	4	Table 13-5
3	Grounding *	1	Table 13-5
4	Bushing *	4	Table 13-5
5	Gasket *	1	Table 13-5

* Applicable to pad mounted and submersible types only

Table 13-4 Service Record Sub-Condition Parameters and Weights (m=3) - Distribution Transformers

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Overall	2	Table 13-5
2	Loading	1	Table 13-6

13.1.2 Condition Criteria

Inspection

All the condition scores are based on EnWin's inspection grading results (within the range of 0 to 4).

Table 13-5 Inspection Result Criteria - Distribution Transformers

Score	Description
Score = EnWin_inspection_grading	

Loading

Set of transformer loading information (e.g. 5 years of monthly 15 minute peaks, daily peaks for past year)

Table 13-6 Loading Criteria - Distribution Transformers

Data = $\{S_1, S_2, S_3, \ldots, S_i, \ldots, S_N\}$ *(MVA)*
$$Score = \frac{4 * N_A + 3 * N_B + 2 * N_c + 1 * N_D}{N_A + N_B + N_c + N_D + N_E}$$
S_B = rated MVA
N_A = Number of $S_i / S_B \leq$ than 60%
N_B = 60% < Number of S_i / S_B is $\leq$ than 80%
N_C = 80% < Number of S_i / S_B is $\leq$ than 100%
N_D = 100% < Number of S_i / S_B is $\leq$ than 120%
N_E = Number of S_i / S_B > 120%

Age Limiting Factor

In this project, age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Principle of applying the degradation survival curve is described in Equation 6 of Section 1.1.2.

In this project, the parameters of Distribution Transformers age limiting curve are shown in the following table, based on EnWin historic removal records.

Table 13-7 Age Limiting Curve Parameters - Distribution Transformers

Asset Type	α	β
Pole Top 1-Phase	**28.6871**	**2.3033**
Pole Top 3-Phase	**31.2225**	**2.1337**
Pad Mounted 1-Phase	**43.8766**	**6.8528**
Pad Mounted 3-Phase	**57.6224**	**3.1203**
Submersible	**33.7723**	**3.1899**

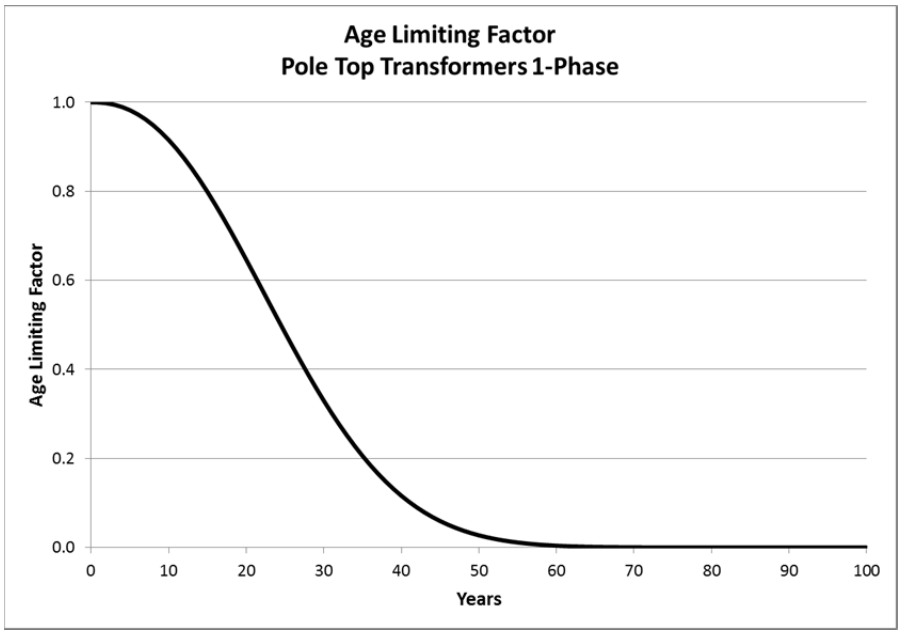

Figure 13-1 Age Limiting Factor Criteria - - Distribution Transformers (Pole Top 1-Phase)

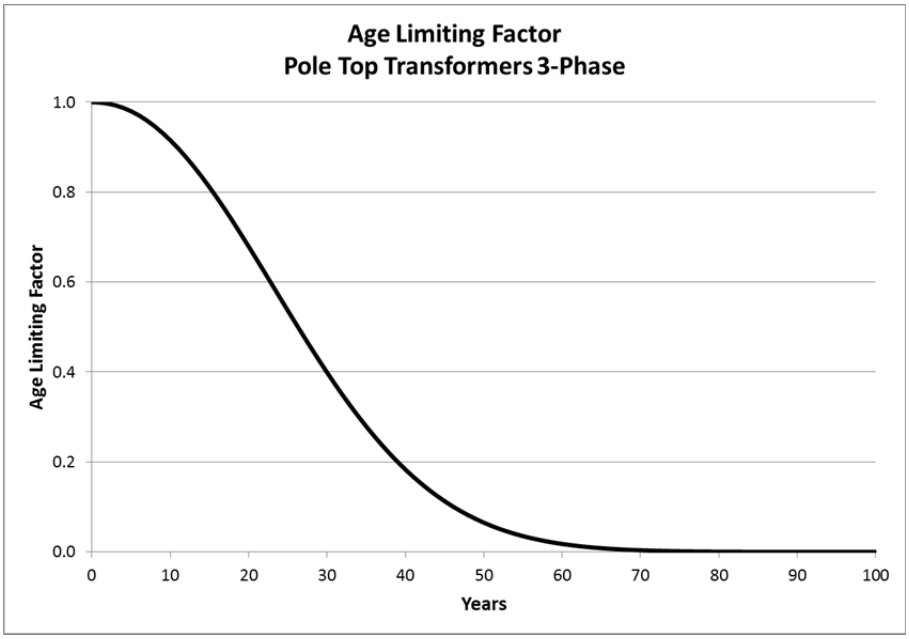

Figure 13-2 Age Limiting Factor Criteria - - Distribution Transformers (Pole Top 3-Phase)

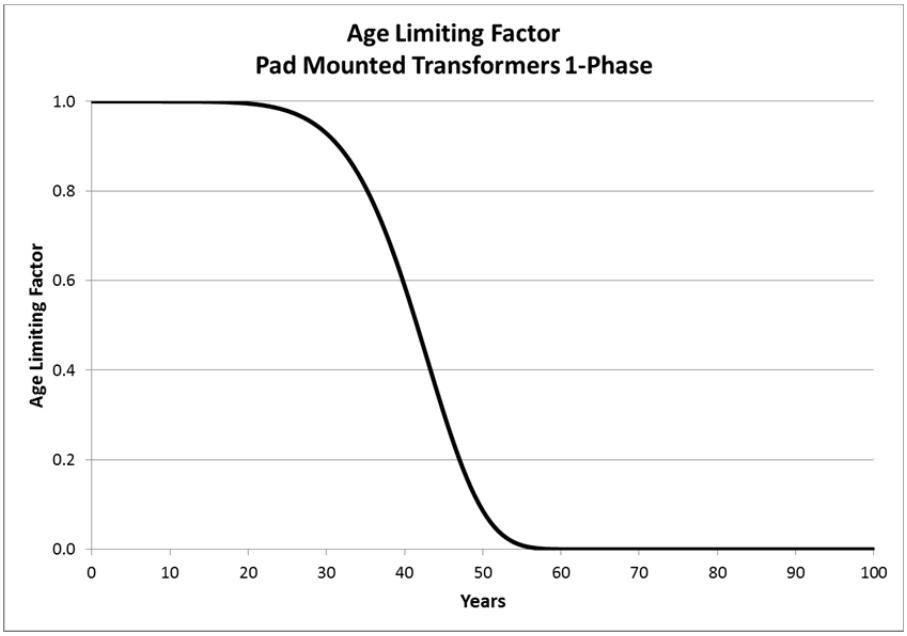

Figure 13-3 Age Limiting Factor Criteria - - Distribution Transformers (Pad Mounted 1-Phase)

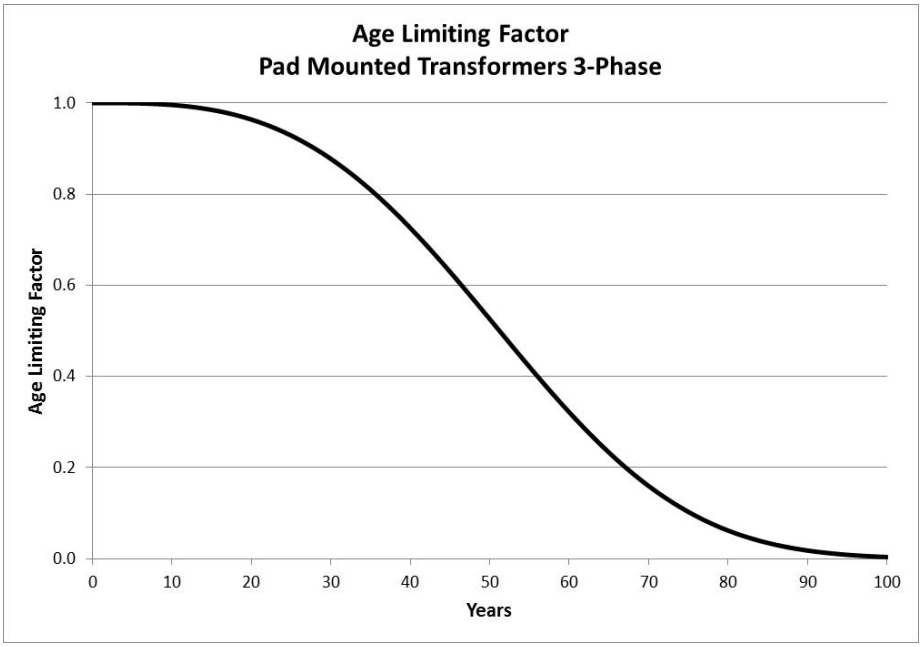

Figure 13-4 Age Limiting Factor Criteria - - Distribution Transformers (Pad Mounted 3-Phase)

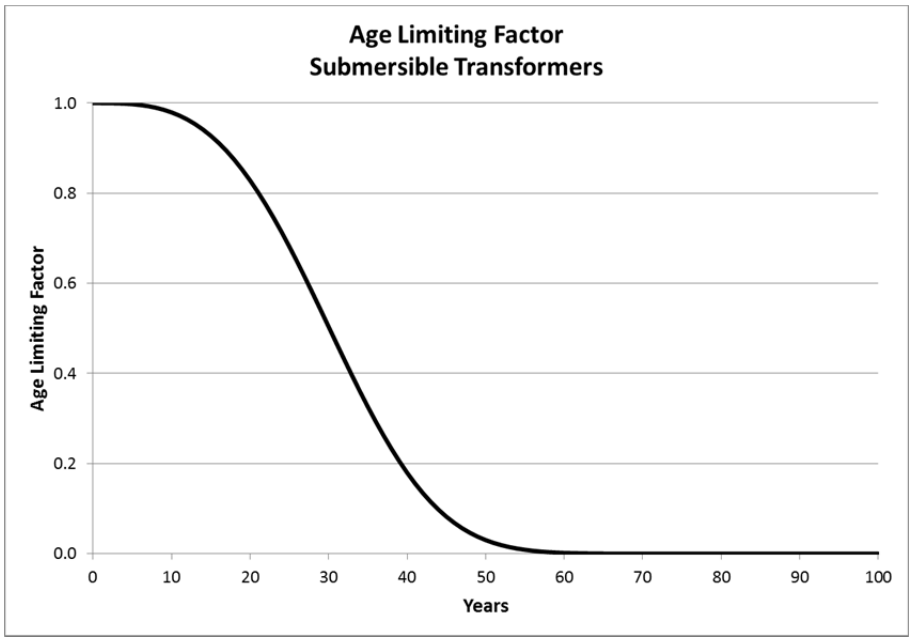

Figure 13-5 Age Limiting Factor Criteria - - Distribution Transformers (Submersible)

13.2 Age Distribution

The average age of the units was 14, 15, 17, 19 and 24 years, for pole top 1-phase, pole top 3-phase, pad mounted 1-phase, pad mounted 3-phase and submersible Distribution Transformers respectively.

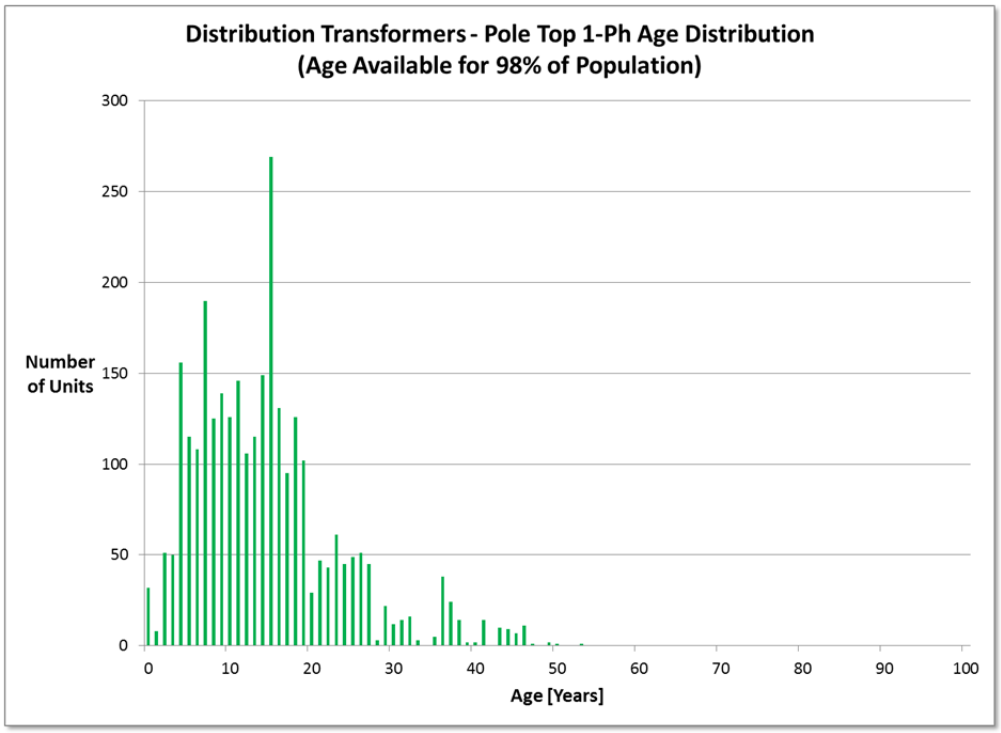

Figure 13-6 Age Distribution - Distribution Transformers (Pole Top 1-Phase)

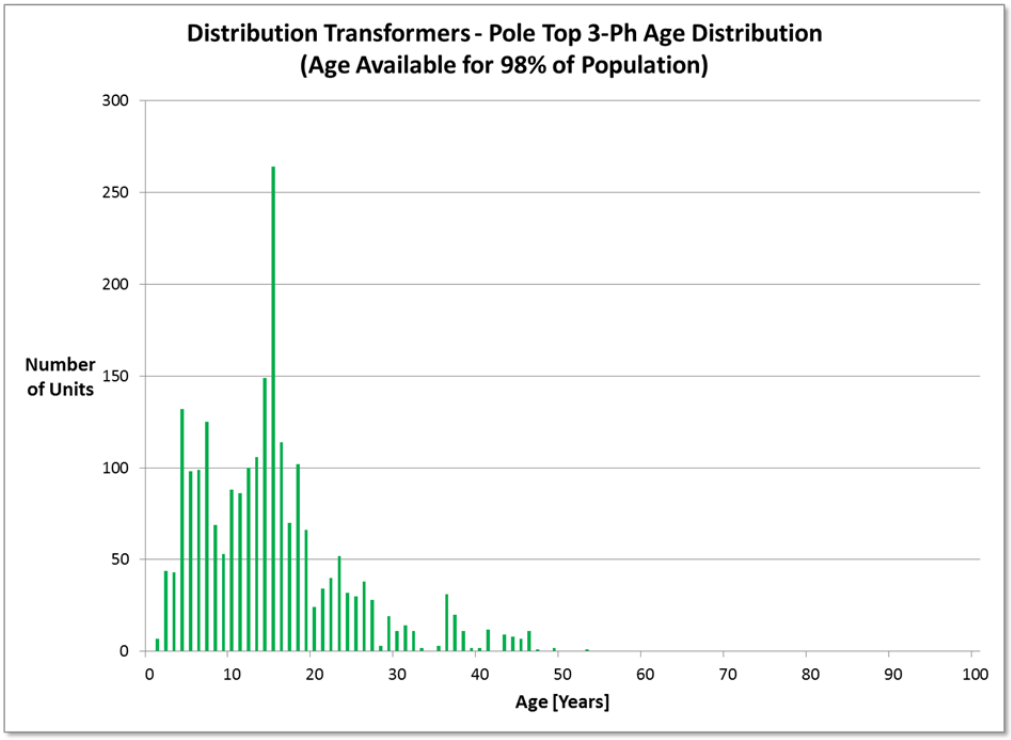

Figure 13-7 Age Distribution - Distribution Transformers (Pole Top 3-Phase)

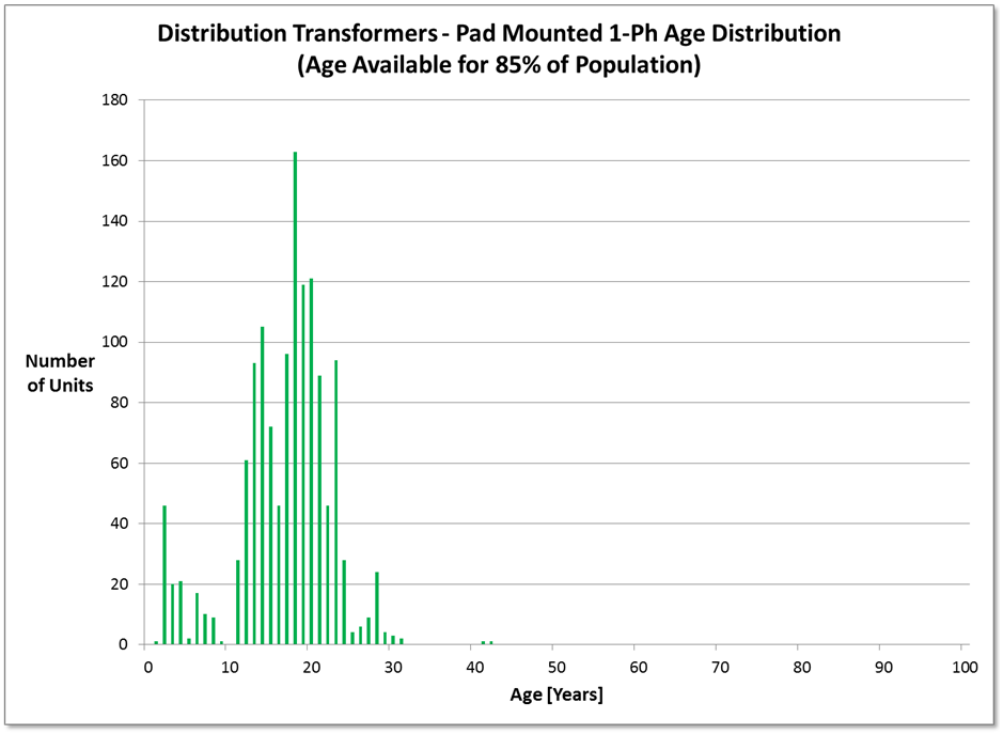

Figure 13-8 Age Distribution - Distribution Transformers (Pad Mounted 1-Phase)

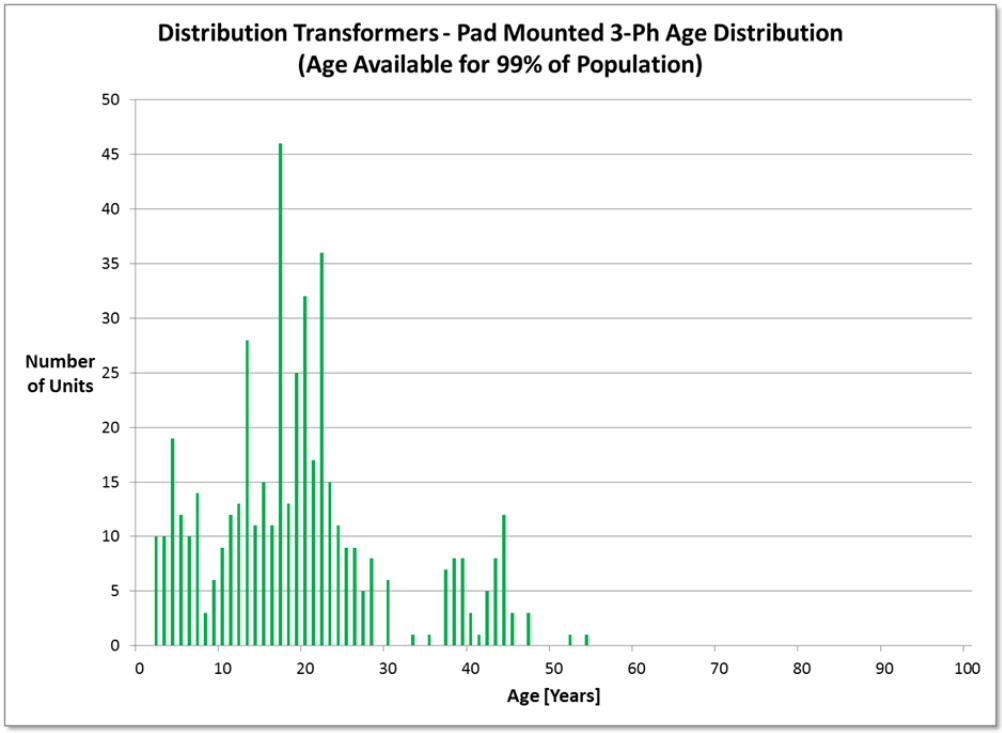

Figure 13-9 Age Distribution - Distribution Transformers (Pad Mounted 3-Phase)

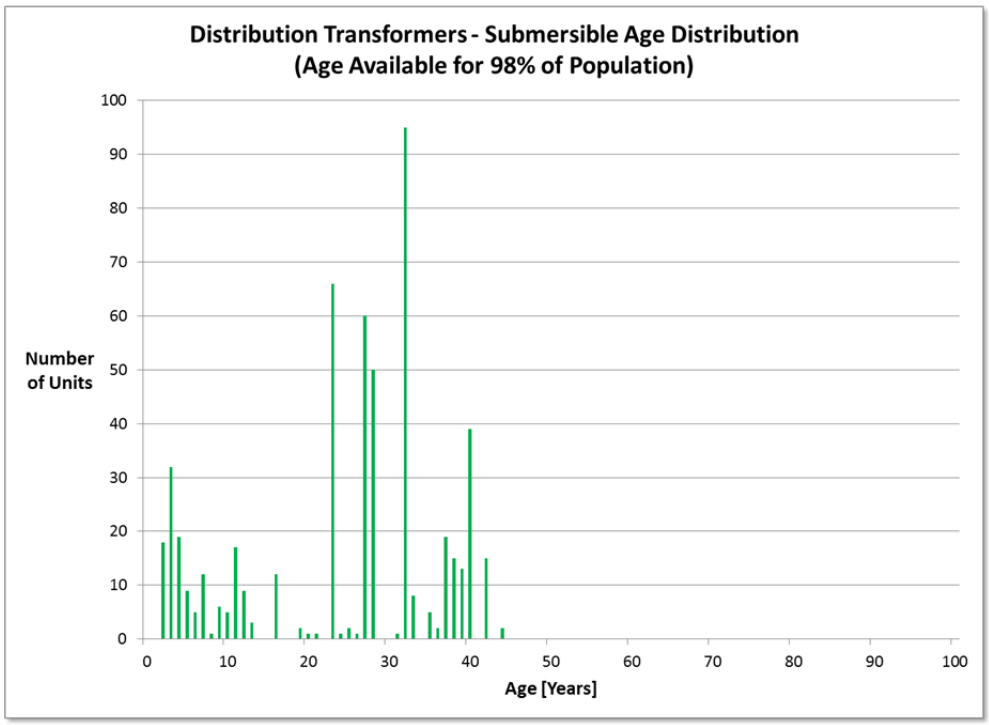

Figure 13-10 Age Distribution - Distribution Transformers (Submersible)

13.3 Health Index Results

There were a total of 2978 units of pole top 1-phase Distribution Transformers at EnWin. Among them, 2969 units had sufficient data for a Health Indexing.

There were a total of 2324 units of pole top 3-phase Distribution Transformers at EnWin. Among them, 2316 units had sufficient data for a Health Indexing.

There were a total of 1584 units of pad mounted 1-phase Distribution Transformers at EnWin. Among them, 1342 units had sufficient data for a Health Indexing.

There were a total of 482 units of pad mounted 3-phase Distribution Transformers at EnWin. All of them had sufficient data for a Health Indexing.

There were a total of 556 units of submersible Distribution Transformers at EnWin. All of them had sufficient data for a Health Indexing.

The average Health Index score for this asset group was 70%, 70%, 97%, 78% and 58%, for pole top 1-phase, pole top 3-phase, pad mounted 1-phase, pad mounted 3-phase and submersible Distribution Transformers respectively.

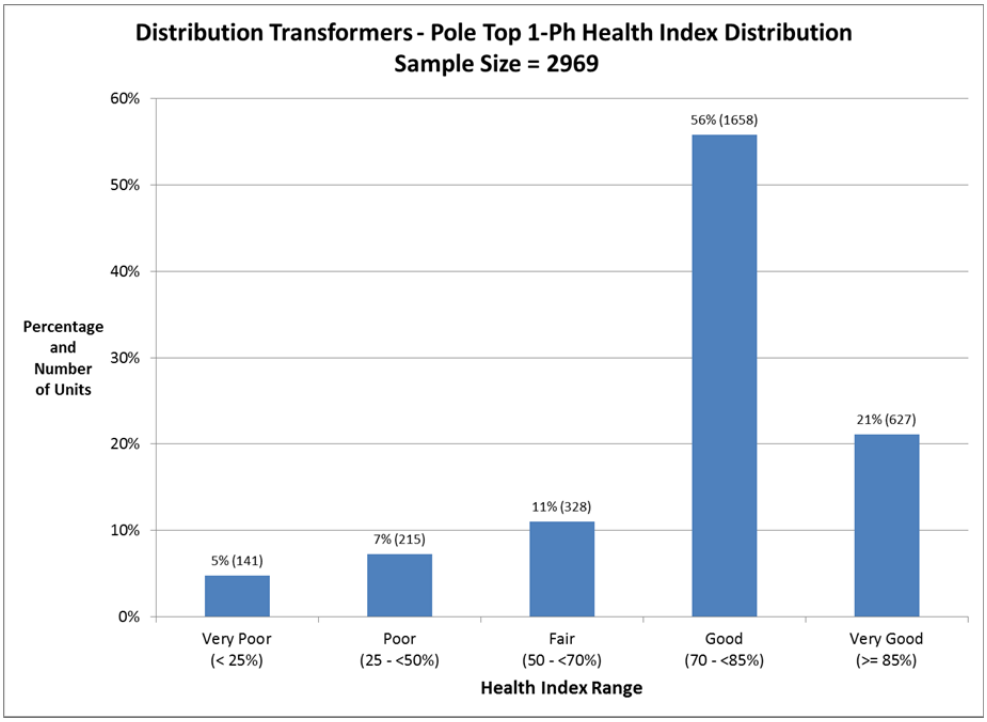

Figure 13-11 Health Index Distribution - Distribution Transformers (Pole Top 1-Phase)

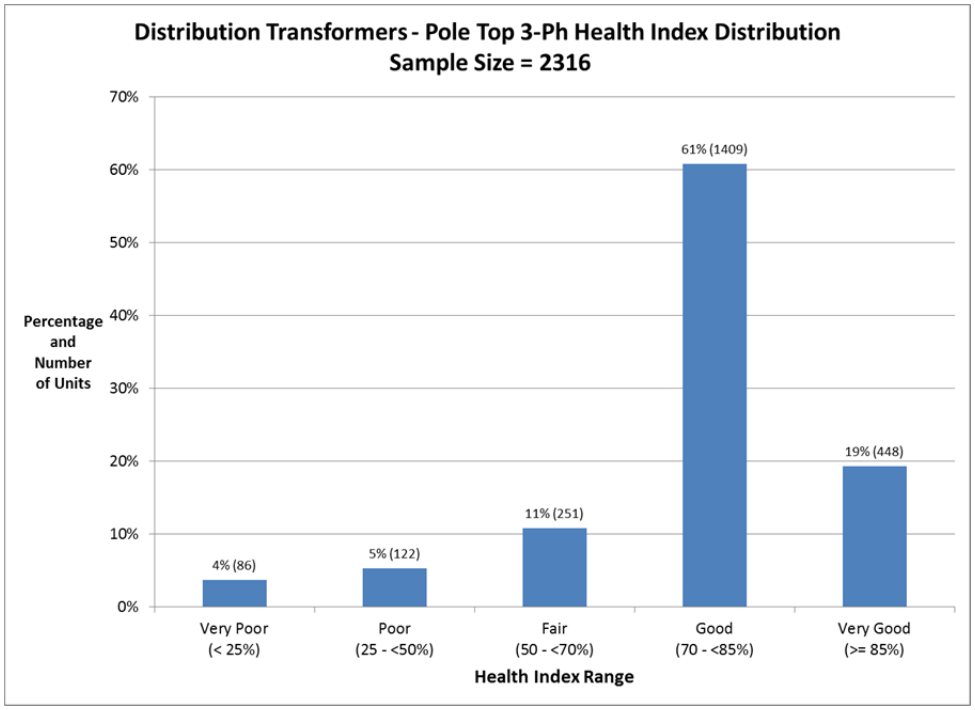

Figure 13-12 Health Index Distribution - Distribution Transformers (Pole Top 3-Phase)

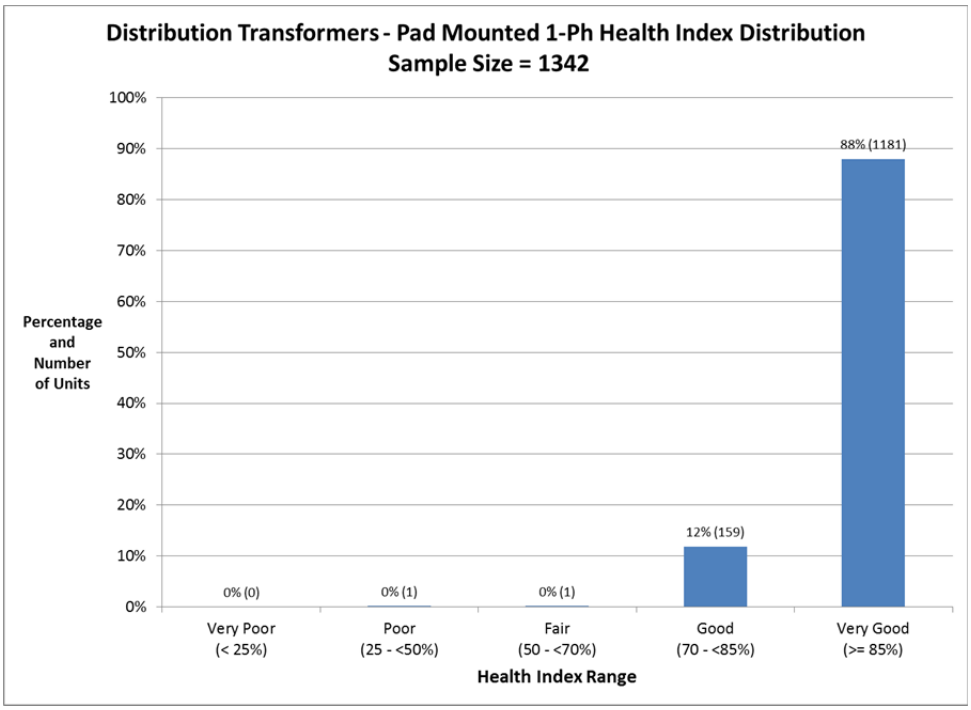

Figure 13-13 Health Index Distribution - Distribution Transformers (Pad Mounted 1-Phase)

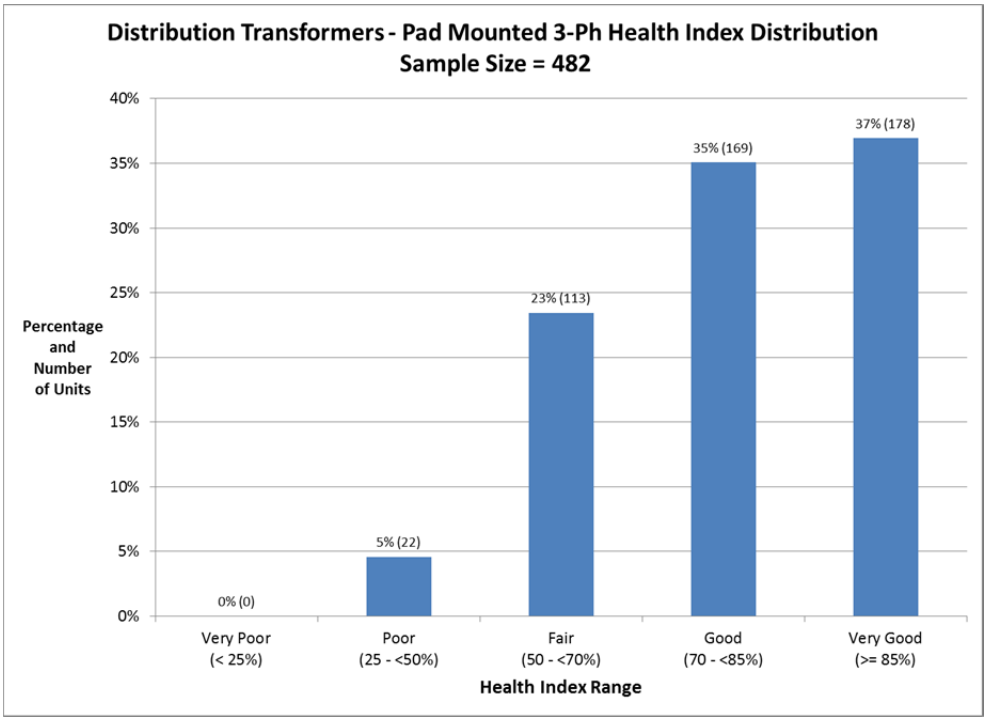

Figure 13-14 Health Index Distribution - Distribution Transformers (Pad Mounted 3-Phase)

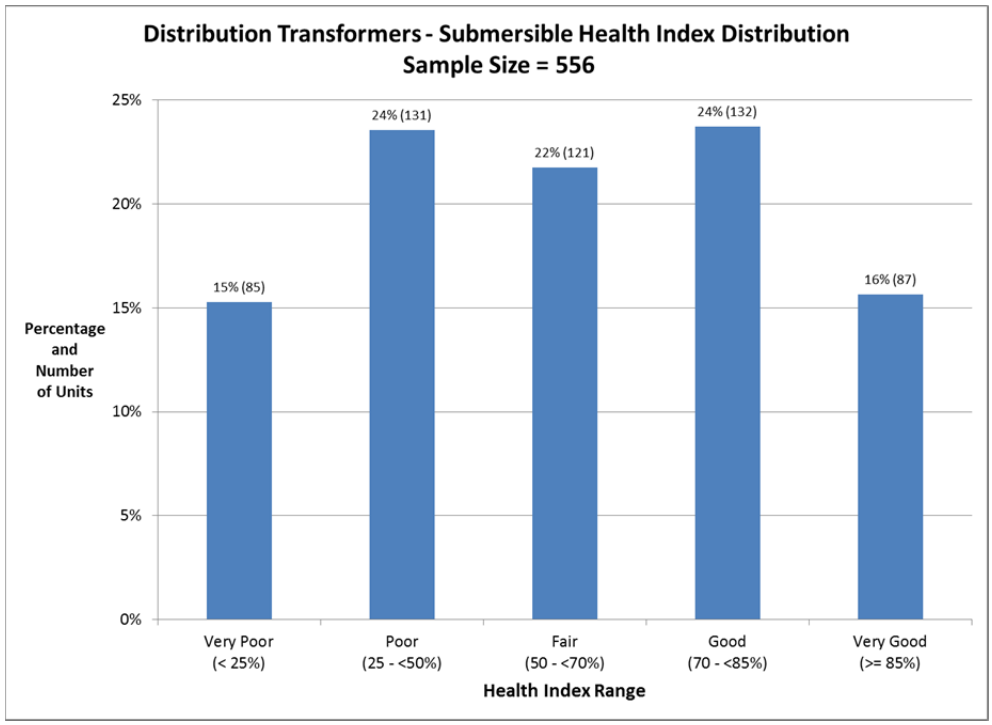

Figure 13-15 Health Index Distribution - Distribution Transformers (Submersible)

13.4 Flagged for Action Plan

The flagged for action plan of Distribution Transformers was based on the asset removal rate.

The flagged for action plans for Distribution Transformers were based on the data of the entire population. The flagged for action plans for Distribution Transformers were based on the data from sample size and extrapolated to the entire population. The following diagram shows the flagged for action plans:

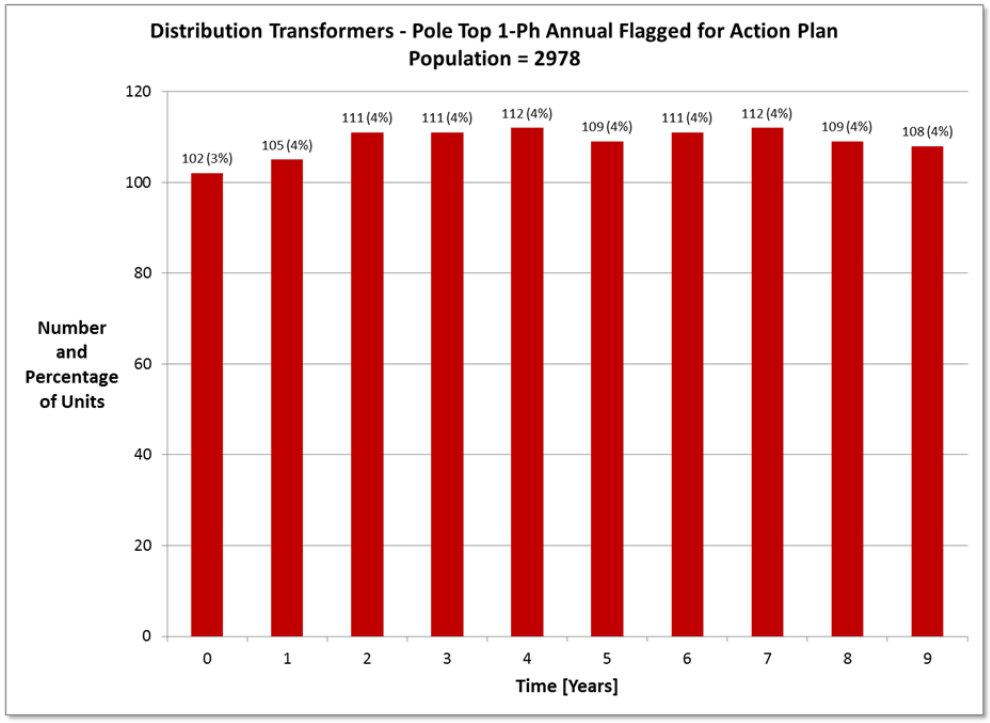

Figure 13-16 Flagged for Action Plan - Distribution Transformers (Pole Top 1-Phase)

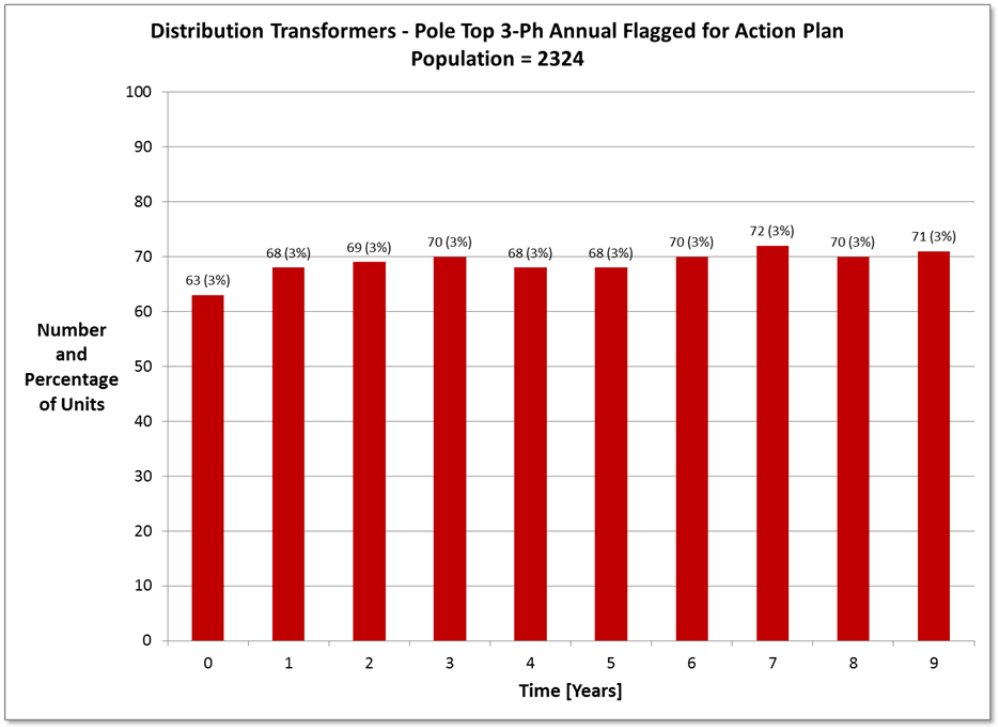

Figure 13-17 Flagged for Action Plan - Distribution Transformers (Pole Top 3-Phase)

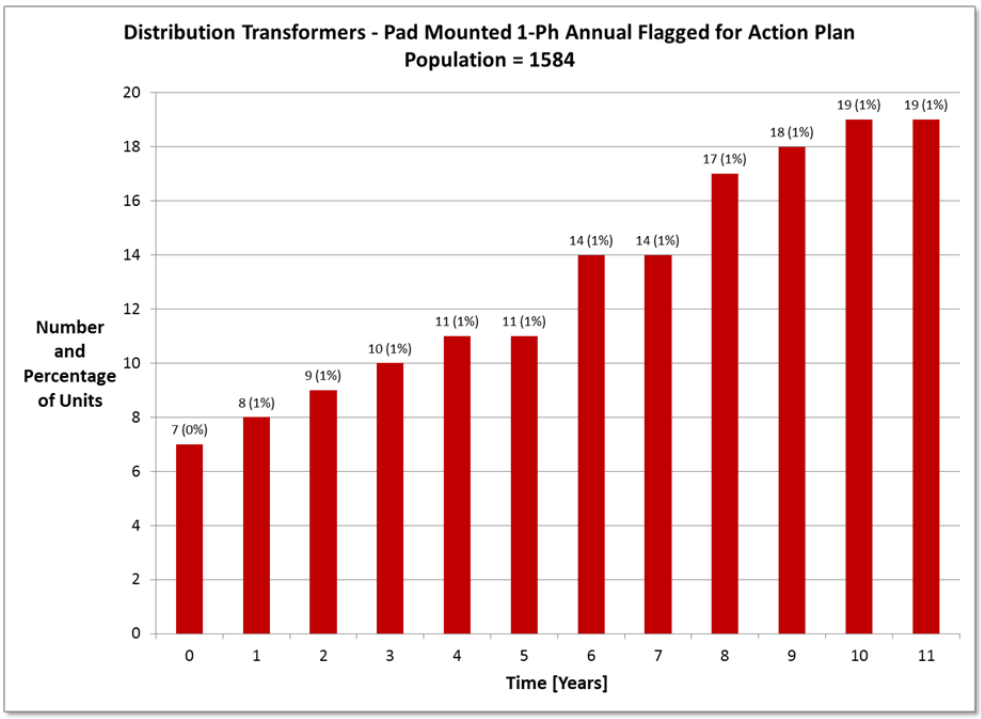

Figure 13-18 Flagged for Action Plan - Distribution Transformers (Pad Mounted 1-Phase)

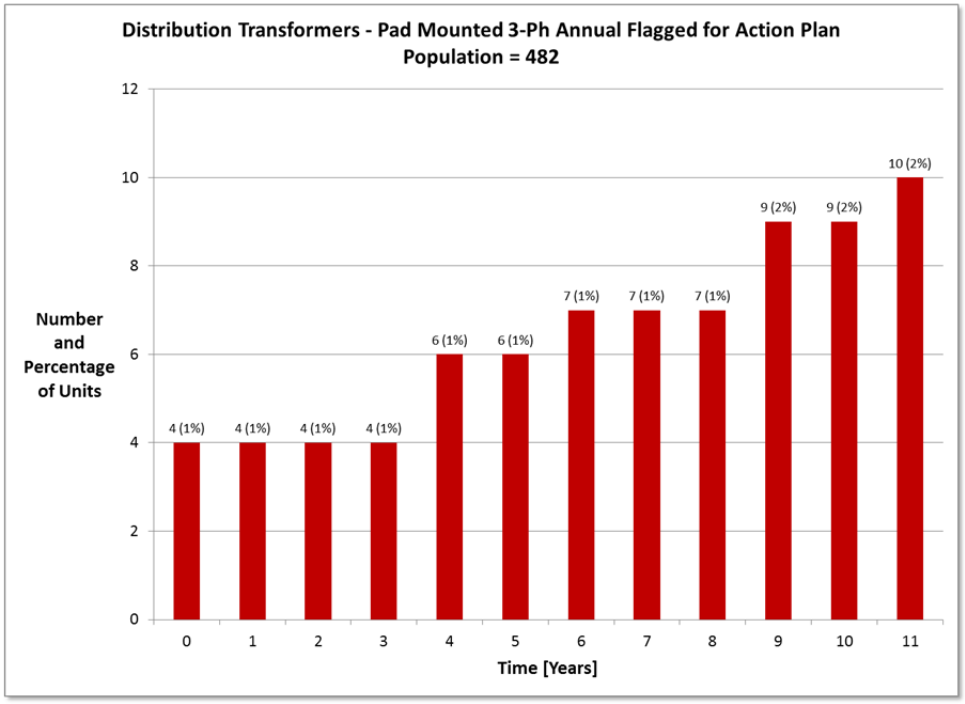

Figure 13-19 Flagged for Action Plan - Distribution Transformers (Pad Mounted 3-Phase)

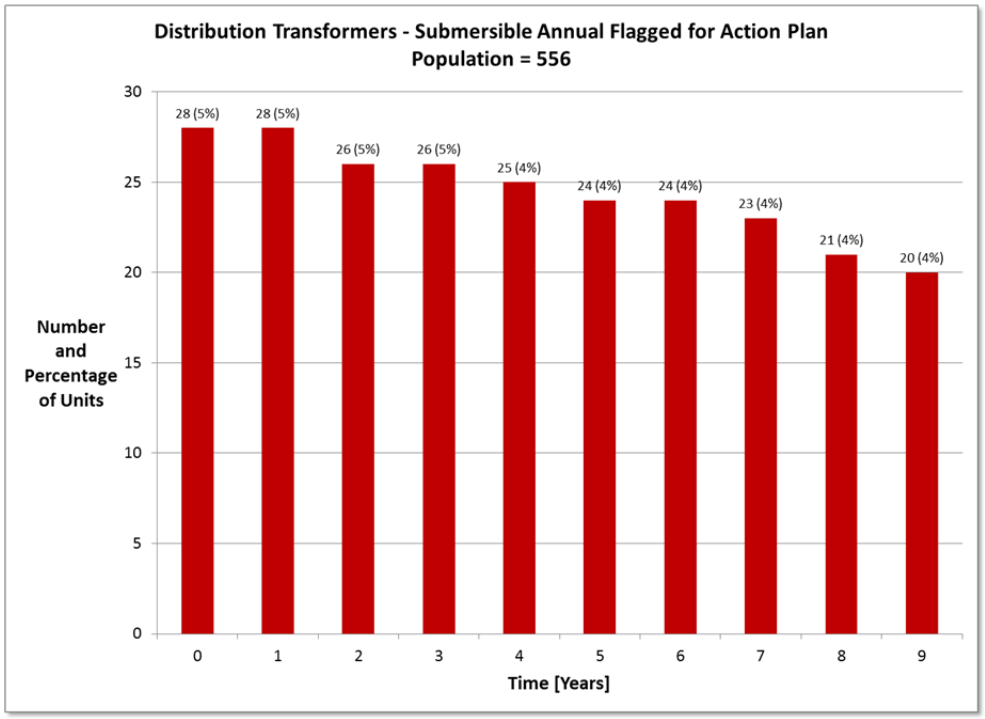

Figure 13-20 Flagged for Action Plan - Distribution Transformers (Submersible)

13.5 Data Gaps

The data used for pole top 1-phase, pole top 3-phase and pad mounted 1-phase Distribution Transformers assessment included age, loading and historic removal records.

The data used for pad mounted 3-phase and submersible Distribution Transformers assessment included age, inspection results, loading and historic removal records.

The data gaps are as follows, applicable to pole top 1-phase, pole top 3-phase and pad mounted Distribution Transformers:

Table 13-8 Data Gap for Distribution Transformers

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Tank Corrosion	Physical Condition	☆☆	Enclosure	Surface deterioration	On-site visual inspection
Oil Leak	Connection and Insulation	☆☆	Insulation	Insulation medium loss	On-site visual inspection

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14 PAD MOUNTED SWITCHGEAR

14.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

14.1.1 Condition and Sub-Condition Parameters

Table 14-1 Condition Parameter and Weights - Pad Mounted Switchgear

m	Condition parameter	WCP_m	Sub-Condition Parameters
1	Physical Condition	6	Table 14-2
2	Switch	3	Table 14-3
3	Insulation	5	Table 14-4
4	Service Record	8	Table 14-5
	Age Limiting Factor		Table 14-8

Table 14-2 Physical Condition Sub-Condition Parameters and Weights (m=1) - Pad Mounted Switchgear

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Corrosion	4	Table 14-6
2	Debris/Dirt	1	Table 14-6
3	Base	1	Table 14-6
4	Access	1	Table 14-6

Table 14-3 Switch Sub-Condition Parameters and Weights (m=2) - Pad Mounted Switchgear

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Cable	2	Table 14-6
2	Grounding	1	Table 14-6
3	Switch	3	Table 14-6
4	Arc Suppressor	2	Table 14-6

Table 14-4 Insulation Sub-Condition Parameters and Weights (m=3) - Pad Mounted Switchgear

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Insulator	2	Table 14-6
2	Barrier	1	Table 14-6

Table 14-5 Service Record Sub-Condition Parameters and Weights (m=4) - Pad Mounted Switchgear

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Overall	1	Table 14-7

14.1.2 Condition Criteria

Inspection

All the condition scores are based on EnWin's inspection grading results (within the range of 0 to 4).

Table 14-6 Inspection Result Criteria - Pad Mounted Switchgear

Score	Description
Score = EnWin_inspection_grading	

Overall Maintenance

Table 14-7 Overall Maintenance Count Criteria - Pad Mounted Switchgear

Score	"Notification Count" Value
4	Notification Count <3*
3	3 ≤ Notification Count < 6
2	6 ≤ Notification Count < 9
1	9 ≤ Notification Count < 12
0	Notification Count ≥ 8

Where "Notification Count" is calculated as below:

Year	Severity Score				Weight
	1	2	3	4	
2017	Low	Medium	High	Critical	1
2016					0.9
2015					0.8
2014					0.7
2013					0.6
2012					0.5
2011					0.4
2010					0.3
2009					0.2
2008					0.1

Notification Count = $\sum Score_i \times Weight_i$

Where *i* refers to the year the CM was conducted

In case no severity information is available, a notification is assigned a default severity of 3

Age Limiting Factor

In this project, age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Principle of applying the degradation survival curve is described in Equation 6 of Section 1.1.2.

In this project, the parameters of Pad Mounted Switchgear age limiting curve are shown in the following table, based on EnWin historic removal records.

Table 14-8 Age Limiting Curve Parameters - Pad Mounted Switchgear

Asset Type	α	β
Pad Mounted Switchgear	**28.4463**	**7.824**

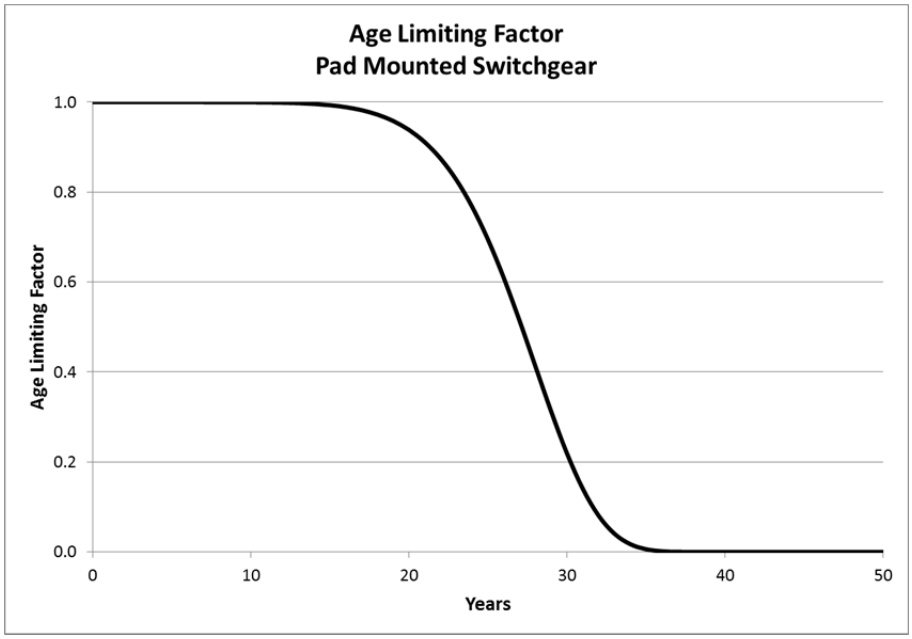

Figure 14-1 Age Limiting Factor Criteria - - Pad Mounted Switchgear

14.2 Age Distribution

The average age of the units was 17 years for Pad Mounted Switchgear.

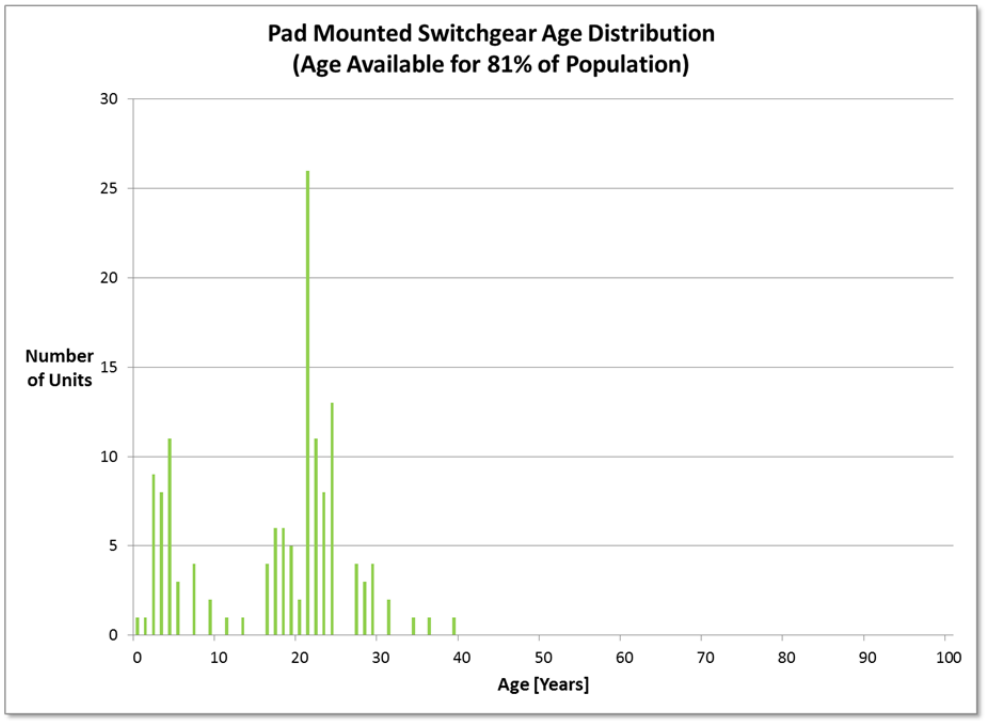

Figure 14-2 Age Distribution - Pad Mounted Switchgear

14.3 Health Index Results

There were a total of 170 units of Pad Mounted Switchgear at EnWin. Among them, 146 units had sufficient data for a Health Indexing.

The average Health Index score for this asset group was 76%.

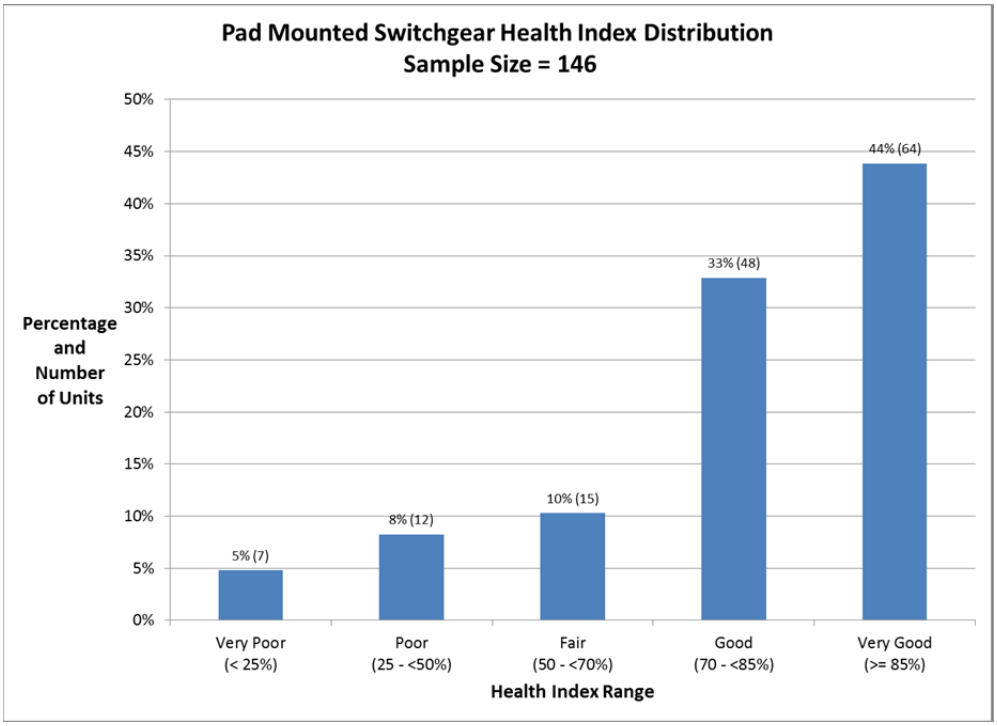

Figure 14-3 Health Index Distribution - Pad Mounted Switchgear

14.4 Flagged for Action Plan

The flagged for action plan of Pad Mounted Switchgear was based on the asset removal rate.

The flagged for action plans for Pad Mounted Switchgear were based on the data of the entire population. The flagged for action plans for Pad Mounted Switchgear were based on the data from sample size and extrapolated to the entire population. The following diagram shows the flagged for action plans:

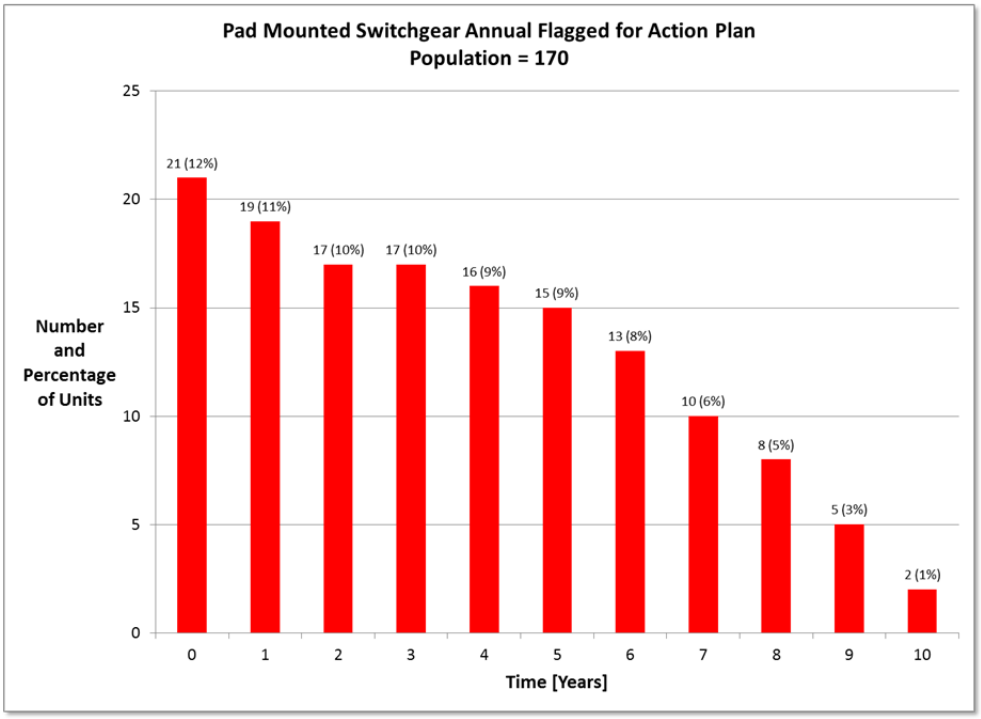

Figure 14-4 Flagged for Action Plan - Pad Mounted Switchgear

14.5 Data Gaps

The data used for Pad Mounted Switchgear assessment included age, inspection results and historic removal records.

There was no major data gap for this asset group.

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15 PRIMARY UNDERGROUND CABLES

15.1 Health Index Formula

As there was insufficient condition data available, the HI assessment for this asset category was based simply on age and the cumulative likelihood of survival at a given age.

Age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Refer to section 1.1.2 for principle.

In this project, the parameters of Primary Underground Cables age limiting curve are shown in the following table, based on industry practice.

Table 15-1 Age Limiting Curve Parameters - Primary Underground Cables

Asset Type	α	β
UG Cables	**30.00**	**3.82**

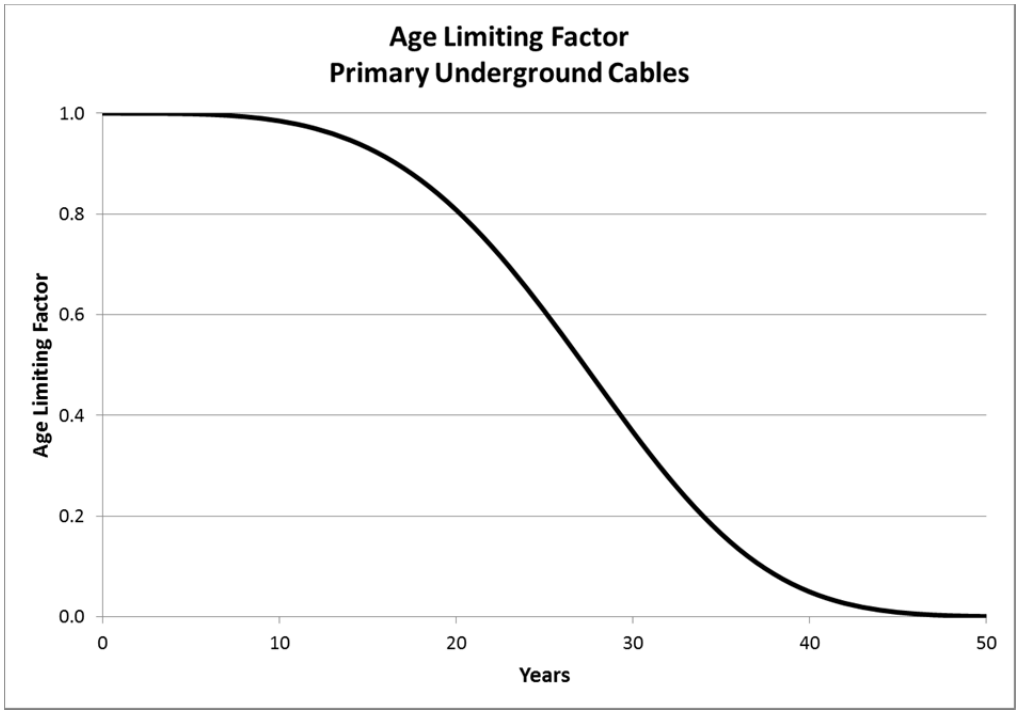

Figure 15-1 Age Limiting Factor Criteria - - Primary Underground Cables

15.2 Age Distribution

The average age of all in service units was 14. The age distribution for Primary Underground Cables was as follows.

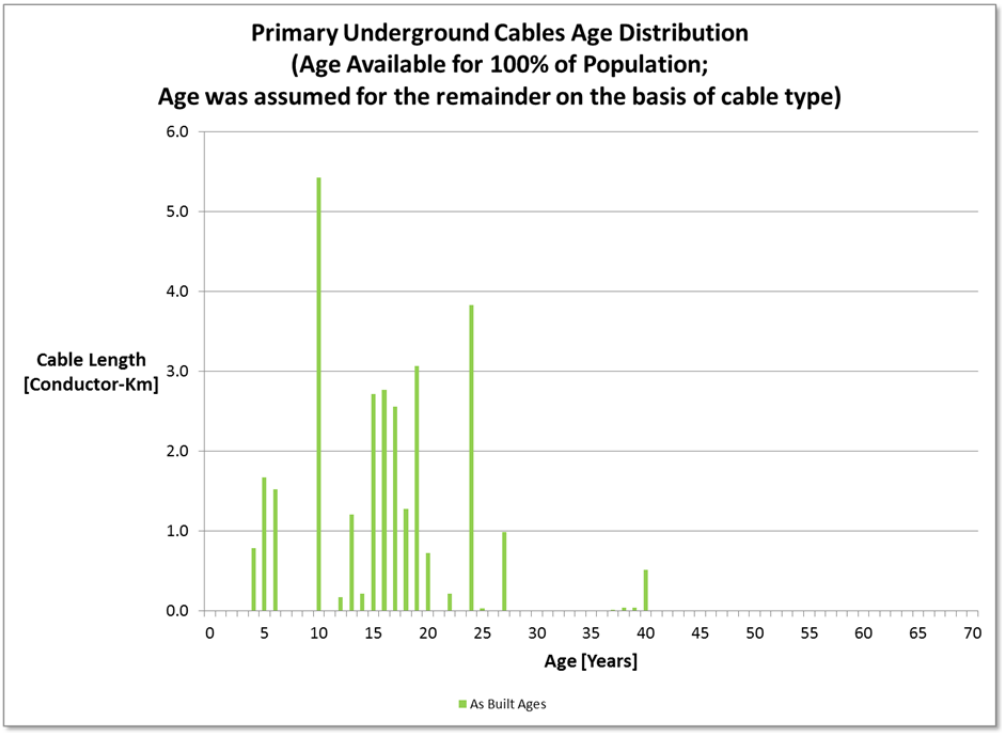

Figure 15-2 Age Distribution - Primary Underground Cables

15.3 Health Index Results

There were 29.8 km Primary Underground Cables at EnWin. All of them had age data for a Health Indexing.

The average Health Index for this asset group was 87%.

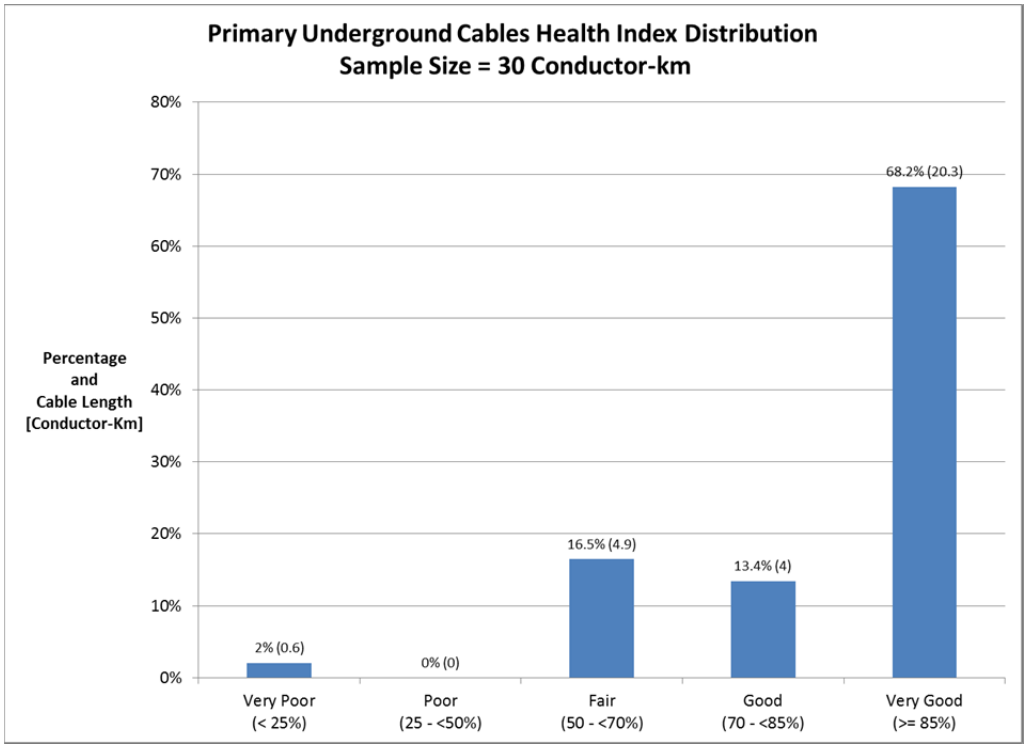

Figure 15-3 Health Index Distribution - Primary Underground Cables

15.4 Flagged for Action Plan

The following diagram shows the flagged for action plan:

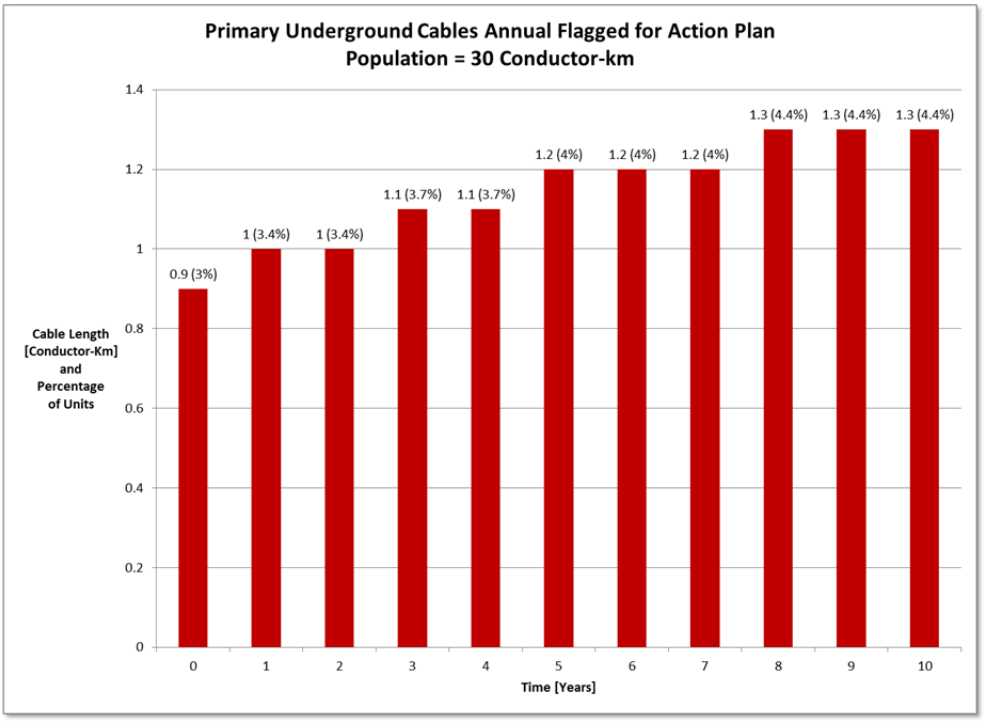

Figure 15-4 Flagged for Action Plan – Primary Underground Cables

15.5 Data Gaps

The data used for Primary Underground Cables assessment included age only.

The data gaps are as follows:

Table 15-2 Data Gap for Primary Underground Cables

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Cable Splice	Physical Condition	☆	Cable Connection	Cable connection issue	On-site visual inspection
Cable Termination		☆			On-site visual inspection
Outer Jacket	Insulation	☆	Cable	Exterior deterioration	On-site visual inspection
Partial Discharge		☆☆	Cable	Insulation defect	On-site test
Loading	Service Record	☆☆	Cable	Utilization status	Historic records
Removal rate at Segment Level		☆☆	Cable	Failure status	Historic records
Historic Removal Record		☆☆☆	Age	Age at Removal	Inventory Database

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16 MANHOLES

16.1 Health Index Formula

Assume a parameter scoring system of 0 through 4, where 0 and 4 represent the "worst" and "best" scores respectively. Thus, the maximum score for any condition or sub-condition parameter (maximum CPS and CPF) is "4".

16.1.1 Condition and Sub-Condition Parameters

Table 16-1 Condition Parameter and Weights - Manholes

m	Condition parameter	WCP_m	Sub-Condition Parameters
1	Structure	3	Table 16-2
2	Access & Work Environment	1	Table 16-3
3	Service Record	2	Table 16-4
	Age Limiting Factor		Table 16-6

Table 16-2 Structure Sub-Condition Parameters and Weights (m=1) - Manholes

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Roof/Slabs	3	Table 16-5
2	Walls	3	Table 16-5
3	Floors	1	Table 16-5

Table 16-3 Switch Sub-Condition Parameters and Weights (m=2) - Manholes

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Lid	1	Table 16-5

Table 16-4 Service Record Sub-Condition Parameters and Weights (m=3) - Manholes

n	Sub-Condition Parameter	$WSCP_n$	Condition Criteria Table
1	Overall	1	Table 16-5

16.1.2 Condition Criteria

Inspection

All the condition scores are based on EnWin's inspection grading results (within the range of 0 to 5).

Table 16-5 Inspection Result Criteria - Manholes

Score	Description
Score = EnWin_inspection_grading * 0.8	

Age Limiting Factor

In this project, age was used as a limiting factor to reflect the degradation of asset unit as time passed by. Principle of applying the degradation survival curve is described in Equation 6 of Section 1.1.2.

In this project, the parameters of Manholes age limiting curve are shown in the following table, based on industry practice.

Table 16-6 Age Limiting Curve Parameters - Manholes

Asset Type	α	β
Manholes	**57.534**	**10.686**

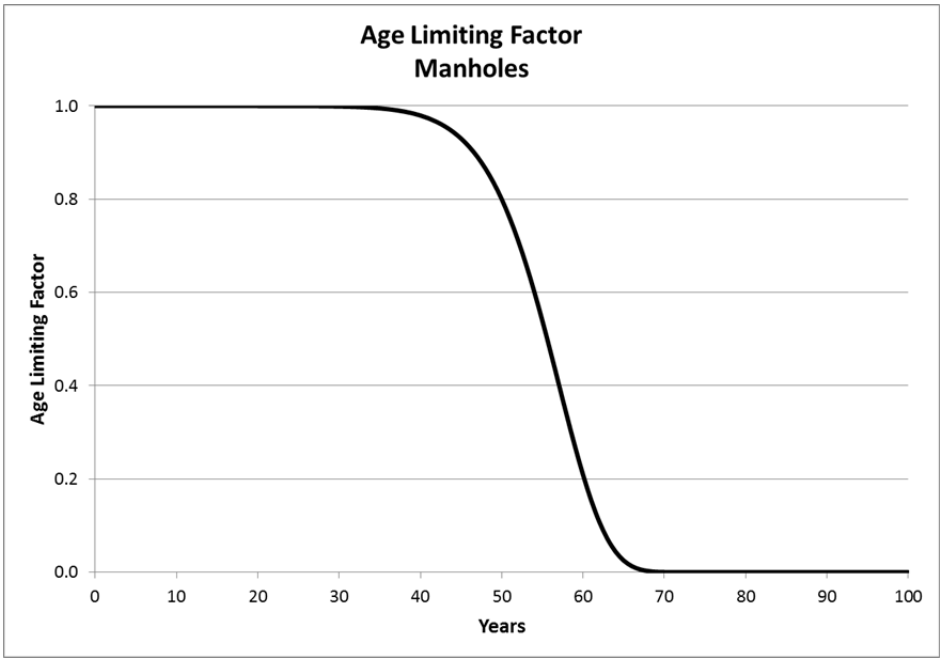

Figure 16-1 Age Limiting Factor Criteria - - Manholes

16.2 Age Distribution

The average age of the units was 49 years for Manholes.

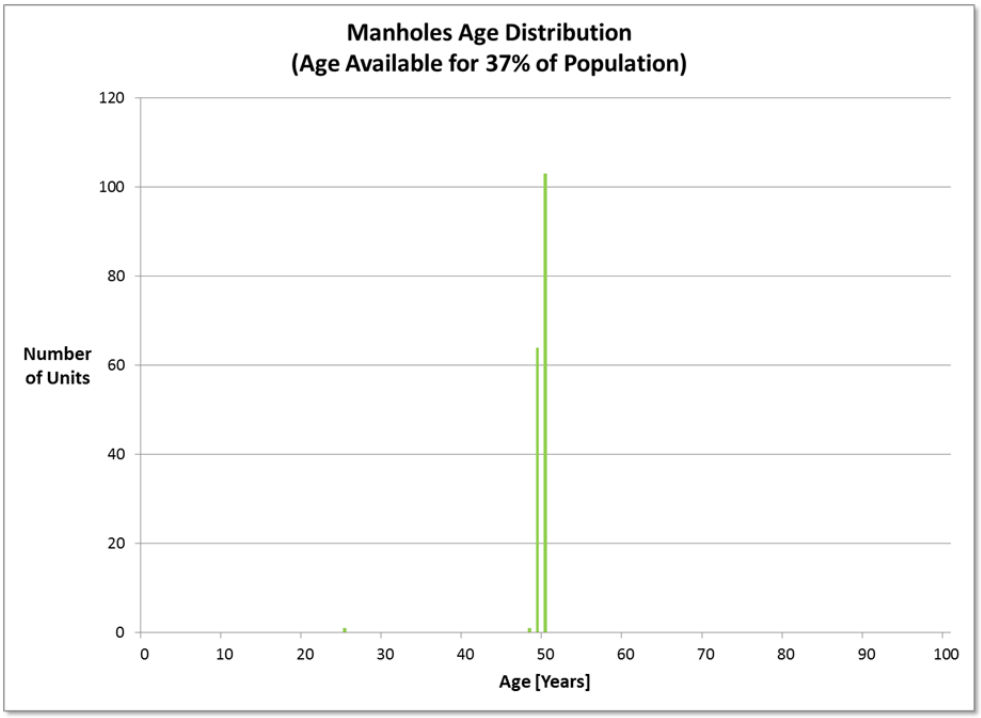

Figure 16-2 Age Distribution - Manholes

16.3 Health Index Results

There were a total of 461 units of Manholes at EnWin. Among them, 386 units had sufficient data for a Health Indexing.

The average Health Index score for this asset group was 88%.

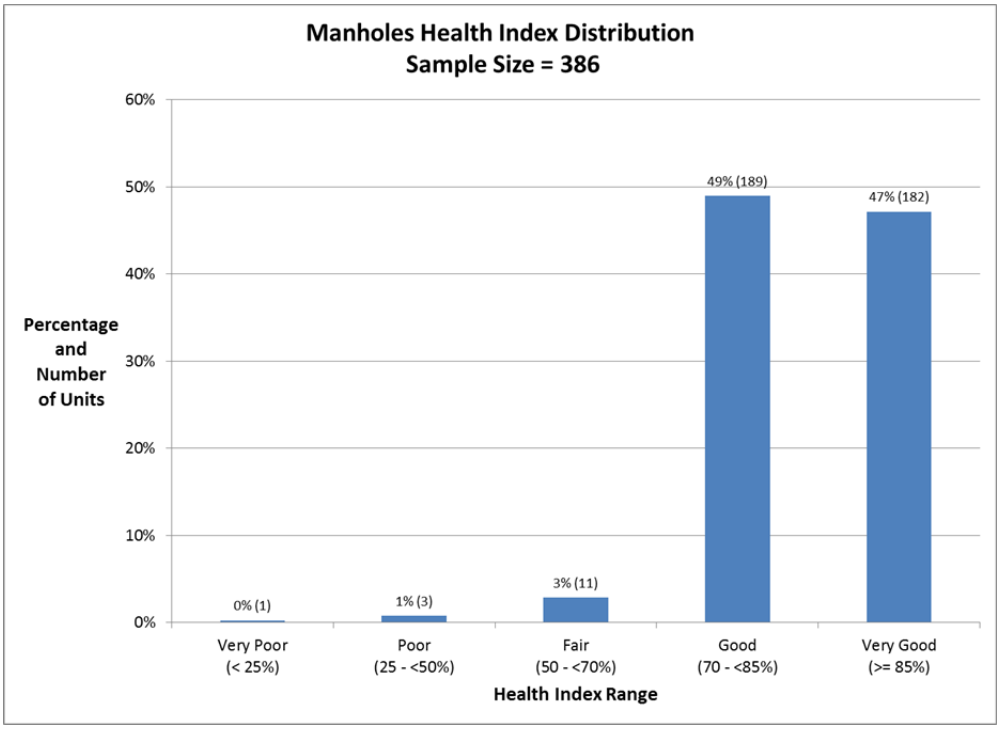

Figure 16-3 Health Index Distribution - Manholes

16.4 Flagged for Action Plan

The flagged for action plan for Manholes were based on the data from sample size and extrapolated to the entire population.

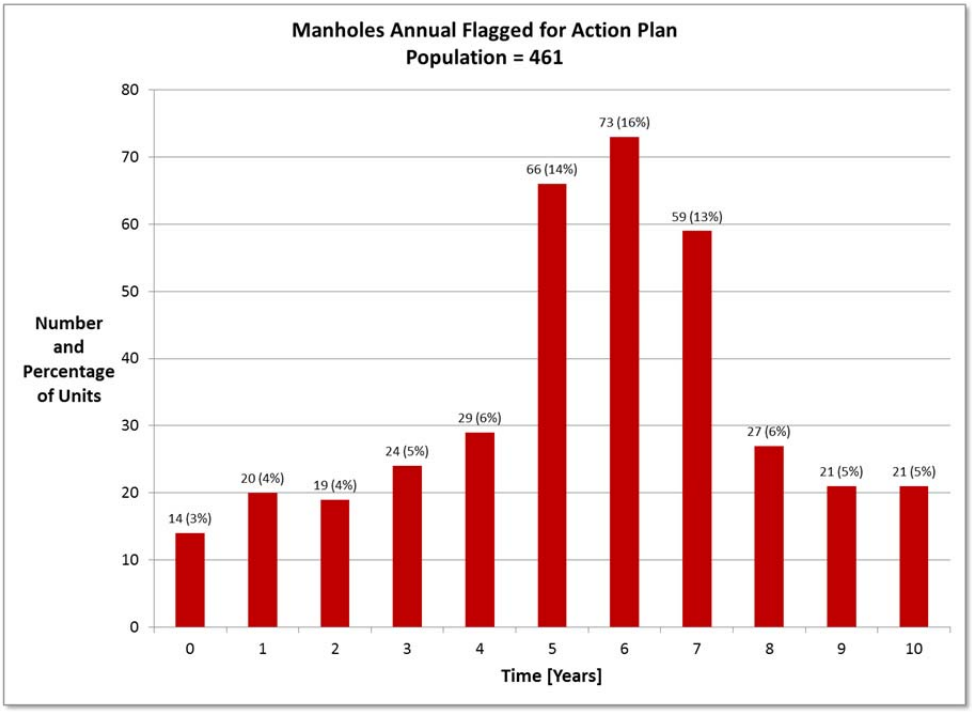

Figure 16-4 Flagged for Action Plan - Manholes

16.5 Data Gaps

The data used for Manholes assessment included age and inspection results.

The major data gap for this asset group was historic removal record.

Table 16-7 Data Gap for Manholes

Data Gap (Sub-Condition Parameter)	**Parent Condition Parameter**	**Priority**	**Object or Component Addressed**	**Description**	**Source of Data**
Historic Removal Record		☆☆☆	Age	Age at Removal	Inventory Database

Appendix B - Customer Engagement

INNOVATIVE RESEARCH GROUP

Customer Engagement

PRIVILEGED AND CONFIDENTIAL

2019 Rate Application

Prepared for:

EnWin Utilities Ltd.
787 Ouellette Avenue
Windsor, Ontario
N9A 5T7

Customer Engagement Report

2019 Cost of Service Rate Application

October 2017

Confidentiality

This Report and all of the information and data contained within it may not be released, shared or otherwise disclosed to any other party, without the prior, written consent of EnWin Utilities Ltd. ("EnWin").

Acknowledgement

This report has been prepared by Innovative Research Group Inc. ("INNOVATIVE") for EnWin. The conclusions drawn and opinions expressed are those of the authors.

Innovative Research Group Inc.
56 The Esplanade, Suite 310
Toronto, Ontario M5E 1A7
Tel: 416.642.6340
Fax: 416.640.5988
www.innovativeresearch.ca

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Introduction

About this Consultation

Innovative Research Group Inc. (INNOVATIVE) was commissioned by EnWin Utilities Ltd. (EnWin) to help the utility design, collect feedback and document its customer engagement and consultation process as part of the development of EnWin's 2019 Distribution System Plan and assessment of capital investments and operational plans.

EnWin's 2019 Distribution System Plan (DSP) will be a key element of its next Cost of Service distribution rate application. The outcome of the application will determine EnWin's electricity distribution rates for 2019 and will help set the pace of spending over the following 5 years.

The Ontario Energy Board's (OEB) "consumer-centric" approach to rate applications contained in the *Renewed Regulatory Framework for Electricity (RRFE)* requires Local Distribution Companies (LDCs) to demonstrate that their services are provided in a manner that responds to identified customer needs and preferences[1]. Distributors are required to provide an overview of customer engagement activities that they have undertaken with respect to its plans and how customer needs and preferences have been reflected in the distributor's application. These requirements have the effect of bringing customers directly into the process of finding the right balance between distribution costs and reliability.

The OEB does not specify how customer engagement should be done or how customer feedback should be received. However, it has encouraged utilities to use *"both existing and new processes"*[2]. EnWin's customer engagement was designed with this in mind, where customer feedback was collected using multiple methodologies, including: an online workbook, focus groups, workbooks, one-on-one interviews, and telephone surveys. The following section explains the customer engagement approach taken by and on behalf of EnWin.

Approach to Meaningful Customer Engagement

Engaging customers in meaningful consultation on electricity can be a challenge. The reality of most consultation processes is that they start out aiming to collect the views of the average person, but end up collecting the views of organized advocacy groups.

Often customers feel they do not know enough to contribute to a consultation. Others fear the combative nature of some public processes or prefer not to risk offending friends and neighbours by taking positions on issues that are sometimes controversial. Moreover, many customers simply do not pay attention and remain unaware of particular consultations that they would participate in had they been aware.

[1] OEB Renewed Regulatory Framework for Electricity Sections 2.4.2, 5.0, and 5.0.4.

[2] Handbook to Utility Rate Applications (October 13, 2016)

Running a customer engagement consultation has an additional challenge – customers' lack of familiarity with the distribution system; including how it is funded, regulated and the nature of its challenges.

Considering both the challenge of engaging a representative group of customers and the challenge of lack of knowledge, we developed a process built on five key principles:

1. Ensure all EnWin customers have an opportunity to be heard.
2. Use random-sampling research elements to ensure a representative sample of customers are engaged.
3. Create open voluntary processes that allow anyone who wants to be heard an opportunity to express themselves.
4. Focus on fundamental value choices. Look for questions that ask people to choose between key outcomes rather than focus on the technical questions of how to reach those outcomes.
5. Create an opportunity for customers to learn the basics of the distribution system so they can provide a more informed point of view.

Finally, a specific effort was made to collect participant comments on the process itself.

Customer Consultation Overview

Based on the principles outline above, INNOVATIVE worked with EnWin staff to design a multifaceted customer engagement program which included a combination of qualitative and quantitative research elements. This consultation was designed to engage multiple rate classes and collect feedback on their priorities, needs and preferences as they relate to EnWin's service delivery and the capital investment and operational spending required to deliver the services customers' value. Findings from the customer engagement initiative will help inform EnWin's business plan, DSP and rate design which will form part of its rate application to the OEB.

The consultation encompassed five core elements of customer engagement.

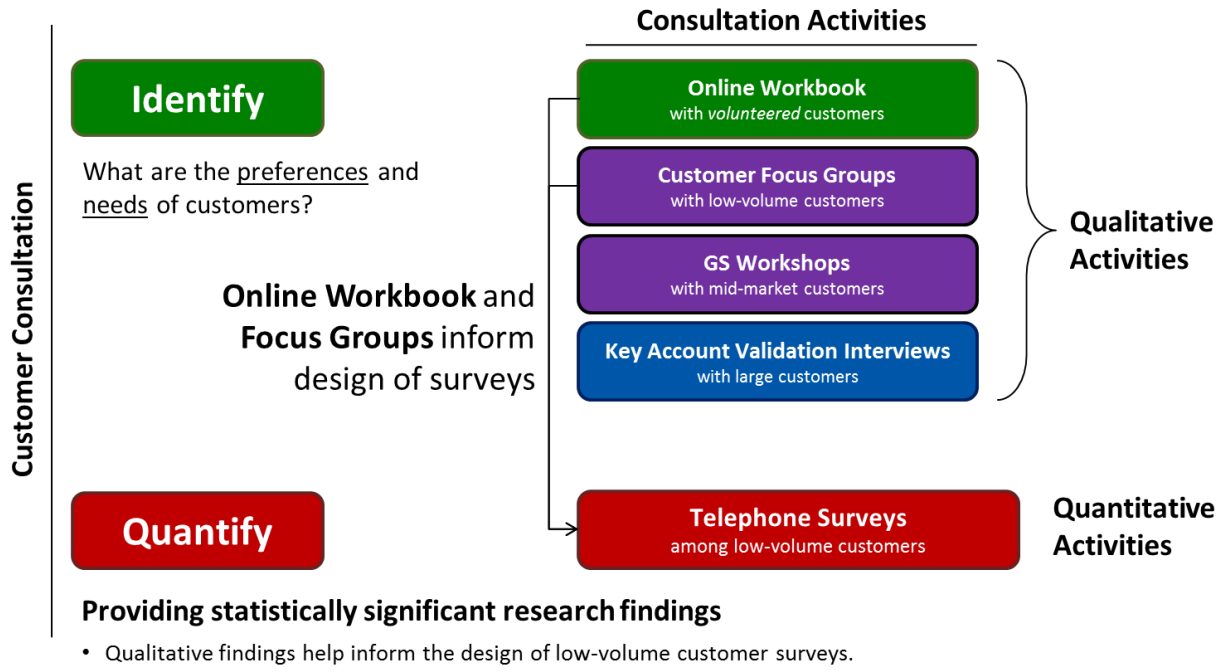
1. **Small business (GS<50kW) and Residential Consultation Groups:** This qualitative phase of the consultation was designed to educate customers, assess their preferences and priorities, gauge reaction to proposed rate changes, and ultimately inform the quantitative phases of the consultation. The groups were randomly recruited and held in the City of Windsor. A workbook was used to provide the participants with core information about both the provincial and local electricity system, EnWin's proposed capital investment and operating spend to maintain system reliability, as well as the rate impact for each respective rate class. Participants were provided incentives in recognition of their time commitment.
2. **Mid-Market Workshops**: Mid-Market customers (GS > 50 kW) were engaged through a randomly recruited workshop. This workshop included a presentation delivered by EnWin CDM and engineering staff on the utility's DSP and rate implications for this rate class, a Q&A session with EnWin staff, and "breakout style" discussion groups led by INNOVATIVE staff.

3. **Key Account Validation Interviews**: Key Accounts (Large Use customers) were consulted on the proposed plans and options by EnWin staff. INNOVATIVE followed-up by telephone with these customers after their consultation session to validate the process and to verify that EnWin provided them with the information they needed to provide informed feedback on the proposed plan.
4. **Online Workbook**: The online workbook was promoted through print and digital advertising by local media outlets, social media, as well as EnWin's website. This phase of the consultation was available to any EnWin customer who wanted to participate.
5. **Random Telephone Surveys**: INNOVATIVE conducted telephone surveys with residential and small business (GS < 50kW) customers to provide a quantitative assessment of key aspects of the system plan. Customer lists for both respondent groups were provided by EnWin and the sample was randomly selected by INNOVATIVE.

There were three stages in developing and implementing EnWin's customer consultation:

- **Think**: The first stage was to develop the core background material and key questions for the workbook. INNOVATIVE and EnWin worked together to review information pertaining to the distribution system including reliability challenges and asset health, as well as options related to capital investments and OM&A spending. Potential questions were identified that would enable customers to share their needs, preferences and priorities for the utility. Then a workbook was developed that would provide the information needed to enable customers with varying levels of knowledge to find answers to those questions.
- **Identify**: The second step was to determine the range of views held by EnWin customers regarding the system plan through qualitative elements of the process. This included holding customer discussion groups using randomly recruited samples of residential and small business customers.
- **Quantify**: The third step was quantitative – a randomly recruited telephone survey of residential and GS < 50 kW customers. Randomly recruited surveys allow for generalizable conclusions that can be applied to the broader population of EnWin customers. The surveys were developed based on the feedback from the qualitative research.

Customer Engagement Stages



Workbook Development

As we noted earlier, a key challenge in obtaining customer feedback on EnWin's rate application is the lack of knowledge customers have regarding Ontario's electricity system and EnWin's role as the local distributor within the system. EnWin's proposed Distribution System Plan, capital investment plan and OM&A budget are all very detailed and extensive documents that use technical language. Our challenge was to briefly cover these key issues and frame meaningful questions about customer needs and preferences.

Development of the consultation workbook began in late 2016. INNOVATIVE provided a framework for the workbook, which contained background information on the rate application process and the provincial electricity system. All content specific to EnWin was provided by the utility or obtained through the OEB Yearbook.

The final consultation workbook had five distinct chapters:

1. **What is this Consultation About?** The purpose of the discussion, where the discussion fits in the context of electricity planning in Ontario.
2. **Electricity 101**: How the overall system works and the players involved in operating and regulating the system as it relates to EnWin's customers.
3. **EnWin's Distribution System Today**: A discussion of the structure and key elements of EnWin's distribution system.
4. **Pressures on the Distribution System**: A discussion of the various challenges facing EnWin's distribution system and an overview of recent and current initiatives to manage identified challenges. This section provided an overview on forecasted capital and operating spending for 2019 to 2023.

5. **What could EnWin's Plan Cost Customers**: A section covering the expected impact on rates and overall reaction to the investment plan.

Although customer experience and familiarity with the energy sector varied, the same basic workbook was used in all qualitative customer engagements. The references to bill impact were varied to reflect the details of that specific rate class (either residential or GS < 50 kW). As the customers went through the consultation workbook they were prompted with questions relating to system reliability, system challenges, and preferences on the direction of EnWin's proposed system plan, capital investment and operating spend.

The questions themselves were another key element of the workbook. In developing the questions, we looked for those that would also have value in telephone survey format, without requiring all of the information in the workbook.

The *needs* questions were the most straightforward to design. We started with a basic satisfaction question and then asked an open-ended question about how EnWin could improve its services. Customers were able to discuss topics important specifically to them, without boundaries. Later in the workbook we probed satisfaction with the number and duration of outages as well as power quality, and the impact outages have on customers of each rate class.

Questions designed to capture *preferences* took more consideration. We were looking for value choices rather than technical issues. Key topics for preferences included:

- What do customers expect of EnWin and where should the utility focus its priorities?
- What should the balance be between system reliability and rate impact?
- What should EnWin's priority be when planning its level of investment in replacing aging infrastructure?
- How important is grid modernization to customers?
- Should EnWin invest in buildings, equipment and IT systems?

The final questions asked about the cost of the plan and the outcomes it planned to achieve. First, we asked to how they feel about the proposed range of rate increase Customers were given, three options, as well as a "don't know" option:

- The proposed range of rate increases is reasonable and I support it
- I don't like it, but I think the proposed range of rate increases is necessary
- The proposed range of rate increases is unreasonable and I oppose it
- Don't know

This was followed by a more direct value question concerning the trade-off between price and reliability. In the telephone survey, residential customers were presented with four scenarios and the rate impact of each, as follows [small business (GS < 50 kW) figures are shown in brackets]:

- I would be willing to accept an additional **$5.25 ($12.00)** on the EnWin portion of my bill by 2023 if reliability and service performance **improves**.
- I would be willing to accept an additional **$4.35 ($10.00)** on the EnWin portion of my bill by 2023 if reliability and service performance **remains the same as now**.

- I would be willing to accept an additional **$3.45 ($7.90)** on the EnWin portion of my bill by 2023 knowing that reliability and service performance **could eventually decline**.
- I am **not willing to accept any additional charges** on the EnWin portion of my bill knowing that reliability and service performance **could decline significantly**.

The workbook concluded with a final set of five questions to assess the workbook and process itself.

The workbooks for residential and small business customers can be found in the **Appendices** of this report.

Executive Summary

In this section, we provide a high level overview of EnWin's customers' needs and preferences.

This overview includes feedback from customers who participated in the *qualitative stage* of the consultation where we explored the range of issues related to EnWin's rate application, as well as feedback from 762 residential and small business (GS<50 kW) customers who responded to the quantitative stage where we documented the incidence of *needs* and *preferences* across the customer population.

Customer Needs

Overall, customers are satisfied EnWin's performance on almost all measures that directly affect them and their organizations, including power quality, reliability, and customer service. The only overarching concern is the cost of electricity, an issue raised consistently throughout the customer engagement consultation.

Overall Satisfaction across Consultation Phases

Q. Generally speaking, how satisfied are you with the job EnWin is doing running your electricity distribution system?

Response	Directional (Focus Groups)		Directional (Workshop)	Directional (Online)	Directional (Validation Interviews)	Generalizable (Telephone Surveys)	
	Residential	Small Business	Mid-Market (>50kW)	Residential	Key Accounts	Residential	Small Business (<50kW)
Very satisfied	n=9	n=4	n=4	38%	n/a	30%	31%
Somewhat satisfied	n=4	n=5	n=7	31%	n/a	44%	53%
Neither satisfied nor dissatisfied	n=3	n=2	n=0	17%	n/a	6%	7%
Somewhat dissatisfied	n=0	n=1	n=2	10%	n/a	9%	4%
Very dissatisfied	n=0	n=1	n=1	3%	n/a	10%	5%
Don't know / Refused	n=0	n=0	n=0	1%	n/a	1%	1%
	n=16	n=13	n=14	n=114	n=5	n=560	n=200

Note: Online General Service (n=2) responses not shown

In the table above, 'directional' is synonymous with qualitative. Findings from these phases capture broad ideas and determine what questions should be asked in subsequent phases, however the preferences and opinions expressed here cannot be said to be representative of the population as a whole. In contrast, findings from the 'generalizable' are quantitative, and are representative of the population.

Note: The above question was not asked during the Validation Interviews with Key Accounts.

Customers Satisfied with Reliability of Service

In terms of delivering reliable service, EnWin is performing very well. In the *qualitative* phases, the impact of outages and how customers are affected by interruptions were explored. Experiences of outages were few and most posed only a minor inconvenience.

Small business (GS < 50kW) and mid-market (GS > 50kW) customers experience outages to varying degrees of severity, depending on the type of operation they run. In the focus groups, mid-market (>50 kW) customers reported very few outages lasting over a minute, and while they found outages to leave a lasting impression, they acknowledge that the impact was not great. Further, 8-in-13 small business (<50 kW) customers cited that service interruptions caused only *minor* or *barely any* impact to their businesses altogether.

In the *quantitative* phase questions were framed to determine satisfaction with various aspects of reliability; number of outages, restoration time, and power quality. All measures show a high degree of satisfaction as illustrated in the table below.

Satisfaction with Reliability	Telephone	
	Residential	Small Business (<50kW)
Number of Outages	87%	93%
Restoration Time	88%	88%
Power Quality	85%	82%

Aside from lowering cost, few customers have any additional improvements to suggest

Customers in all phases of the consultation were given the opportunity to provide suggestions as to how EnWin can improve service to them. Lowering rates was the primary suggestion cited across the groups. Many customers are feeling the financial burden of increasing costs, and keeping costs low where possible is a high priority. Aside from this, when it comes to other aspects of EnWin's operations, customers appear to be satisfied and have no additional needs to address.

How can services be improved? (Open-Ended) – Top 2 Answers	Online	Telephone	
	Residential	Residential	Small Business (<50kW)
Lower Rates	13%	54%	43%
No Improvements/Don't know	64%	29%	40%
Other	23%	17%	17%

Customer Priorities

Residential and small business (<50kW) see cost, reliability and safety as EnWin's top priorities

The sentiments expressed above were echoed across the groups given a more structured exercise in priority ranking. Customers were provided a list of areas to which EnWin could allocate resources and attention, and were asked to rank their top three of six measures. The top priority, consistent across groups, was the need to *deliver electricity at a reasonable price.* There is some acknowledgment that EnWin is responsible for only part of the bill as less than half of customers reported being familiar with the portion of their bills remitted to EnWin (telephone survey – residential: 43%; small business: 36%). Further, the impact electricity bills have on customers' finances persists as a top of mind concern, with those most significantly affected least likely to support investments that may increase their bills.

That said, maintaining reliability is the second most important priority to customers across the board.

Finally, safety is the third top priority. It is an almost unspoken expectation that the system is operating safely for all EnWin staff and customers.

Top 3 Customer Priorities	Online	Telephone	
	Residential	Residential	Small Business (<50kW)
1st	Price	Price	Price
2nd	Reliability	Reliability	Reliability
3rd	Safety	Safety	Safety

Customer Preferences

Customers expect EnWin to maintain a proactive capital investment program that either improves or maintains system reliability.

Proactive Investment: The telephone surveys reveal that a majority of low-volume customers want EnWin to spend what is needed to either *maintain* or *improve* system reliability related to fewer and shorter outages.

System Service Investment: Technologies, such as automated switches, that can improve reliability and manage outages more efficiently, are seen to have comparatively the most value in terms of investment. In the telephone survey about 7-in-10 respondents (residential: 69%; small business: 73%) feel that it is important to invest now in modernizing the grid. This sentiment was shared by 47% of residential online respondents, who felt that *technology will save money in the long run*.

General Plant Investments: Around half of telephone survey respondents acknowledge the importance of EnWin staff having the tools, equipment and IT systems they need to operate the system, and therefor feel the EnWin should be wise with its spending in this area. Residential respondents (58%) were slightly more supportive of this approach than their small business (50%) counterparts.

System Renewal Investments: When it comes to replacing aging infrastructure, respondents are divided with a slight lean in favour of investing what it takes to maintain system reliability; even if this increases customer monthly bills.

Telephone Survey Respondents	Residential	Small Business (<50kW)
Addressing the *Frequency* of unexpected power interruptions		
Spend what is needed to **reduce** # of power outages	23%	25%
Spend what is needed to **maintain** current levels	51%	49%
Accept more power outages in order to help costs from rising	14%	14%
Addressing the *Length* of unexpected power interruptions		
Spend what is needed to **reduce** length of power outages	25%	23%
Spend what is needed to **maintain** current levels	47%	50%
Accept longer power outages in order to help costs from rising	19%	17%
General Plant Investments (fleet, tools, IT systems)		
Be wise with spending, but important staff have needed equipment	58% ✓	50% ✓
Find ways to make do with existing equipment	35%	39%
System Renewal Investments (aging/end-of-life replacement of infrastructure)		
Invest in replacing aging infrastructure	45%	49%
Lower investment to lessen bill impact, even if reliability decreases	44%	37%
System Service Investments (new technology investments)		
Technology will save money in the long run	69% ✓	73% ✓
New technologies are more of a luxury	21%	19%

Majority of low-volume customers want EnWin to spend what is needed to either *maintain* or *improve* reliability

Customers value a variety of system upgrades but are unwilling to pay for them

In the telephone surveys customer were asked to agree or disagree with a number of statements derived from themes uncovered in the previous qualitative stages of the customer engagement.

The telephone survey reinforces the idea that customers expect EnWin to sustain a proactive capital investment program designed to maintain system reliability.

Not only do customers personally value reliable electrical service, they see reliability as an economic advantage for the City of Windsor. There also appears to be a preference to make investments now as opposed later due to the current relative health of the local economy.

However, customer willingness to pay for improved system reliability upgrades is lower than maintaining the current level of reliability.

The tables below illustrates the customer attitudes toward the themes uncovered throughout the previous stages of the consultation. The numbers represent the net agreement score; the proportion of those who agree minus the proportion of those who disagree.

Agree/Disagree Statements Net Agreement Scores = Agree - Disagree	**Residential**	**Small Business (<50kW)**
Competitive Advantage: A reliable local electricity system is a competitive advantage for the City of Windsor and can help retain existing jobs and attract new ones.	+66%	+72%
System Reliability: A few power outages are fine for me personally, but I worry about the impact this has on more vulnerable people, such as the elderly.	+65%	+55%
Labour Costs: Skilled hydro workers are sought out across both North America and Ontario. EnWin should pay the people who maintain the local distribution system a competitive salary, or they risk losing the most qualified and experienced hydro workers to other utilities.	+58%	+58%
Legacy: Nobody likes to pay more for electricity, but I think we have an obligation to maintain the reliability of our local electrical system for future generations.	+56%	+58%
Modernizing the Distribution System: We need to modernize the local electricity system so consumers can have greater control over their electricity usage.	+48%	+49%
Pay Now or Later: We should invest in our electricity system now, while the local economy is relatively strong and unemployment is relatively low.	+41%	+49%
Willingness to Pay: I'm willing to pay a bit more for my electricity if it means better system reliability.	-24%	-37%

Reaction to Proposed Investment Plan

Most customers accept the proposed range of rate increases

When making the final determination in whether the rate increase is supported or not, we look for what is called *social permission*. A binary scenario is too polar to appropriately capture the conflict many experience when considering an issue such as this. Therefore, we included a third option, which allows for resistance to an increase, while acknowledging its necessity. This, combined with outright support for the increase, equates social permission.

Customers gave EnWin social permission on the generalizable portion of the consultation – the telephone survey. Customers have become accustomed to the level of reliability and service they receive from EnWin, and while many do not like the idea of an increase, the majority are in favour of paying a little more to maintain their service.

Ultimately, 54% of residential customers and 59% of small business (>50kW) customers accept the proposed range of rate increase.

This sentiment was not seen as strongly in other phases of the consultation, however it is important to note that those phases were comprised of a very limited sample. They are considered "directional," which is to say findings from these phases cannot be considered representative of

EnWin's entire customer base. Telephone surveys on the other hand, are "generalizable" and represent the overarching beliefs of the population.

Response	Directional (Focus Groups)		Directional (Workshop)	Directional (Online)	Directional (Validation Interviews)	Generalizable (Telephone Surveys)	
	Residential	Small Business	Mid-Market (>50kW)	Residential	Key Accounts	Residential	Small Business (<50kW)
The rate increase is reasonable and I support it	n=5	n=2	n=1	9%	n=0	17%	20%
I don't like it, but I think the rate increase is necessary	n=8	n=3	n=7	32%	n=2	37%	39%
The rate increase is unreasonable and I oppose it	n=2	n=8	n=3	48%	n=3	36%	32%
Don't know / Refused	n=1	n=0	n=3	11%	n=0	10%	9%
TOTAL	**n=16**	**n=13**	**n=14**	**n=114**	**n=5**	**n=560**	**n=200**

Note: Online responses for General Service (n=2) not shown

Among residential customers, reasons for opposing the proposed range of rate increases are primarily due to the belief that: bills are already too high (46%); EnWin should make do/plan better (11%); don't trust EnWin to spend properly (11%); generally just don't like paying more (8%).

The most common reason for supporting the range of rate increase, among both those who support it outright (52%) and those who don't like it but feel it's necessary (46%), is that the increase is reasonable, necessary and to be expected. This is followed by the acknowledgement that upgrading and maintaining the system is important for the future (31%, and 15% respectively).

Q And why do you say that?
[asked of all residential customers with a response; n=475]

Permission: Reasonable, and support	
Increase reasonable, necessary and to be expected	52%
Upgrading/maintaining system important (for future)	31%
Waiting will cost more	7%
Other	7%
Sample size	**n=88**

Permission: Don't like, but necessary	
Increase reasonable, necessary and to be expected	46%
Upgrading/maintaining system important	15%
Bill is already too high	7%
Don't like any increase	5%
No reason	3%
Waiting will cost more	2%
Other	20%
Don't Know	2%
Sample size	**n=191**

Unreasonable, and oppose	
Bill is already too high	46%
EnWin should make do/have planned better	11%
Don't trust EnWin to spend properly/won't see benefit	11%
Don't like any increase	8%
Management salaries too high	5%
Increase amount is too much, already increased it recently	3%
No reason	2%
High cost of living, hurting low-income Ontarians	1%
Other	13%
Don't Know	1%
Sample size	**n=196**

Similarly, among small business (<50kW) customers who oppose the proposed range of rate increases, top reasons for opposing are: already paying too much (28%); proposed increases too

high/can't afford (21%); EnWin should find other ways to finance needed investment and spending (14%); don't trust EnWin (7%) and generally just don't like paying more (5%).

The most common reasons for supporting the range of rate increase, among small businesses who support it outright, are that 51% feel it's a small increase over time and 29% feel it's important to invest in improvements.

Q And why do you say that?
[asked of all small business customers with response; n=162]

Permission: Reasonable, and support	
It is a small increase over time	51%
They have to improve things	29%
Price of everything goes up	6%
No one wants a rate increase	3%
They should find other ways to finance it	3%
Other	9%
Sample size	**n=35**

Permission: Don't like, but necessary	
They have to improve things	21%
No one wants a rate increase	21%
Already paying too much	11%
They should find other ways to finance it	9%
No choice/someone has to pay for it	8%
Other	6%
Price of everything goes up	5%
It is a small increase over time	3%
Don't trust EnWin	3%
Increase is too high/can't afford any more	2%
Refused	12%
Sample size	**n=66**

Unreasonable, and oppose	
Already paying too much	28%
Increase is too high/can't afford any more	21%
They should find other ways to finance it	14%
Don't trust EnWin	7%
No one wants a rate increase	5%
Everything is being increased, the system should be better	4%
Other	12%
Don't Know	2%
Refused	7%
Sample size	**n=57**

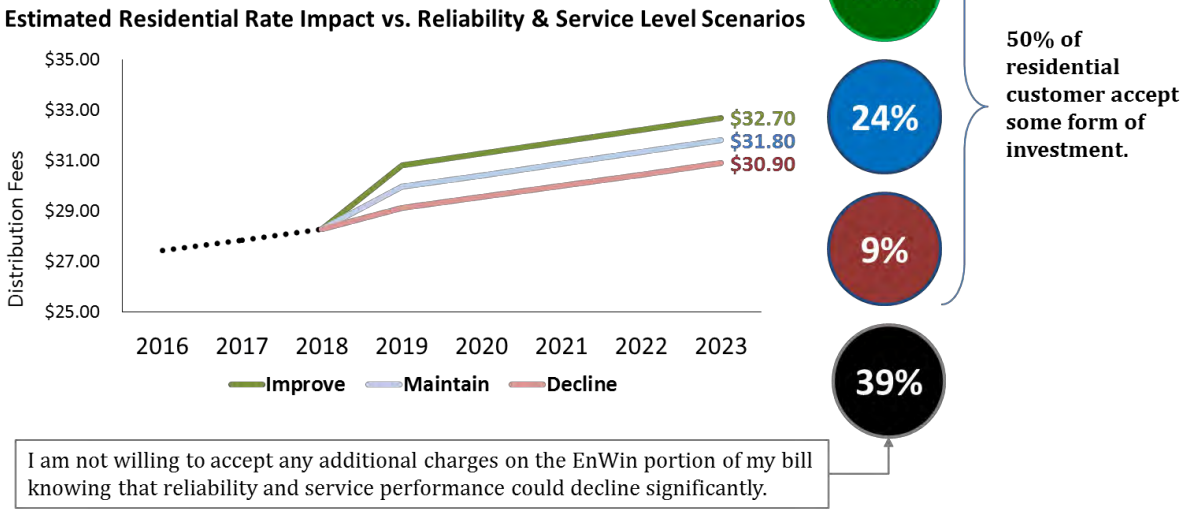
A majority of customers support rate increases to varying degrees

After being presented with all relevant information customers were exposed to several different scenarios and were given the choice of several outcomes and how those outcomes would affect their rates.

Q While *ENWIN* has presented a preliminary plan that ***maintains*** the current level of reliability and service performance, as part of its planning process, *ENWIN* has looked at two alternative scenarios:

- one where reliability and service levels ***decline***;
- and one they ***improve***.

Each scenario impacts customer rates differently.



Note: 'Don't know'/'Refuse' (11%) not shown

As illustrated in the table below, a plurality of the customers (39% residential and 36% small business) would accept a significant decline in service; they prioritize cost over reliability and accept more potential outages in order to minimize bill impacts.

That said, a majority of customers are willing to pay at least some additional amount on their bills to invest in the distribution system.

Response	Focus Groups		Workshop	Online	Validation Interviews	Telephone Surveys	
	Residential (FG)	Small Business (FG)	Mid-Market & Large GS (FG)	Residential (O)	Key Accounts (KA)	Residential (Res)	Small Business (SB)
Improve [FG, O, KA: 9%; Res: $5.25; SB: $12.00]	n=6	n=1	n=5	17%	n=0	17%	11%
Maintain [FG, O, KA: 6%; Res: $4.35; SB: $10.00]	n=8	n=4	n=6	39%	n=1	24%	25%
Eventually Decline [FG, O, KA: 3%; Res: $3.45; SB: $7.90]	n=2	n=3	n=1	45%	n=1	9%	17%
Significantly Decline [No additional distribution charges]	n/a	n/a	n/a	n/a	n/a	39%	36%
None of the above / Don't know / Refused	n=	n=5	n=2	n/a	n=3	4%	8%
TOTAL	n=16	n=13	n=14	n=114	n=5	n=560	n=200

Note: Online General Service (n=2) responses not shown

The value of maintaining a healthy grid is noted throughout the consultation, however price remains a driving factor in the trade-off between reliability and costs borne by customers. EnWin may wish to consider this in the development of its DSP and customer rate design.

Focus Group Consultation

Focus Group Consultation
with Residential and
General Service customers

PURPOSE: To gain qualitative input on EnWin's plan from residential, GS < 50 kW and GS > 50 kW customers and to help inform the design of the subsequent telephone surveys.

Methodology

About the Residential and General Service (GS < 50 kW & GS > 50 kW) Customer Consultation

INNOVATIVE was engaged by EnWin to conduct a series of residential and general service customer consultation sessions designed to identify the needs and preferences of customers as they relate to the utility's proposed spending on the distribution system.

The consultation sessions were held in Windsor between March 7th and 9th, 2017. A total of 43 general service and residential customers participated in these consultation sessions.

Residential Rate Class	16 participants
General Service under 50 kW Rate Class ("Small Business")	13 participants
General Service over 50 kW Rate Class ("Mid-Market")	14 participants

Recruiting Consultation Participants

General Service customers in both the under 50 kW and over 50 kW rate class were randomly selected from customer lists and then screened by telephone for appropriateness as session participants. Customers qualified for the consultation if they manage or oversee their organization's electricity bill, to ensure they are at least somewhat knowledgeable of their electricity costs and could have an informed discussion on the impact of the proposed rate increase.

Residential customers were screened to ensure they are the person in the household with primary or shared responsibility for paying the electricity bill.

Customer recruitment was randomly drawn from full customer lists that were provided by EnWin from their billing database. Randomized recruitment ensured a good mix of customers representing the broader EnWin customer base.

At the time of being recruited, customers were informed they would receive a cash incentive for participating in the consultation sessions. An incentive of $80 was provided to all residential customers; general service under 50 kW customers received $100 and general service over 50 kW received $150.

All focus group sessions were video recorded to verify participant feedback and capture verbatim quotes.

Consultation Session Structure

The consultation sessions were structured around the themes contained in the workbook that was developed by INNOVATIVE and EnWin in early 2017.

The workbook themes included the following:

1. What is this Consultation About?
2. Electricity 101
3. EnWin's Distribution System Today
4. Pressures on the Distribution System
5. What will EnWin's Plan Cost Customers?

At the beginning of the sessions, the facilitator provided an overview of the purpose of the consultation and why EnWin is seeking feedback from customers in their respective rate class.

After explaining the purpose of the consultation, hardcopy workbooks were distributed to act as a session guide and for participants to record their answers to the questions contained within.

The facilitator then led the participants through the workbook section by section to ensure they understood the information and to answer any questions about the content.

When it came to the questions within the workbook, participants were asked to fill in their answers independently. The facilitator then led a group discussion on the various issues covered in the workbook, and the implications for participants or their organizations.

While the consultation largely followed this structure, discussions arose organically as participants explored the workbook. Questions and comments were addressed by the moderator, and depending on the topic (i.e. whether or not it fell within the scope of this consultation), participants' impressions were further probed.

Hardcopy workbooks were collected from the participants at the conclusion of each consultation session. While two hours was allotted for each consultation session, due to the nature of the conversations, most sessions ran slightly longer.

Informing the Consultation Process

In addition to identifying customer needs and preferences related to the proposed Distribution System Plan, feedback collected from this phase of the consultation was used to inform the design of the qualitative phase (namely the telephone surveys) of EnWin's broader customer engagement program.

NOTE: Results contained within this report are based on a limited sample and should be interpreted as directional only. Margins of error cannot be applied to qualitative research.

A note on interpreting focus groups findings:

In focus group research, the value of the findings lies in the depth and range of information provided by the participants, rather than in the number of individuals holding each view. References in this report such as "most" or "some" participants cannot be projected to the full

population. Only a large sample, quantitative survey would be accurately projectable to the full population.

Participant Feedback

The following sections highlight the general feedback from each consultation session.

Residential Rate Class

EnWin's Role in the Electricity System

"EnWin should be proactive in telling people how the system works. The more we know, the more we are able to contribute."

In general, many residential customers entered these consultation sessions with a limited initial understanding of how the electricity system functions in the province and where EnWin's role fits into the broader system. In fact, *customer education* was a concept that was brought up in both consultation sessions. Residential customers often felt that the electricity system in Ontario was *"a little confusing"* and as a result, customers don't necessarily know where to place their frustration with regards to rising rates or other concerns they might have.

For many, *customer education* also goes beyond simply understanding how the system works. In fact, further proactive education efforts by EnWin were seen to be a way in which customers could impact their bill overall, whether through conservation or general habitual changes.

> *"So EnWin is a privately-owned company? That's why I wanted to clarify. Because in order to base opinions, it's difficult without knowing if we have choices, or if EnWin's a monopoly"*
>
> *"To tell you the truth, this is very new to me. To be honest, I didn't realize the fact that EnWin was solely distribution. I would talk about rates, but you're saying that the rates aren't even set by EnWin. So, this kind of changes my perspective."*
>
> *"EnWin should be proactive in telling people how the system works. The more we know, the more we are able to contribute. And personally, me and my family, we just pay our bills. I think it's important that people know how the system works."*
>
> *"When someone signs up for electricity service from EnWin, give them a copy of this book. I'd sooner read this than go searching online on my own."*
>
> *"I'd like to see more transparency, and more education of the customer base."*
>
> *"Maybe they should be making this information more widely available. Put a flyer in the bill to make more people aware."*

"I don't think they can solve the other distribution problems which are farther up the chain…"

Largely, in part due to low initial knowledge, residential customers often place their frustrations on the electricity system as a whole on EnWin solely. As the "face" of their electricity bills, few participants were aware that EnWin receives roughly 20% of their total bill to operate, maintain and modernize the distribution of electricity in the Windsor area.

Following a moderator-led discussion about the responsibilities of the various entities in Ontario's electricity sector, residential participants largely began to focus their displeasure "farther up the chain", specifically with Hydro One and the provincial government.

"With EnWin being the distributor, most of my gripes are higher up the chain with decisions made by the province as far as their generation mix. I have a lot of issues with that, I don't think they thought it out. As far as EnWin, I'd like to see them, within a reasonable rate, making more investments in their infrastructure."

"I don't think they can solve the other distribution problems which are further up the chain with Hydro One's high voltage lines."

"I bet EnWin staff get a lot of flak for decisions that are made at the top [provincial government]."

"It's just mismanagement by the government. The government just keeps getting bigger and bigger and our bills are going up."

"When you're on a fixed income, [EnWin] needs to understand not to go too high…"

While only representing a minority of residential participants, those on fixed incomes feel that EnWin needs to consider their difficulties and the impacts of rising electricity costs. These participants want EnWin to understand that any rate increase, regardless of the size, will make their budget decisions more difficult and ultimately result in difficult spending priorities being made.

"When they set up off-peak and on-peak. It's hard because you work all day and then come home and want to take a shower or cook a meal and you can't use [electricity] until after 7pm and it's too late to eat. You don't want to make the bill go up more, and sometimes they don't seem to understand that when you're on a fixed income, it's harder for us."

"When you're on a fixed income, [EnWin] needs to understand not to go too high. Like some of us have smaller payments. You've got to survive on what's there, and sometimes in tighter to figure out what to buy and what to do when you've got a bill that high."

System Reliability and Access to Information

"Personally, I don't see any disruptions. Obviously when there's a storm, the lights will go out, and to me that's understandable…"

For most residential participants, the current system reliability and number of outages is acceptable or as one respondent put it, *"consistent and reasonable"*. Beyond cases of severe weather, no residential participant recalled experiencing a prolonged outage as an EnWin customer (outside of the widespread power outages in 2003).

Overall, residential participants did not vocalize significant complaints about outages, defined as interruptions of more than one minute and agreed that the reliability in Windsor, especially compared to other regions, is quite good. They did however underscore the importance of continuing this level of reliability now and into the future. There is limited appetite amongst respondents in this rate class to accept more or lengthier outages.

"Personally, I don't see any disruption. Obviously when there's a storm, the lights will go out, and to me that's understandable, considering the weather conditions you're experiencing at that time. I don't expect my power to stay on when there's severe weather. That's just the way it goes. But I do expect that the power will back within a reasonable time. To me, reasonable is within 20 minutes, maybe that's expecting too much from them."

"These outage numbers look pretty consistent and reasonable."

"What we have here is very reliable. The number of outages and the time of restoration. I don't think I had one outage in the past year."

"Mexico, the Caribbean, Latin America and South America, they don't have the reliability of their power system that we have here."

"Why can't EnWin put outage information on their website?"

Despite limited displeasure with system reliability, residential participants were still interested in EnWin offering increased communications regarding estimated time of recovery (ETOR). This may include outage maps on their website, or social media accounts that provide up-to-date information on outages.

That said, there appears to be a limited desire amongst residential customers to engage with EnWin, and largely, participants are not proactively seeking this information, and largely aren't aware these communications tools already exist.

"I think there should be some reasonable expectation upon customers, that when you lose power… if anything, more information…when the power goes off, you don't know if it's going to come back the next minute or the next hour."

"Why can't EnWin put outage information on their website?"

In addition to information of ETOR, one residential participant noted that it would be useful for EnWin to offer a live-chat function on their website to address any customer questions in real-time, similar to what some other industries are offering. In this respondent's mind, such a tool would eliminate the customer need to phone EnWin to resolve inquiries or concerns. This suggestion, however, was unique to one residential respondent.

"I think they should have a section on their website for comments. Everybody is doing that. So, there's no telephoning, no waiting, you just ask a question and get an answer."

"If there's ever an outage, I wake up, the microwave is blinking and it didn't affect me."

With regards to outage impacts, residential customers largely noted minor inconveniences such as blinking lights and re-setting clocks. In fact, 11 out of 16 residential participants noted that their most recent power outage either *had barely any impact on their household* or *they don't recall ever experiencing an outage as an EnWin customer.*

"I think that if a transformer goes out on a pole, it's reasonable it's going to take a while to get vehicles in to where they have to go."

"If there's ever an outage, I wake up, the microwave is blinking and it didn't affect me."

That said, residential participants rely on the current service levels that EnWin provides in order to go about their daily lives. Just because the impact of outages is limited, does not mean reliability is not an important priority for these participants. A handful of participants noted that they work from home, and the current levels of reliability are important to them, and efforts should be made to maintain this level. Continuity and predictability of service are both extremely important for residential respondents to go about their daily lives, regardless of whether they work from home or not.

"For me their top priority should be reliable service. I also work out of my house a lot and I'm on my computer so I need my service regardless."

"…I think it's important to attract businesses…"

For a few residential participants, EnWin's services and associated costs play an important role in attracting and keeping businesses in the Windsor area. Therefore, EnWin should be doing what is necessary to maintain strong reliability as well as keep costs low and competitive to other regions (largely the United States).

> *"I want to make sure than Windsor and this area have a good reliable electrical system because I think it's important to attract businesses. If people are shopping around looking for a place where they're going to set up shop, if we can have a good reputation for reliable power and service, I think that's something that they could consider. I wouldn't want to see it go in the other direction."*

In the same vein, some residential participants would like to see EnWin keep jobs local, rather than potentially outsourcing to other regions. This was an important aspect of EnWin's operation for a small number of residential respondents.

> *"One comment I have is outsourcing, and taking away from employees that aren't doing anything… I've spoken to an EnWin employee where there outsourcing work where they are capable and have time to do it…"*
>
> *"…I'd also like to see as much labour involved as possible, I'd like to see that labour sourced from Windsor."*

Conservation and Demand Management (CDM)

"If you're not paying attention and leaving your lights on and your TVs are all on, it's not my problem."

For many participants, conservation is one of the most important areas that EnWin can help customers save and ultimately reduce their electricity bills. That said, many participants place the onus on themselves to change their electricity consumption habits, they would welcome the support of EnWin in communicating conservation strategies.

More information and proactive communications regarding conservation programs was frequently mentioned by residential participants. Participants are largely interested in more information on how to save on their electricity bills, and EnWin is seen to be a reliable source for expertise in this area.

> *"Right now, everything's been going well for me. I've went and upgraded my electrical system, and that's helped me a lot. I went through that insulation program. Everyone thought I was going overkill, but I don't think it was."*
>
> *"Talking to my friends, I think it all comes down to your usage habits. I work from home and I'm in the house all year round. When I'm working from home in the winter, I only have the heat on in the basement, I have the luxury of doing that. But I shut off the [electric] heat in the rest of the house and turn the lights off. It's a trade of between the lifestyle you want to live and the amount you want to pay [for electricity]."*
>
> *"I really don't think I use a lot of electricity, myself, I live on my own and I don't really think I use too much. I really hear a lot of people complain about it. I don't have any complaints about the service, I think the bill is relatively reasonable, considering I pay $120 in hydro and water. To me, that's pretty good."*
>
> *"If you're not paying attention and leaving your lights on and your TVs are all on, it's not my problem. You're paying for it, don't complain about it."*

"I changed my behaviour, and I didn't see any difference whatsoever."

Even though many participants voiced that they have changed their consumption behaviours, a number of them have not yet seen this reflected in their electricity bills. These residential participants want to see their total electricity bill reduced as a result of their proactive changes in behavior (i.e. only doing laundry in during off peak hours). EnWin is seen as an important partner in reducing bills, primarily through CDM programs and broader customer education.

> *"Teaching people and being consistent with what they are saying. They went through the major expense of the Smart Metres, and it cost the consumer. I didn't see any difference, but I don't think I'm your typical user."*
>
> *"I do hear a lot of people complain about time of use rates. I changed my behaviour, and I didn't see any difference whatsoever. That's what I hear a lot of people complaining about."*

Proposed Plan and Rate Impact

"I'm not opposed to a rate increase as long as they are reasonable…"

Ultimately, despite emphasizing the importance of EnWin continuing to look for internal efficiencies, and a general displeasure of the idea of their bills increasing, most residential participants supported the proposed range of increases. In fact, in the workbook, 10 out of 16 participants support the proposed range; two support it outright, while eight said *while I don't like it, I think it's necessary*.

> *"I'm luckily in a position where for me, financially, it's not a hardship to pay my monthly bills. I don't have a problem with the proposed range of rate increases, provided that the rate increases actually go towards maintaining and modernizing the system. I'd also like to see as much labour involved as possible, I'd like to see that labour sourced from Windsor."*
>
> *"We have to make sure that the system stays reliable in the future as well. Not just now."*

Despite largely supporting the proposed range of rate increases, many participants want to be ensured that this is not a "slippery slope". It was widely understood that a rate increase is necessary to address the growing pressures on the system, but participants want to be sure that their money is being well spent. One participant who didn't like it, but found it necessary noted that these investments need to be made both for ourselves as well as our children and grandchildren – a general sentiment that was echoed by a number of participants.

> *"I'm not opposed to a rate increase as long as they are reasonable and I think that the consensus here is that we'll pay for a reasonable rate increase. But again, I think there's a disconnect between what you've agreed upon as reasonable and what you actually see in your bill."*
>
> *"It's necessary. It's one of those evils. We've got to do it if we want to have electricity for our kids or grandkids. We've got to take care of it."*
>
> *"From my perspective, there is a problem with aging infrastructure. Infrastructure across North America is aging out, we hear about it all the time. Electricity is no different."*

A number of residential participants are concerned with *"what happens next"*. A central point made by a number of residential participants was with regards to *"what happens next"*. When presented with the potential range of rate impacts, some participants questioned whether this would actually be the impact, or is their total bill was going to continue to climb. Participants often struggled to separate EnWin from the broader electricity sector, and therefore wanted to understand what would happen to their bills in the coming months and years.

"We don't live in caves, so we know it's going to cost to keep the electricity flowing. But not too high."

General Service under 50 kW Rate Class ("Small Business")

Similar to the residential sessions, small business customers have a limited initial understanding of the electricity system and role EnWin plays within in. In fact, only 4 of 13 participants express being at least somewhat familiar with the various parts of the electricity system. Most small business participants knew very little about Ontario's electricity system before the session began.

General Satisfaction

Despite low initial awareness of EnWin's role in the electricity system, participants voiced varying opinions about their general experiences dealing with EnWin. 11 out of 13 participants were either satisfied(9) with or had neutral(2) feelings towards the service provided by EnWin. The two participants who were either somewhat (1) or very (1) dissatisfied with EnWin had specific requests that they felt were not being adequately addresses. The first was related to EnWin's perceived lack of responsiveness to helping customers "get off the grid". The second was related to damaged EnWin infrastructure near the participants business, which they felt was not being adequately addressed.

"I would like to see options to get off the grid in order to control and stabilize our future use."

"We have a power pole being held up by the wires attached. We have called for over 4 years. They keep sending someone but nothing had been done. Keep sending two workers to look at the pole with hands in their pocket"

"When you see a bill, you just see a bill."

As mirrored in the residential sessions, many small business customers have misplaced frustration towards the rising costs associated with electricity. Again, as a reflection of low initial knowledge of the system, many small business customers don't know who or what is responsible for bill increases, however, because EnWin is on the "frontline" they take the brunt of the blame. While almost all participants are satisfied with the services provided by EnWin, they would likely benefit from increased education regarding how the electricity system operates.

"My concern is the price. It seems like EnWin isn't getting a big piece of the pie, but our bills are so huge. It's probably not even EnWin's fault at this point, it's the government's fault."

"When you see a bill, you just see a bill. You don't really break it down into its various components."

In a similar vein, a number of participants feel that while they are frustrated with rising costs, EnWin's portion of the bill is not responsible for the "skyrocketing" rates. In fact, there was a general sentiment amongst some small business customers that the whole system is "hopeless" and they question whether anything they say or do will have an impact on reducing their overall bill.

"I look at the whole hydro bill. You're in this abyss. They to me are the people that are billing me."

"To me, it's just a farce. What can I do?"

After explaining and discussing EnWin's role within the electricity system, many customers refocus their anger and frustration towards provincial government "mismanagement". Again, there was a

general sentiment amongst some participants that the process is flawed and their best interests are not always being considered, nor are there any real solutions to the "problems" that exist within the sector.

> *"It's a lack of faith in the process. It's a lack of faith in how things are being operated. It's the system as a whole, I don't know who to point the finger at."*

While overall satisfaction with the services provided by EnWin are high, a handful of participants had negative experiences dealing with billing and deposits. Although not a common sentiment, some participants felt that EnWin's "new billing system" was not as effective as it was in the past. When probed, these participants noted that it had become increasingly difficult to manage bills for multiple properties. These participants further clarified these issues were largely technical, and not related specifically to EnWin's level of customer service.

Additionally, some participants pointed to deposits as an area of improvement for EnWin. These participants felt that deposit costs were too expensive, and some believed that deposits were often not returned after the allotted period. One participant noted that after being in business for 12 years, they still have not received their deposit back. The disconnect between EnWin's actual procedures related to deposits and customer perception suggests a need for further customer education in this area.

> *"They switched to another billing system and I've had lots of problems. To try and straighten it out, it's at least three phone calls... particularly about deposits, I was on the phone at least four times. The people are friendly and helpful, it's the system that's not working."*
>
> *"I think EnWin does a good job. I have heard lots of problems around deposits."*
>
> *"You have to actually phone about deposits. They say they hold it for five years, I've been in business for 12 years."*

"…Cheaper hours of usage where customer traffic is not in question."

Many small business customers echoed throughout the sessions that Time-of-Use pricing does not work for their individual businesses. Most residential customers have the ability to change their behaviours (when to do laundry, for instance), however business customers feel that they can't simply alter their hours of operation to take advantage of off-peak pricing.

Time-of-Use pricing is seen to be an important aspect of conservation, and a number of these small business customers feel that they are missing out on valuable opportunities to change their consumption periods and therefore the impact of their electricity bills.

> *"The problem is, as business owners, we don't have the luxury of saying we're going to open up at midnight to conserve electricity."*
>
> *"Change time of use max charge to 9AM instead of 7AM. Change time of use max charge to 3PM instead of 7PM. [I] would rather pay a slightly higher price mid-day with reduced rates pre 9AM – post 3PM."*

System Reliability and Outage Impacts

Varying impacts of outages. When the discussion turned to system reliability and outage impacts, it became clear that businesses experience varying impacts, ranging from complete shutdown to minor inconvenience. While 7 of 13 participants have experienced two or more outages (longer than one minute) in the past year, participants in both sessions were largely satisfied with EnWin's system reliability.

In fact, 8 out of 13 respondents said that their most recent outage had a minor impact (2) or barely an impact (6) on their business at all. Minor impacts among these participants included making a supply run, or having to turn a computer on and off. For these businesses, because system reliability is perceived to be good, an outage has only a minimal impact on their day-to-day operation.

> *"The power stays on, it's really good at my shop. I really have no complaints other than you can make it cheaper. I'm satisfied."*
>
> *"In my little shop, when we had a power outage, I took the opportunity to run around and get supplies… It's not a big deal. We have a pretty good system in our city."*
>
> *"I've been impressed with the reliability… I'm willing to take on a risk of more outages."*

For those business' who noted that outage impacts had a more significant impact, consequences ranged from lost productivity to damaged or unusable product. One participant who operates a stone cutting business noted that even a temporary outage could ruin a $2,000 piece of granite (if the outage occurred during the laser-cutting process).

> *"Machine stops and you've got to start over."*
>
> *"If the air conditioner goes out for a day, I would lose my yeast."*
>
> *"If the power goes out while we're cutting a piece of granite, in some cases, that's a $2,000 stone."*

Conservation and Helping Businesses Save

"With regards to conservation, you don't really see a difference."

For a number of participants, there is a general concern that their conservation efforts are not being reflected in their bills. These customers feel that their efforts should directly influence the price they pay for electricity. That said, there is a general desire amongst this rate class for more information regarding Conservation and Demand Management (CDM). These participants are largely willing to engage in conservation, but expect to see it reflected in their bills.

> *"We do everything we can at 5 o'clock to make sure our hydro is off. Other than throwing the main switch. Yet, we seem to always use more hydro from 5 o'clock at night to 8 o'clock Monday morning. If EnWin could send someone with some kind of tester and say OK this is what's causing your electricity usage on the weekend when your entire business is shut down. There's no lights on. There's no machinery on."*
>
> *"With regards to conservation, you don't really see a difference. You don't see that effort reflected in our prices."*

"You guys are the professionals, we don't have time to stay up to date on the latest trends."

A common theme that emerged throughout both sessions was regarding EnWin helping customers make business decisions. This sentiment was largely driven by a desire for EnWin to disseminate information on conservation programs, as well help businesses understand where there are opportunities to save on their bills. Specifically, a number of participants pointed to access to consumption information as a useful tool to help make business decisions.

When the moderator followed-up on EnWin increasing communications regarding conservation, participants were largely unaware of the current programs and the type of consumption information currently offered. EnWin is perceived to be an expert in the field of conservation, and

many participants would like to see a more proactive approach taken to communicating cost-saving opportunities to help make business decisions.

> *"I don't know whether it's available, but it would be useful for the type of business I have to be able to go online and look at the consumption and [have them] give some analysis with that. If they do have such a thing, I'm not aware of it, so perhaps they need more publicity."*

> *"My own corporation, are we keeping up with more efficient, longer life, low-cost lighting fixtures?"*

> *"You guys [EnWin] are the professionals, we don't have time to stay up to date on the latest [conservation] trends."*

> *"EnWin being a business, do they really want you to conserve? They make a percentage, so the more you use, the more the percentage."*

> *"If you run a business, hydro is a large cost… conservation is important to me to stay current."*

Specifically, in one of the sessions, a number of participants were receptive to the idea of receiving consumption information compared to their peers. These participants find it difficult to understand how efficient their business is compared to other similar businesses in the region. For instance, "Is my furniture store consuming a lot more electricity than a similar store down the street? Access to comparative information like this is seen to be a potential useful tool in making business decisions related to replacing equipment or retrofitting lighting.

> *"Is this operating comparatively to five other properties? If it's not, I have a situation I need to address to improve my bottom line."*

> *"If I had some type of reference, I could do way better with conservation."*

Additionally, in both small business sessions, the concept of an *"energy audit"* in relation to conservation and cost-saving measures was raised. A number of participants are interested in having an EnWin employee come to their business and provide actionable information on how their facility is performing, what equipment is being inefficient, and generally what measures they can take to save on electricity. After probing, it's unclear whether small business these participants would be willing to pay for such a service, but, nonetheless it's a concept that was very appealing to those in both sessions.

> *"We'd really like to have someone come by and say, "This is what's going on." Someone with some expertise as to why our hydro usage is almost as much during downtime as during a regular business day."*

> *"EnWin is also the frontline, more so than the transmission and producers for conserving electricity. As the public face of conservation, I would like to see a consultant come by and "say this is out of whack" … I have no idea whether [my bill] is really high or really low, so stats within their system… compared to other similar buildings, you're high or low…"*

> *"Free service to determine where and how much power is used by business equipment so we can determine best hydro usage practices."*

"We are willing to work with them on modernizing the system."

A few small business participants would like to see EnWin make a better effort of becoming a "partner" with small businesses in the community. One participant, who operates a residential and commercial development company feel that there is a willingness amongst the business community to work with EnWin on modernizing the system, but the utility has to be fair and reasonable. This

same participant pointed to infrastructure relocation (largely poles in residential developments) as an area where EnWin could improve communication with businesses.

A common sentiment held throughout the sessions was *"it has to make business sense"*. Small business customers are willing to work as a partner with EnWin, as long as it makes sense for their businesses.

> *"They quoted a ridiculous amount to move lines underground on one of our properties. If they want help from the private sector, they need to be more reasonable. I think some of the private sector is willing to work with EnWin, but they have to be reasonable."*
>
> *"We are willing to work with them on modernizing the system. If they wanted more partnerships with the private sector, it's there. It just has to be worth it for us."*

"I've got to pass this on to my customers. It's a competitive market out there."

Beyond affordability, rising electricity prices are also perceived, by some, as an issue of competitiveness. These participants feel that they are at a disadvantage to businesses in other jurisdictions with lower electricity costs. Ultimately, they feel that they will have to pass on these costs to their own customers, which can affect the way they run their businesses.

> *"My concern would be the proposal of better rates so we are not amongst the highest but amongst the lowest. Right now, I think we're amongst the highest in North America. I would like lower rates to be more competitive with everyone else."*
>
> *"I've got to pass this on to my customers. It's a competitive market out there."*

"They don't seem to run their business like we do."

After explaining EnWin's role within the system and the regulatory framework they work with in, a number of participants were nonetheless persistent that they don't operate like the "average Windsor business". This sentiment can be attributed to the fact that there is inherent distrust with monopolies. A number of participants, despite the context of how EnWin is run, feel that the stakes and "consequences of bad decisions" are not the same for a monopoly. As one participant put it, *"we can't feed our families, that's our consequence. They don't have consequences."*

> *"Instead of giving the money to a bottomless pit – the city of Windsor – they should be putting it into a reserve fund."*
>
> *"I don't think they're being efficient. I don't know who's making the decisions."*
>
> *"They don't seem to run their business like we do. Because they don't have to."*
>
> *"It's a monopoly. We pay for their bad decisions. If we make bad decisions, our customers make us pay."*
>
> *"We can't feed our families, that's our consequence. They don't have consequences. If the government has their hand in it, there's no efficiencies. They could find more efficiencies."*
>
> *"Line loss is basically shrinkage. I can't charge that to my customers. They have a monopoly."*

Proposed Plan and Rate Impact

"I don't want to pay more."

The sentiment amongst small business participants is largely divided, mostly on the issue of price. 8 out of 13 participants opposed and found the proposed range of rate increases unreasonable; three don't like it but find it necessary, while the remaining two find it reasonable and support it.

Small business participants approach rates increases from a different perspective than residential customers. Small businesses face a number of pressures themselves, and feel that EnWin should take the necessary steps not to pass on costs to their customer base. There was a general sentiment in both sessions that businesses in Windsor don't have the ability to pass on costs to their customers, so why should EnWin?

In addition to a general unwillingness to pay anymore, some participants also see low rates as a competitive advantage. Many Windsor businesses are in direct competition with their neighbours in the United States, and continuous rate increases are making it difficult to keep up.

> *"Electricity is already too high."*
>
> *"The overwhelming majority of businesses have experienced negative growth over the last 5-6 years and had to tighten their belts – have not been able to raise our prices or rates."*
>
> *"Not interested in any increases."*
>
> *"Increased costs make it harder and less attractive to continue business in Windsor. Cost should rise only by rate of inflation or less, based on upcoming cost savings… lower wages for new staff compared to current staff."*

While the majority of small business participants oppose any rate increase, 5 out of 13 acknowledge that it's necessary. Most participants understand that there are growing pressures on the system, and EnWin needs to make investments in order to maintain or even improve the level of reliability and service they have come to expect from their utility. In fact, of those who responded to the question in the workbook, 5 out of 8 participants believe that EnWin should invest in order to either maintain (4) or improve (1) the system – understanding that both options come with a price.

Thinking as businesses themselves, many small business participants want to feel that EnWin is being effective and efficient in how they are spending money. As one participant put it, *"just be fair and humble as an entity."* Again, beyond rates, small business customers are largely satisfied with the services they receive from EnWin. While there is general frustration with the electricity system as a whole, EnWin is perceived to be doing a good job.

> *"Maintenance costs do increase so revenue needs to be increased to continue quality service."*
>
> *"Do what's needed to increase reliability and efficiency over the long run. Just be fair and humble as an entity."*
>
> *"The proposed range of rate increases is necessary, certainly by 2023…"*

When the moderator followed-up on how EnWin could further demonstrate their efficiency, participants we're unable to provide a concrete answer. There is a general belief amongst participants in this rate class that monopolies are inherently inefficient and bureaucratic. In fact, independent research conducted by INNOVATIVE has shown that the general public in Ontario increasingly views the electricity sector as being inefficient and able to get by without rate increases to make system investments.

For some participants, supporting any rate increase is contingent on "not being surprised" with future increases. These participants have questions that include; *What about the future? Will rates continue to go up? What about investments leading to a rate decrease?* Many participants feel that an increase is an increase, regardless if it comes from EnWin's portion of the bill or from the remainder (generation, transmission, etc.).

> *"Some of the investments we're talking about making were increasing efficiencies…but it doesn't reflect greater efficiencies down the road. In all the cost analysis, the line keeps going up even though we're investing all this money in efficiencies. How about when we make all these investments the line goes down and it starts to get cheaper?"*
>
> *"If I'm going to agree to a 3 or 4 per cent increase, that's the increase I should see. I shouldn't see a 40% increase, even though I'm doing everything in my power to reduce consumption, and I don't get that."*
>
> *"I'd like to see consistency. I don't want to be surprised. I'd like to know what's in my future regarding prices."*

General Service over 50 kW Rate Class ("Mid-Market")

About the Mid-Market Session

The mid-market consultation session followed a slightly different structure than the previous residential and small business groups. This consultation session was, again, structured around the themes contained in the workbook, however, EnWin staff provided a roughly 45-minute presentation prior to the moderator-led breakout sessions. EnWin staff provided a general overview of the process, pressures facing the system, future investments and answered questions from participants. The question and answer period was intended to serve as an open dialogue between EnWin staff and consultation participants. Following EnWin's presentation, consultation participants were separated into three "breakout sessions", each led by experienced moderators. These sessions followed the same outline as the previous consultation groups (outlined above).

General Satisfaction

"I cannot say anything bad about EnWin on service."

In comparison to other rate classes, "electricity management" factors more heavily in the daily operations of mid-market participants. Their businesses, and therefore relationships with EnWin and the electricity system, vary greatly. While some, for example, may manage residential units and receive a large number of bills, and others rely heavily on a large electricity supply to operate their facilities, they all have a basic familiarity with the electricity system in Ontario. Further, almost all (11 of 14) are satisfied with the service they receive. Four reported being *very satisfied*, and seven *somewhat satisfied*.

When discussing the portion of their bills that is allocated to EnWin, however, perspectives did vary. 7 of 14 participants reported being unfamiliar with this breakdown. Many expressed concerns that were outside EnWin's purview and were surprised to learn that only a small portion of the bill is remitted to EnWin. Others wondered if that small portion is enough to be able to adequately maintain the system. There was also acknowledgment that lack of familiarity with the breakdown of the bill may present an obstacle for some.

"I was surprised by the 8% only going to EnWin."

"When they talk about the infrastructure, and the failing of the infrastructure – does the 8% really cover what they need?"

"I've been told that [the portion of the bill allocated to EnWin] is a very small percentage. I'm aware of that, but I understand your need to emphasize this because it all appears on one bill. So, there may be a misperception that EnWin is responsible for a bigger part."

While, 10 of 14 participants find this breakdown to be reasonable, the cost and impact of their bills is at the forefront of participants' concern. More than half (10) agree that the cost of their bill has a major impact on their finances and requires that they do without some other important priorities.

"A little bit more notification on incentive programs that maybe apply specifically to us."

When asked how EnWin could improve service to them, participants almost unanimously want more proactive communication and assistance with managing and reducing their consumption. They want a direct connection with an EnWin representative who is able to help them navigate the multitude of options at their disposal. One participant from the private sector felt that they were at a disadvantage compared to publicly owned businesses in terms of program admittance; this was immediately confirmed by another participant from a public business.

"Clearer communication on the savings and incentives programs that they have. I'd rather hear it from EnWin than from Joe the Contractor that comes knocking on our door."

"A little bit more notification on incentive programs that maybe apply specifically to us because there are a lot of programs out there and unless you have somebody on staff that can research that all the time you really miss the boat."

"It would be very helpful if the dedicated rep knew their people that they are supposed to be dealing with and make sure that that stuff is communicated."

"That is my concern also - notifications. [The other participants] are publicly owned but we are privately owned so we are at the bottom of the list. [I feel like we are at the bottom of the list] because all the money that becomes available…Who gets the money? They do. I'm very fortunate because I did receive some kickbacks but the biggest improvement I wanted to do was put the managing system in – because we pay our electricity. Well I didn't get it."

"We did. It works really well."

Another dichotomy arose between two participants involved with residential housing, and the experiences they had with one of EnWin's programs.

"At one of our sites we have tenants that pay their own hydro. And [EnWin does] have a program that we signed up for that when it reverts back to the landlord we'd be notified. They have dropped the ball on many occasions, and I have vigourously complained. It has ended up costing us a lot of money because we were in a court case with these tenants and we use that information to know how we can proceed. It is very critical that as soon as they are informed that the tenant is moving that we be informed."

"I have to support EnWin in this. We are under the same program and we receive numerous calls every day about tenants that are moving. And they honestly have not dropped the ball with us at all. I'm not sure what the difference is between you and I. The program is still working for us and I'm sorry that it's not working for you because it is a very beneficial program."

Customer Service

In terms of customer service, respondents expressed some concern with their interaction with EnWin representatives when they came to their businesses. This led to discussion of the importance of *"keeping better track of their spending and managing their resources*," and of *"optimizing efficiency in time, resources, and skill."* One participant felt that the onus was misplaced on him to educate the EnWin representative on what he needed – "I don't know what I don't know."

> *"The guys are great, they come on out, but I would scrutinize that as a business. Why are there three people from your office here right now? That's not right – there's no way. You wouldn't send three nurses to a room."*
>
> *"The three people that came out from EnWin were not that informative. Their main goal was to get me – they gave me a list of electrical companies like Electra and those places – to get me to call and get all the details and information."*
>
> *"Save On Energy has been good for my facility. My rep is very good."*
>
> *"I've tried several times to do the Save on Energy program and we're not big enough – or just big enough to use all the money in the engineering report, and no benefit to us."*

Participants were asked to rank their top three key priorities from a list including cost, reliability, safety, and customer service, among others. They showed a clear consensus. *Ensuring reliable electrical service* and *delivering reasonable electricity prices* are the number one priorities. Tied for second was again *delivering reasonable electricity prices* and *helping customers with electricity conservation and efficient usage.*

In terms of safety:

> *"One would just assume that part of the parcel with delivery. It better be part of it. Health and safety are driven into us, and you've got to believe it's equal with [EnWin] – if not more."*

Participants were presented with a list, and aside from several exceptions, are unwilling to pay more for additional customer service offerings such as Twitter or Facebook updates, mobile apps, or online/telephone conversations with a customer services representatives.

System Reliability

"Reliability is everything."

Overall, the reliability of EnWin's system is good. While participants reported relatively few outages, not lasting great lengths of time, the impression these instances have are lasting. The scale of their operations mean that many people and operations are impacted by the quality of their power.

> *"Reliability is a big priority and we've not had any interruptions. But that would be so significant."*
>
> *"Very much because in residential housing you have to ensure power 24/7."*

While the number of outages varied from none to more than four, participants most commonly experience one to three unexpected power outages. The average length of time without power for the most recent outage was less than 30 minutes.

> *"No more than fifteen minutes out. No more than two three times a year."*

It was at this point of the discussions again that the importance of notification regarding outages arose. There cannot be too much notice, particularly for those who are responsible for vulnerable

persons (seniors), and those in heavy manufacturing where unexpected outages can be costly and dangerous.

> *"I have less outages at my house than I have at my facility."*
>
> *"EnWin upgraded distribution last year, was supposed to shut me down twice. They shut me down three times, two of the times we were not notified."*
>
> *"A little bit more notification when there are going to be outages - like if they're planned outages - rather than that morning. It's really helpful because some of our tenants have to be moved because they have medical issues."*

"You can't eliminate them all."

It was acknowledged that no system can be 100% reliable, and there is a shift in expectation due to extreme weather.

> *"When there's nasty weather you would expect outages. Yes, [my expectations change]."*
>
> *"Yesterday I had [outages] five times with that wind. The power went on and off. This didn't have much cost, but the one before had a lot of cost."*
>
> *"My expectations don't change necessarily, but I understand it."*
>
> *"My reliability [during adverse weather] was very bad until I had a backup generator installed."*

Impact of Outages

The impact outages vary depending on the scope of the operation. For some it's simply a matter of inconvenience – resetting computers and electronics.

> *"We have to set our alarm system every time."*
>
> *"If the powers goes out it doesn't really cost us anything. It's a matter of a couple hundred dollars rather than thousands."*

For others, the costs steadily increase, and the logistics of managing operations during an outage are more difficult.

> *"As soon as it goes over five minutes you get panic."*
>
> *"I run a manufacturing plant. We have a hundred spindles running all at once. If one of those spindles goes down it's a bad day."*

For those affected, even momentary outages have an impact – these participants are affected by any interruption, no matter the length.

> *"Absolutely [momentary outages] are impactful. As soon as that happens we run out of our offices and go and look at the million dollar machines that aren't running to see if they're in the parts. Because if they're in the parts it takes eight hours to recover. If they're not in the parts it takes us two hours to recover."*
>
> *"People getting stuck in elevators. [A momentary outage] will trip an elevator and someone will get stuck. Then we have to call in a third-party person to do the repair, and by the time they get there the people will already be out of the elevator. It costs us money because you can't stop them, they're already on their way."*

Considering system reliability, the balance between price and cost is a point of contention, and difficult for some to prioritize one over the other. Most commonly, participants reported that they

would be willing to pay slightly more on their electricity bill to maintain the current level of reliability, however an almost equal proportion indicated that they *don't know* enough to say.

"If you want to stay current and efficient you have to invest. It might cost a little more, but that's why you have to be wise in capital allocations."

Participants almost unanimously agreed that *EnWin should invest what it takes to replace the system's aging infrastructure to maintain system reliability, even if that increases their monthly electricity bill by a few dollars over the next few years*. This sentiment was accompanied by the acknowledgement that investing now, will save money in the future.

> *"I'd like to see them invest to drive the costs down in the future. Find more efficient ways of conducting the work."*

Similarly, almost all participants agreed that i*nvestments in new technology will increase system reliability, make our local distribution system more efficient, save us money in the long run and attract new businesses to the region.*

"We want to see where the efficiencies are."

Participants related EnWin's investment and budgeting to their own businesses, in that an identifiable return on investment can be measured, whether it be in terms of improved reliability or reduced cost.

> *"You should be able to quantify [the impact]."*
>
> *"There's an expectation that when they put the capital expenditure out, the customers sees something in return, like more reliability. We want to see where the efficiencies are."*

"I would rather know that information so that I can make a decision."

Agreement varies with the statement, *I value accurate and timely information about outages and restoration during a storm, even if it costs me a little bit more for EnWin to provide this service.* Some participants aren't seriously impacted by outages, but for those who are affected this is a very important issue. Receiving communication from EnWin, or having that information readily available is key.

> *"I would rather know that information so that I can make a decision. So, I strongly agree. There are things that I can do but you need to communicate that with me."*
>
> *"When the power's out they don't pick up their phones.*
>
> *"Things are going to come. For me, if disasters comes, it is the service provided after that is important."*
>
> *"During the wind [yesterday], based on the amount of information they had on their website I was able to make a decision. We ended up sending everybody home."*

Regarding electronic billing, more than half of the participants would be interested in switching over from paper bills. Three participants are already signed up for e-billing.

Conservation and Demand Management (CDM)

"Tools to manage usage is my top priority."

Managing, using and finding ways to conserve is a high priority among participants. Knowledge is power and given the scope of their operations small adjustments can have great impacts. Of the 14 participants, 9 had previously participated in an EnWin conservation program. Further, almost every participant (12) is likely to participate in a future program.

"Tools to manage usage is my top priority. They've talked to us that they're looking at software that would allow us to manage consumption."

"My second top priority was helping customers with electricity conservation and efficient usage."

Earlier, when participants were asked how EnWin could improve service to them they stressed the need for better communication and notification of available programs. They also touched on the importance of having a representative who is familiar with their individual operations, and able to advise on programs that would suit their specific needs. The lack of familiarity with a complex system of programs, coupled with the limits of their finite resources are barriers that may be preventing some participants from bringing likelihood to participate in future programs, to actually participating in future programs.

"The program management to get into one of these [CDM programs] is very onerous. There's a lot of steps and a lot of requirements. My parent company has an engineer that handles it, but if it was just left to us, I don't think we could manage it."

"If their practicing and preaching, saying everyone needs to conserve energy, then they're the experts. Teach me how to conserve energy."

While interest in CDM programs is high, a few participants expressed some skepticism. They were concerned by the lack of "buzz" around these programs, and that EnWin may not be motivated to go the extra mile to help their customers conserve. It should be noted that some concerns were addressed by the moderator by explaining the role the Ontario Energy Board (OEB) has in encouraging distributors to find efficiencies in their own systems.

"It's about word-of-mouth. If something works and is good you'd hear about more of them [CDM programs]. It's not working that's why people aren't screaming "Hey, it's fantastic!"

"It's not in their interest to drive our prices down. If I were running the business, I would go to the other extreme. Take less money and become known for giving great service. Then we'll trust them and that'll create more business."

"It really comes down to a trust thing."

Trust was the most important sentiment for participants when considering their relationship with EnWin. They are looking for a partner with a vested interest that can ensure them that they are getting personalized service.

"I've never had a problem with my electricity. You know, it's gone out, but that's nothing. But I want a business partner who would come out to my building and help me integrate our businesses."

"It really comes down to a trust thing. I don't feel comfortable calling EnWin and having [contractors] come do an assessment on my building because I don't know who I'm getting. They should have professionals within the EnWin corporation that can come out to whatever business it is and go through that building with you – whether it takes an hour or five hours."

Green energy is a polarizing factor when considering CDM and was discussed in length in each breakout session. Discussion tended to centre around the technicalities of integrating green infrastructure into the grid, and while some attested to the efficacy of their solar panels, more expressed skepticism. The main thing they are looking for is an impact on their bills and most aren't able to see any.

"When I put my solar panels in – one day they were put in, the next day I got money."

"Everybody has solar panels and turbines. With everyone generating like that the electricity costs aren't coming down. That didn't really reduce costs."

"They're not because the green energy was subsidized by the government. That drove cost to the system. It didn't improve cost to the system."

"We have solar panels on our plants and they're supposed to be generating $10,000 dollars a month and they're not."

Proposed Plan and Rate Impact

"You don't necessarily like it, but you understand it."

All things considered, half (7) of the participants acknowledge the necessity of an increase to their rates, albeit with some hesitation. Throughout the consultation, the importance and impact of price on their bottom line was highlighted. They recognize that infrastructure is aging and adding a little more to their monthly bills is worth it to mitigate the possibility of unreliable service.

"As a social housing provider, I'm sensitive to the expenses because we all pay for it. This is a city owned operation. The employees of the city have a lot of benefits that John Doe doesn't have. I understand why it's necessary but it's tough."

One participant supports the increase outright, citing that given the success of the local economy, it's best to invest now while an increase wouldn't have as much negative impact.

"Certainly during 2008-2009, EnWin would have to back down on its aggressive investments – 2010 even. But now we're down to 5% unemployment. Now is the time to maybe crank up those rates a couple of percentage points, yes. Invest in the system so that in the next automotive downturn we can coast by."

Three participants found the increase to be unreasonable and opposed it. For one participant, it was on the business-minded principle that no cost increase is acceptable, however on a personal level could still see its validity.

"It's an emotional reaction because as a business I don't like the idea of any increase. As a homeowner, I'm more reasonable. I understand it. But as a business owner the costs are huge, they're enormous, they're crushing. As a homeowner, it wouldn't bother me so much."

Regarding the amount of the increase participants were divided. 5 of 14 would be willing to accept an increase of 9%, and 6 would prefer an increase of 6% to maintain the service and reliability they currently receive. Only 1 participant would choose a decline in service in order to ensure the lowest increase in cost (3%).

"… [EnWin is] the voice of the customer…"

Throughout the consultation there was discussion of EnWin's role in the larger electricity system. Acknowledgments were made that EnWin only has a certain scope of control and influence, and this was accepted without contest. However, as the face of the system, and participants' only point of contact with the system, it was stressed that EnWin should be a representative of their interests.

"There's a very important role they play here. They are the voice of the customer. It's up to them to take it to the politicians and the generators to let them know that something needs to be done."

"I've heard some examples of the OEB rolling back some of the more aggressive investments in the local utilities infrastructure. But I would suggest that's why there is a board of local

utilities that say, "We know our neighbourhood. We know how aggressive, how speedily this has to be done. We know what our customers tolerate."

Questionnaire Results (Workbook)

The following tables are the tabulations of participant feedback to questions in the workbooks, which were returned at the end of each consultation session.

Note: "GS" = general service under 50 kW customers; "RS" = residential customers and "MM" = Mid-Market (general service over 50 kW customers).

Questions below are based on residential version of workbook. Each rate class received slightly different wording, which reflects the average bill for that customer size (see workbook for details).

1. Before this consultation, how familiar were you with the various parts of the electricity system, how they work together and for which services EnWin is responsible?

	RS	GS	MM	Total
Very familiar and could explain the details of Ontario's electricity system to others	2	-	4	**6**
Somewhat familiar, but could not explain all the details of Ontario's electricity system to others	5	4	6	**15**
Have heard of some of the terms and organizations mentioned in this workbook, but knew very little about Ontario's electricity system	7	7	4	**18**
Aside from receiving a bill from *ENWIN*, I knew nothing about Ontario's electricity system	2	2	-	**4**
Total	**16**	**13**	**14**	**43**

2. Generally, how satisfied are you with the service you receive from EnWin?

	RS	GS	MM	Total
Very satisfied	9	4	4	**17**
Somewhat satisfied	4	5	7	**16**
Neither satisfied nor dissatisfied	3	2	-	**5**
Somewhat dissatisfied	-	1	2	**3**
Very dissatisfied	-	1	1	**2**
Don't know	-	-	-	**0**
Total	**16**	**13**	**14**	**43**

4. Before this survey, how familiar were you with the percentage of your electricity bill that went to EnWin?

	RS	GS	MM	Total
Very familiar	2	-	2	**4**
Somewhat familiar	8	3	5	**16**
Not familiar	6	10	7	**23**
Total	**16**	**13**	**14**	**43**

5. How reasonable do you feel that the 20% of your total electricity bill that you pay to EnWin is for the services they provide?

	RS	GS	MM	Total
Very reasonable	6	2	2	**10**
Somewhat reasonable	8	6	8	**22**
Somewhat unreasonable	1	2	1	**4**
Very unreasonable	-	-	-	**0**
Don't know	1	3	2	**6**
Missing	-	-	1	**1**
Total	**16**	**13**	**14**	**43**

6. Please indicate the extent to which you agree or disagree with the following statement: The cost of my electricity bill has a major impact on my finances and requires I do without some other important priorities.

	RS	GS	MM	Total
Strongly agree	5	7	8	**20**
Somewhat agree	4	3	2	**9**
Neither agree nor disagree	6	2	3	**11**
Somewhat disagree	-	1	1	**2**
Strongly disagree	1	-	-	**1**
Don't know	-	-	-	**0**
Total	**16**	**13**	**14**	**43**

7. The average EnWin customer experiences roughly two unexpected power outages per year. Have you experienced any power outages in 2016 which lasted longer than one minute? If so, approximately how many of these power outages did you experience?

	RS	GS	MM	Total
None	4	1	1	**6**
One	3	3	3	**9**
Two	4	5	-	**9**
Three	4	1	4	**9**
Four	1	-	1	**2**
More than four	-	1	3	**4**
Don't know	-	2	2	**4**
Total	**16**	**13**	**14**	**43**

8. Approximately how many minutes did the most recent power outage in 2016 last at your household/organization?

	RS	GS	MM	Total
Less than 15 minutes	2	-	6	**8**
15 minutes to less than 30 minuts	-	1	3	**4**
30 minutes to less than 1 hour	4	4	-	**8**
1 hour to less than 3 hours	3	1	1	**5**
3 hours to less than 6 hours	3	4	-	**7**
6 hours to less than 12 hours	-	-	-	**0**
12 hours to less than 24 hours	-	-	-	**0**
More than 24 hours	-	-	-	**0**
Don't know	1	-	2	**3**
Missing value	3	3	2	**8**
Total	**16**	**13**	**14**	**43**

9. Thinking back to the most recent power outage you experienced (in 2016 or before) as an EnWin customer, would you say the power outage…

	RS	GS	MM	Total
Had a significant impact/cost on my household/organization	1	2	2	**5**
Had a minor impact/cost on my household/organization	3	2	3	**8**
Had barely any impact/cost on my household/organization	10	6	8	**24**
Don't recall ever experiencing a power outage as an *ENWIN* customer	1	-	-	**1**
Don't know	-	2	-	**2**
Missing value	1	1	1	**3**
Total	**16**	**13**	**14**	**43**

10. Despite best efforts, no electrical distribution system can deliver perfectly reliable electricity. As a general rule, the more reliable the system, the more expensive it is to build and maintain. Please select what statement comes closest to your point of view.

	RS	GS	MM	Total
I would be willing to accept more and longer power outages if that meant there would be a slight decrease on my electricity bill	2	5	1	**8**
I would be willing to pay slightly more on my electricity bill to maintain the current level of reliability	8	1	6	**15**
I would be willing to pay a modest amount more on my electricity bill to improve the level reliability I currently receive from *ENWIN*	2	2	2	**6**
Don't know	2	3	5	**10**
Missing value	2	2	-	**4**
Total	**16**	**13**	**14**	**43**

11. Please rank your top 3 priorities - where "1" would be most important, "2" the second most important, and "3" the third most important to you:

OUTCOME	Residential			General Service			Mid-Market		
	Rank			Rank			Rank		
	1	2	3	1	2	3	1	2	3
Delivering reasonable electricity prices	6	7	2	6	2	4	7	5	-
Ensuring reliable electrical service	7	5	3	3	6	2	8	1	2
Ensuring the safety of electrical infrastructure	4	2	6	2	3	4	3	1	4
Providing enhanced customer service	-	3	-	1	-	1	-	2	1
Helping customers with electricity conservation and efficient usage	2	-	2	2	-	3	2	5	3
Modernizing the electrical system (e.g. electric vehicles, net-metering, etc.)	3	1	3	1	1	1	-	2	5

13. As a company, EnWin needs vehicles and tools to service the power lines and IT systems it needs to manage the system and customer information. Which of the following statements best represents your point of view?

	RS	GS	MM	Total
ENWIN should find ways to make do with the equipment and IT systems it already has.	-	6	1	**7**
While *ENWIN* should be wise with its spending, it is important that its staff have the equipment and tools they need to manage the system safely, efficiently and reliably.	11	6	9	**26**
ENWIN should increase its level of investment to replace aging infrastructure to improve system reliability, even if that modestly increases my monthly electricity bill.	5	1	4	**10**
Total	**16**	**13**	**14**	**43**

14. With regards to projects focused on replacing aging equipment in poor condition, which of the following statements best represents your point of view?

	RS	GS	MM	Total
ENWIN should invest what it takes to replace the system's aging infrastructure to maintain system reliability, even if that increases my monthly electricity bill by a few dollars over the next few years	11	6	12	**29**
ENWIN should lower its investment in renewing the system's aging infrastructure to lessen the impact of any bill increase, even if that means reduced reliability and more, or longer, power outages	2	4	1	**7**
Don't know	3	3	1	**7**
Total	**16**	**13**	**14**	**43**

15. With regards to investment in grid technology designed to improve the reliability of the electricity distribution system, which of the following statements best represents your point of view?

	RS	GS	MM	Total
Investments in new technologies are more of a luxury than a necessity and will cost customers more than they are willing to pay	2	4	2	**8**
Investments in new technology will increase system reliability, make our local distribution system more efficient, and save us money in the long run	12	8	11	**31**
Don't know	2	1	1	**4**
Total	**16**	**13**	**14**	**43**

16. To what extent do you agree or disagree with the following statement? I value accurate and timely information about outages and restoration during a storm, even if it costs me a little bit more for EnWin to provide this service.

	RS	GS	MM	Total
Strongly agree	-	1	4	**5**
Somewhat agree	7	2	4	**13**
Neither agree nor disagree	7	4	3	**14**
Somewhat disagree	-	3	-	**3**
Strongly disagree	2	3	2	**7**
Don't know	-	-	1	**1**
Total	**16**	**13**	**14**	**43**

18. Please rank the service items below in the order in which they would have the greatest positive impact to you as an EnWin customer, where 1 represents the item that would have the most positive impact and 7 represents the least positive impact.

Service Item	Residential Service						
	Rank						
	1	2	3	4	5	6	7
Billing: Improve the format and presentation of bills	2	1	3	-	1	-	2
Ease of doing business: Provide customized customer service through phone, mobile or online	2	2	2	1	-	1	1
Energy management: Provide tools so you can manage your usage and view your consumption	6	2	2	-	-	1	-
Power outage restoration: Provide more accurate estimates of when your power will be restored	-	2	2	1	-	-	1
Renewable generation: Enable customers to integrate their renewable energy devices into the grid.	3	1	1	-	1	-	-
Electric vehicles and storage: Enable customers to use their high capacity home batteries and electric vehicle batteries to provide power during outages.	1	4	1	-	-	1	-
Power quality: Monitor and reduce the number of power quality issues (e.g. flickering lights).	1	1	-	1	2	-	2

Service Item	General Service						
	Rank						
	1	2	3	4	5	6	7
Billing: Improve the format and presentation of bills	-	1	2	-	-	-	1
Ease of doing business: Provide customized customer service through phone, mobile or online	-	3	1	-	-	-	-
Energy management: Provide tools so you can manage your usage and view your consumption	8	2	2	-	-	-	-
Power outage restoration: Provide more accurate estimates of when your power will be restored	-	2	-	-	-	-	-
Renewable generation: Enable customers to integrate their renewable energy devices into the grid.	2	4	-	-	-	-	-
Electric vehicles and storage: Enable customers to use their high capacity home batteries and electric vehicle batteries to provide power during outages.	1	-	3	1	-	-	-
Power quality: Monitor and reduce the number of power quality issues (e.g. flickering lights).	1	-	1	-	-	-	-

Service Item	Mid-Market						
	Rank						
	1	2	3	4	5	6	7
Billing: Improve the format and presentation of bills	3	1	1	1	1	1	2
Ease of doing business: Provide customized customer service through phone, mobile or online	1	1	3	-	1	1	3
Energy management: Provide tools so you can manage your usage and view your consumption	8	2	1	-	-	-	-
Power outage restoration: Provide more accurate estimates of when your power will be restored	1	5	2	2	1	1	-
Renewable generation: Enable customers to integrate their renewable energy devices into the grid.	-	2	1	4	1	3	-
Electric vehicles and storage: Enable customers to use their high capacity home batteries and electric vehicle batteries to provide power during outages.	-	-	1	1	2	1	5
Power quality: Monitor and reduce the number of power quality issues (e.g. flickering lights).	2	2	4	2	1	-	-

19. Electronic billing saves money on postage and paper. The more customers who use electronic billing, the more money EnWin saves; savings which ultimately get passed along to customers. How interested would you be in changing to electronic billing?

	RS	GS	MM	Total
Very interested	4	4	3	**11**
Somewhat interested	3	4	5	**12**
Not very interested	3	3	2	**8**
Not at all interesting	2	2	1	**5**
Already signed up for e-billing	2	-	3	**5**
Don't know	-	-	-	**0**
Missing value	2	-	-	**2**
Total	**16**	**13**	**14**	**43**

21. How much more would you be willing to pay, on top of your monthly bill, for the following customer services?

Customer Service Offerings	Residential					
	Rank					
	Nil	$0.01 to $0.24	$0.25 to $0.49	$0.50 to $.099	$1.00 to $1.99	$2.00+
Telephone conversation with a live customer service representative outside of regular business hours	7	3	1	3	-	-
Enhanced website portal	7	3	2	1	-	1
Online chat with customer service representatives	7	3	2	1	-	-
Self service forms (Request a New Account, Submit a Move Request, Locate Request, Submit a Meter Read, Tree Trimming Request)	8	2	2	1	-	-
Facebook updates	6	5	-	1	-	-
Twitter updates	8	3	-	-	-	1
Mobile apps (to pay bills, monitor electricity consumption, and/or access outage information)	7	4	-	1	-	1

Customer Service Offerings	General Service					
	Rank					
	Nil	$0.01 to $0.24	$0.25 to $0.49	$0.50 to $.099	$1.00 to $1.99	$2.00+
Telephone conversation with a live customer service representative outside of regular business hours	9	1	-	1	-	-
Enhanced website portal	9	1	-	1	-	-
Online chat with customer service representatives	9	1	-	-	-	-
Self service forms (Request a New Account, Submit a Move Request, Locate Request, Submit a Meter Read, Tree Trimming Request)	7	1	1	-	-	-
Facebook updates	10	-	-	-	-	-
Twitter updates	10	-	-	-	-	-
Mobile apps (to pay bills, monitor electricity consumption, and/or access outage information)	6	1	-	2	-	1

Customer Service Offerings	Mid-Market					
	Rank					
	Nil	$0.01 to $0.24	$0.25 to $0.49	$0.50 to $.099	$1.00 to $1.99	$2.00+
Telephone conversation with a live customer service representative outside of regular business hours	12	2	-	-	-	-
Enhanced website portal	11	1	1	-	-	-
Online chat with customer service representatives	10	1	-	1	-	-
Self service forms (Request a New Account, Submit a Move Request, Locate Request, Submit a Meter Read, Tree Trimming Request)	10	1	-	1	-	-
Facebook updates	12	1	-	-	-	-
Twitter updates	12	1	-	-	-	-
Mobile apps (to pay bills, monitor electricity consumption, and/or access outage information)	9	2	1	1	-	-

22. Have you ever participated in an EnWin electricity conservation program?

	RS	GS	MM	Total
Yes	3	9	9	**21**
No	12	3	4	**19**
Don't know	1	1	1	**3**
Total	**16**	**13**	**14**	**43**

23. How likely are you to participate in future EnWin conservation programs that could help reduce your electricity consumption?

	RS	GS	MM	Total
Very likely	9	8	8	**25**
Somewhat likely	5	4	4	**13**
Not very likely	2	1	1	**4**
Not at all likely	-	-	-	**0**
Don't know	-	-	1	**1**
Total	**16**	**13**	**14**	**43**

24. Considering what you know about the local distribution system, which of the following best represents your point of view?

	RS	GS	MM	Total
The proposed range of rate increases is reasonable and I support it	5	2	1	**8**
I don't like it, but I think the proposed range of rate increases is necessary	8	3	7	**18**
The proposed range of rate increases is unreasonable and I oppose it	2	8	3	**13**
Don't know	1	-	3	**4**
Total	**16**	**13**	**14**	**43**

26. Given the varying reliability and services levels under each scenario and the projected customer rate impact of each, please indicate by marking an "X" which approach would you want EnWin to pursue between 2019 and 2023?

	RS	GS	MM	Total
Improve: Would you be willing to accept a 9% distribution delivery rate increase where reliability and service performance improves?	6	1	5	**12**
Maintain: Would you be willing to accept a 6% distribution delivery rate increase where reliability and service performance remains the same as it is now?	8	4	6	**18**
Decline: Would you be willing to accept a 3% distribution delivery rate increase where reliability and service performance eventually declines?	2	3	1	**6**
None of the above	-	3	-	**3**
Missing value	-	2	2	**2**
Total	**16**	**13**	**14**	**43**

Online Workbook Feedback

Summary

The online workbook portal was made available to all EnWin customers. This summary focuses on residential participants. Results from the two General Service participants have been excluded throughout this section on the grounds of statistical insignificance, however they can be found in the body of the report.

Most residential participants said they were familiar (75%) with the system and satisfied (69%) with the service they received from EnWin.

- Almost 2-in-10 (18%) were "very familiar and could explain the system to others" and over half (57%) felt "somewhat familiar, but couldn't explain the details to others".
- Nearly 4-in-10 (38%) felt "very satisfied" and more than 3-in-10 (31%) were "somewhat satisfied"; only 13% felt dissatisfied.

Cost appears to be top-of-mind when it comes to electricity and bills are a struggle for most residential participants.

- 3-in-4 (76%) felt that the cost of their monthly bill "majorly impacted their finances" and half (50%) of residential participants "strongly agreed" with the statement on bill cost.
- In nearly all the open-ended questions, from suggested improvements to customer service items, to top priorities, to reasons for opposition, and to increasing rates, "lower rates" or "rates are already high enough" were consistently in the top mentions.
- 88% of residential participants thought "delivering reasonable electricity prices" should be a top three priority for EnWin and nearly 2-in-3 (63%) thought it should be the number one priority.

Most of the residential participants have experienced at least one outage and felt "just a bit of inconvenience". But for those struggling to pay their bills outages had a much bigger impact.

- More than two-thirds (67%) of residential participants experienced at least one outage and strong majority (61%) of those who experienced an outage in 2016 said it lasted at least 15 minutes. 2-in-10 (20%) have not experienced any outages longer than a minute in 2016.
- For most residential participants (51%), outages barely had an impact, "just a bit of inconvenience".
- For those struggling to pay the bills though, outages seemed to last longer (63% at least 15 minutes) and had a "significant impact in their household" (59%).

Reliability appears to be a key concern and participants are open to upgrading the system. But when it comes to paying more, results are mixed especially among the less satisfied and struggling.

- "Reliable electricity service" was a strong second to price in terms of priority with more than 2-in-3 (67%) who thought it should be a top three priority and 2-in-10 (20%) who considered it the number one priority.
- When asked to choose between accepting worse system reliability for a smaller bill impact (35%) and paying more (36%) to either maintain (26%) or improve reliability (9%), the residential participants were roughly evenly divided. Just 14% of "neutral/dissatisfied"

residential participants were willing to pay more and only 22% among those who "strongly agree" their bill had a major impact on their finances.

- Most want to spend what is needed to maintain the system (67%) and a plurality (49%) want EnWin to invest in aging infrastructure. But 40% felt that investment in new technology "would be more of a luxury than a necessity" and residents are divided on paying more for accurate and timely information about outages (36% vs. 34%).
- Among the customer service initiatives listed, more than 3-in-4 residential participants refused to pay even a cent more for customer service upgrades like online service, enhanced website and social media updates.

A strong plurality of residential participants did not support the rate increase or the alternative "maintain" or "improve" scenarios. Among the dissatisfied and struggling, opposition is much higher.

- 48% thought the increase was unreasonable and opposed it; a third (32%) didn't like the increase, but felt it was necessary; and only 9% thought it was reasonable and supported it.
- Just 14% of those "neutral or dissatisfied" with EnWin supported the rate increase, compared to 72% of those "very satisfied" with EnWin's service.
- Among those who did not feel their electricity bill majorly impacted their finances, 73% supported the rate increase. As for those who "strongly agreed" that their electricity bill had a major impact, just 27% felt the same.
- When given three options -improve reliability and accept a 9% rate increase, maintain reliability and accept a 6% increase, or accept declining reliability and a 3% rate increase- a plurality (45%) of residential participants chose the smallest increase and declining reliability; 39% chose to maintain reliability and accept a 6% increase; and 17% chose to accept a 9% increase to improve reliability.
- Again, there is a strong divide on satisfaction and bill impact: 3-in-4 (74%) of those "neutral/dissatisfied" with EnWin preferred declining reliability and the smallest increase. And a majority (55%) of those residential participants who "strongly agreed" their electricity bill had a major impact also chose the lowest rate increase over reliability.

Social Permission	General Satisfaction			Electricity Bill, Major Impact		
	Very satisfied	Somewhat satisfied	Neutral/ Dissatisfied	Strongly agree	Somewhat agree	Neutral / Disagree
Rate increase is reasonable, and I support it	21%	0%	0%	2%	9%	23%
Don't like it, but think it's necessary	51%	24%	14%	25%	29%	50%
Rate increase is unreasonable, and I oppose it	26%	61%	67%	57%	53%	23%

Methodology

About the General Service and Residential Customer Workbook

EnWin invited its general service and residential customers to participate in this phase of the consultation via an online workbook survey. Both types of customers received similarly structured surveys, with content only differing in the initial demographics (residential) and firmographics (general service) and in the wording of key ballot questions such as the amount of the proposed rate increases.

The workbook was divided into five core sections with an additional feedback section at the end:

1) **What is this consultation about**? EnWin explained the core purposes of the consultation: to ask its customers for their priorities, needs, and preferences to meet the requirements for its five-year investment and spending plan. This section provided a detailed background to help the customer make informed decisions, including explanations of the consultation process and the focus on the local distribution system.
2) **Electricity 101.** The second section outlined how the system in Ontario is regulated, including a brief explanation of the Ontario Ministry of Energy, the Ontario Energy Board and the Independent Electricity System Operator. The first two sections contained background information only, no survey questions.
3) **EnWin's Distribution System Today.** The third section of the workbook outlined the three components of the electricity system- generation, transmission and distribution- and EnWin's role as a local distributor in Ontario. Customers were provided a detailed breakdown of (depending on customer type) a typical EnWin residential or general service electricity bill, as well as a breakdown of the types of system reliability and budget concerns facing EnWin and its customers. This section asked for customer feedback on satisfaction, familiarity, electricity prices, bill impact, system reliability and key priorities.
4) **Pressures on the Distribution System**. The workbook then explained typical pressures on the distribution system, such as aging infrastructure and a breakdown of EnWin's capital investments and the major capital investment issues it needs to address. This section asked for customers to weigh in on capital investment strategy, operating expenses and rank specific customer service initiatives and determine what customers would pay for them.
5) **What Will EnWin's Plan Cost Customers?** The last core section of the workbook outlined the proposed rate increase to consumers and asked them an open-ended question on why they support or oppose it, as well as feedback on alternative scenarios that may improve, maintain or reduce reliability.

Field, Advertising, Data Cleaning and Demographics

The online workbook was available from **March 1st through April 13th, 2017**, open to all EnWin customers. Confidential survey data collected was stored on INNOVATIVE's private servers and responses were combined in the analysis to protect the anonymity of EnWin's customers. Incentives were offered in the form of ten prepaid credit cards to potential contest winners to be selected randomly in April 2017 from the list of completed responses.

To boost the number of customer completes, EnWin promoted the workbook in the following media:

- **Print Newspapers**: Three print ads designed by EnWin in the Windsor Star newspaper on March 11th, March 25th and April 1st, 2017.
- **TV:** CBC interview with Tony Doucette (*CBC Windsor*)
- **Radio:** CKLW interview with EnWin media team.
- **Phone:** Information provided to customers provided by phone in CSR messaging.
- **Online:** Banners promoted throughout the field period, CBC online interview, Windsorite.ca news release
- **Website:** Breaking news story on EnWin website and prominent location on home page
- **Social Media:** Three tweets, cycled weekly, March 13th to April 4th

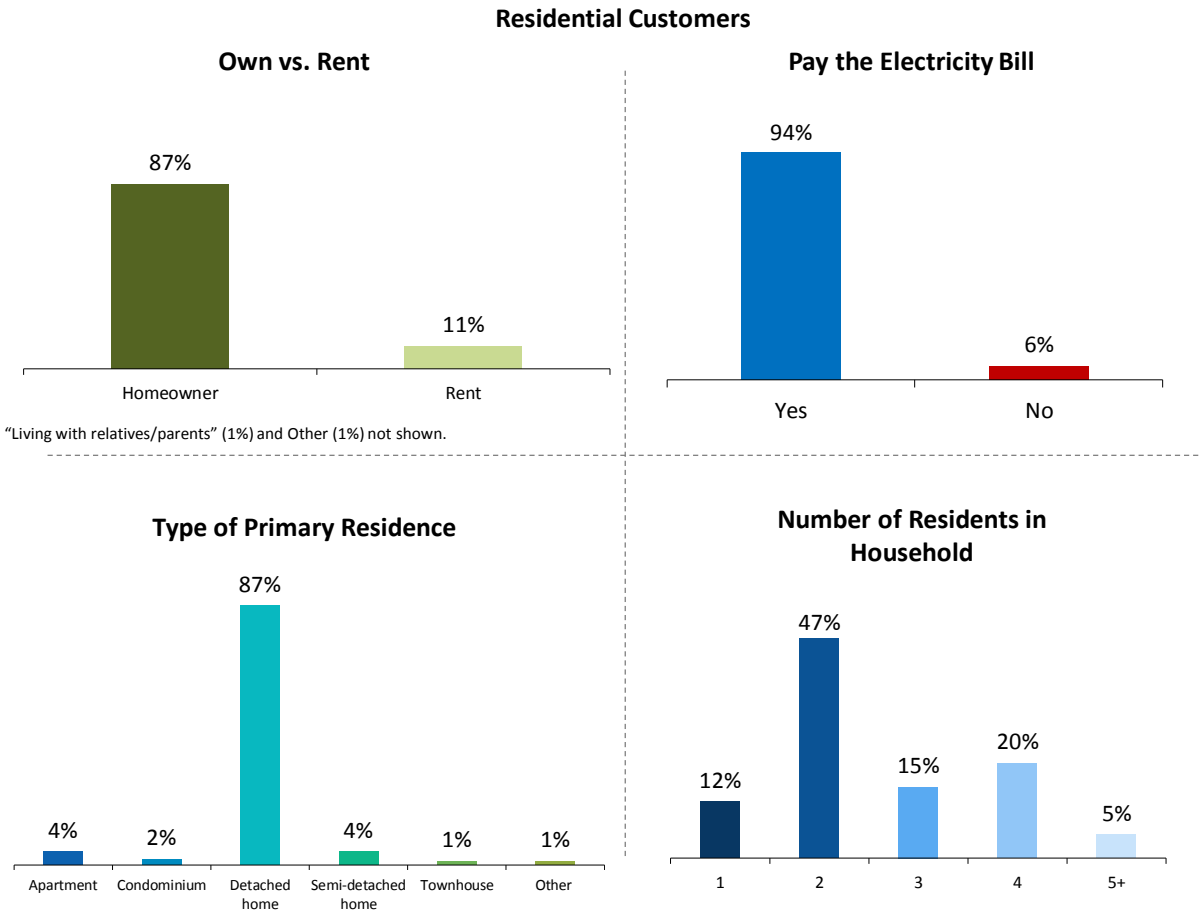
Below is an example of an online banner designed by EnWin and promoted during the survey field:

A total of 8,594 customers clicked on the link and arrived at the EnWinCustomerFeedback.com site. Of those, 336 finished the initial introduction and a total of 164 participants answered the first question on familiarity as well as the preceding demographic questions. INNOVATIVE defines a "partial" survey response as completion of at least the first question of the survey after demographics and has included partial responses in the following report.

Following April 13th, once the portal was no longer available to customers, the data was cleaned to remove duplicates and participants from outside EnWin's service area leaving EnWin with 159 partial completes. Of those, -116 completed the survey through to the final core question on proposed rate increases, only two of whom were general service customers. The remaining 114 residential customers were the focus of the report to follow.

Below is a detailed breakdown of their demographic information:

Figure 1 RC: Demographics



Note: this was a qualitative research exercise and the results to follow should be considered directional only; that is results found here cannot be generalized to the population as a whole.

Participant Feedback

This first section of feedback shows how familiar participants were with the system, how satisfied they were with EnWin generally, and how impacted they felt by their monthly electricity bill.

System Familiarity, Satisfaction, and Bill Impact

Summary: System Reliability and Key Priorities

3-in-4 residential participants felt familiar with the electricity system (75%) and with the amount EnWin collects from their bills (76%).

- Almost 2-in-10 (18%) were "very familiar and could explain the system to others" and over half (57%) felt "somewhat familiar, but couldn't explain the details to others".
- Similarly, a third (34%) said they were "very familiar" with the percentage of their electricity bill that went to EnWin and 42% were "somewhat familiar". Just 1-in-4 (24%) were not familiar with the amount.

Almost 7-in-10 residential participants felt satisfied (69%) with their service and thought the amount they paid is reasonable (69%).

- Nearly 4-in-10 (38%) felt "very satisfied" and more than 3-in-10 (31%) were "somewhat satisfied". Only 13% felt dissatisfied and less than 2-in-10 (17%) didn't felt strongly either way.
- About 3-in-10 (29%) thought the amount they paid was "very reasonable" and 4-in-10 (41%) felt it was "somewhat reasonable". Just 1-in-4 (24%) thought the amount they paid was "unreasonable".

The top volunteered improvement to services, according to residential participants, was cost.

- The most common suggestion to the open-ended follow-up question was "lower costs" (n=21).
- Other suggestions included "more information, communication, service options" (n=7), "improved customer service" (n=6), "faster response times" (n=4), and addressing "management and transparency issues" (n=4).
- The majority (n=102) had no suggestions to offer.

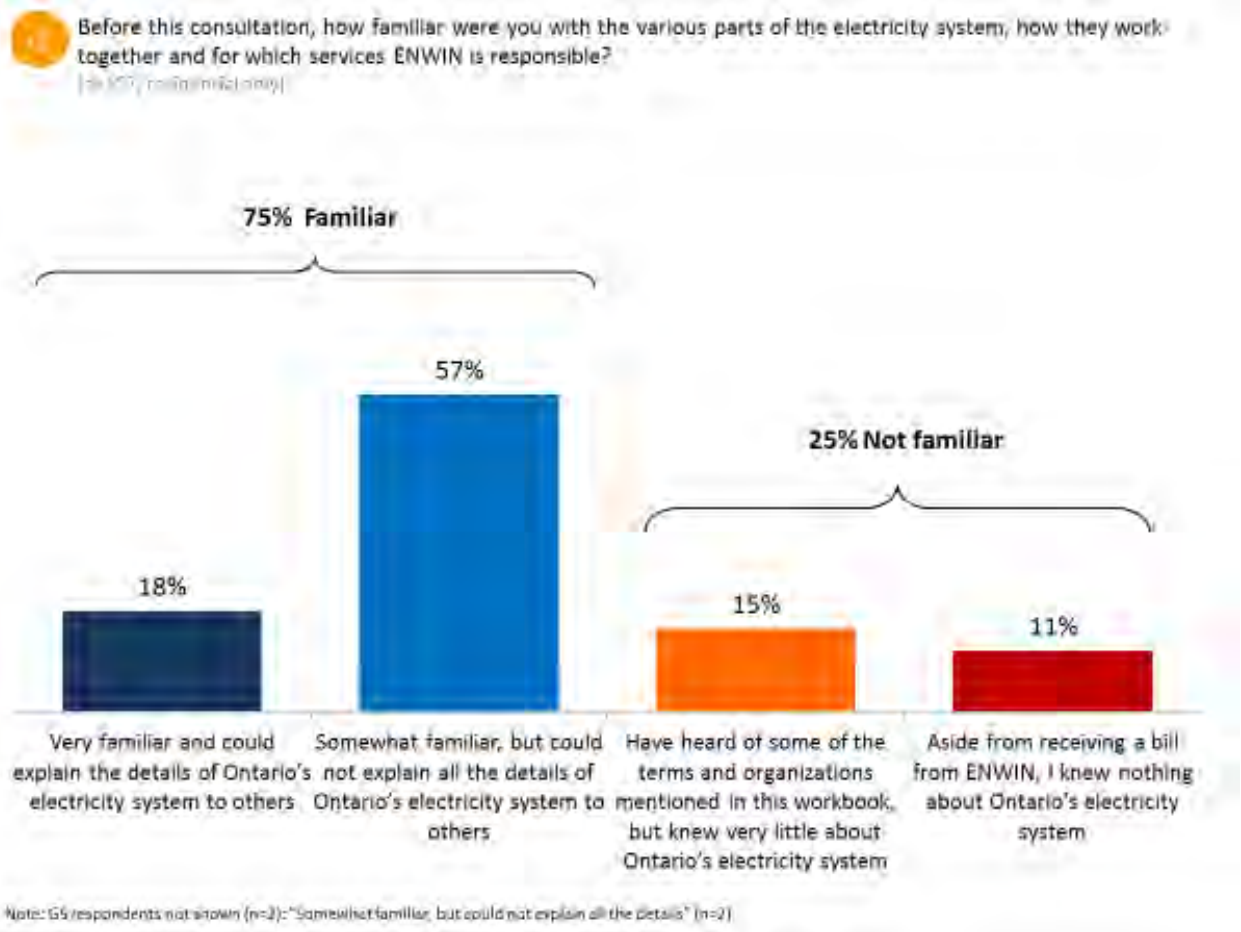
3-in-4 (76%) residential participants felt the cost of their electricity bill majorly impacted their finances.

- Intensity was high on this measure, with half (50%) who strongly agreed. Only 13% disagreed and 10% didn't have an opinion either way.
- The least satisfied were much more likely to have felt impacted by their electricity bills ("Very satisfied": 60%: "Somewhat satisfied": 90%; "Neutral/Dissatisfied": 84%).

3-in-4 (75%) residential customers, when asked about the various parts of the electricity system, self-reported as "familiar" with it. Nearly 2-in-10 (18%) felt "very familiar and could explain" the system to others and more than half (57%) were "somewhat familiar", but couldn't explain the details to others. The remaining quarter (25%) either had heard of it but knew very little (15%) or knew nothing about the system aside from their bill (11%).

- The two general service customers who responded both stated they were "somewhat familiar" with the system.

Figure 2 RC: System Familiarity

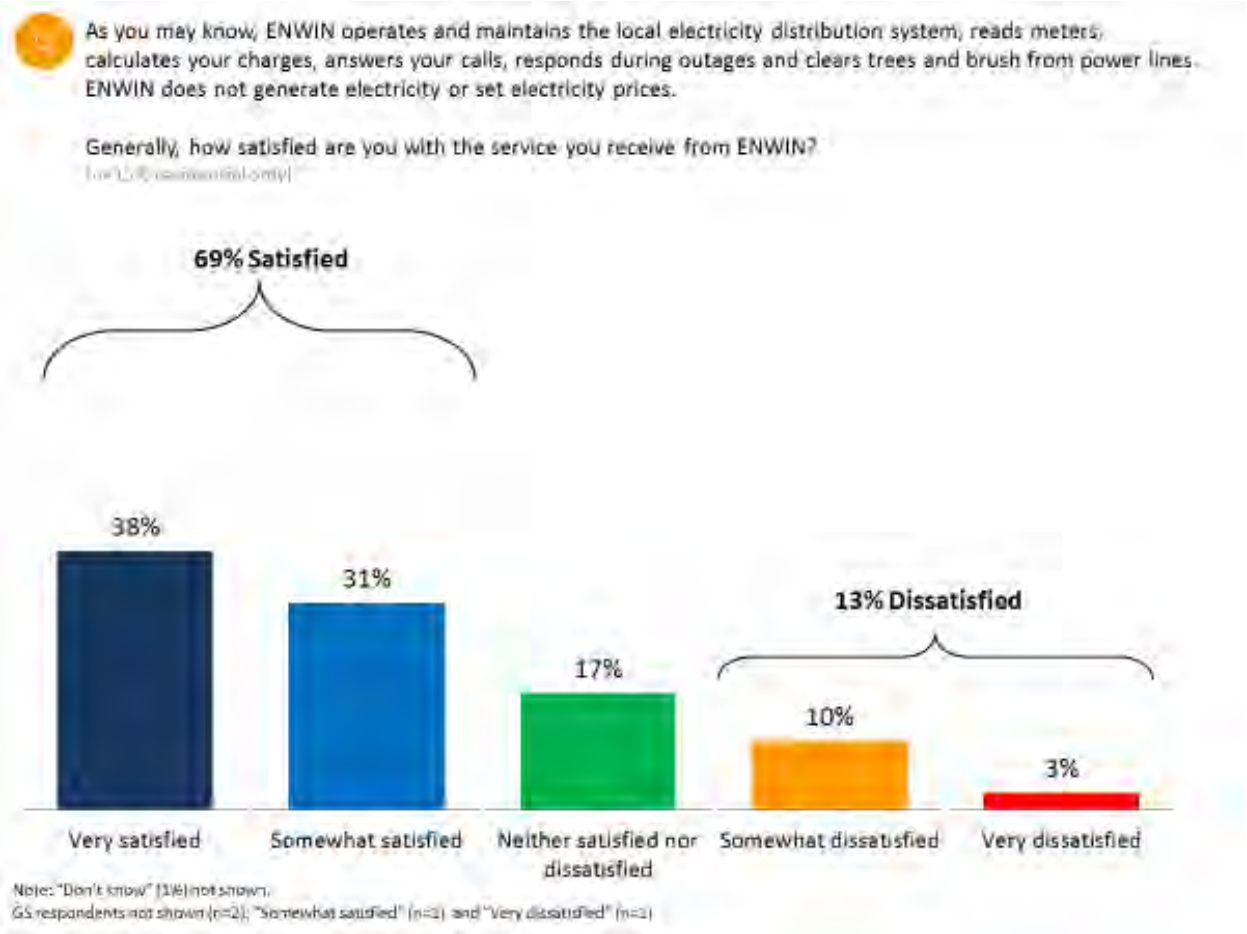


Note: GS respondents not shown (n=2): "Somewhat familiar, but could not explain all the details" (n=2)

Nearly 7-in-10 (69%) residential customers said they were satisfied with the service they received from EnWin. Almost 4-in-10 (38%) said they were "very satisfied" and more than 3-in-10 (31%) said they were "somewhat satisfied". Less than 2-in-10 (17%) were neither satisfied or dissatisfied and just 13% of customers said they were dissatisfied.

- Of the two general service customers who answered, one felt "somewhat satisfied" while the other was "very dissatisfied" with EnWin's service.

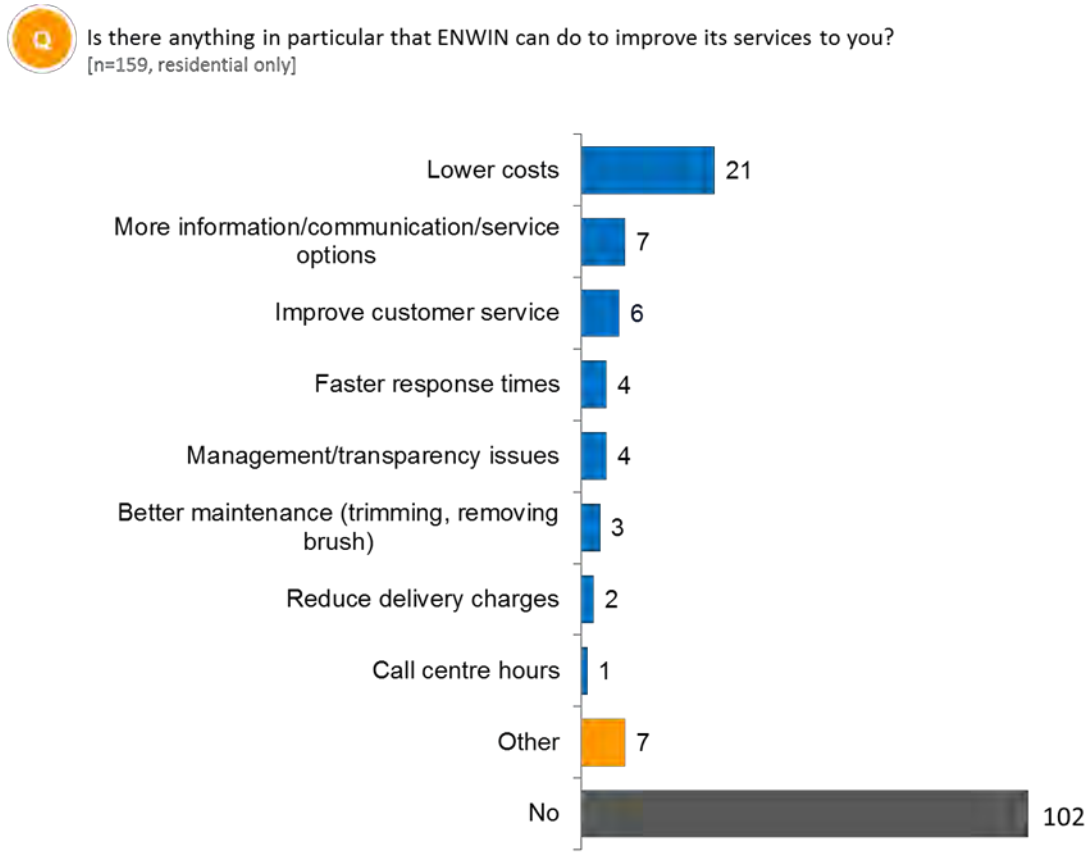
Figure 3 RC: General Satisfaction



Customers were then asked a follow-up question open-ended question, "is there anything in particular that EnWin can do to improve its services to you?" Respondents most commonly cited "lower costs" (n=21) as a key improvement. Other suggestions included "more information, communication, service options" (n=7), "improved customer service" (n=6), "faster response times" (n=4), addressing "management and transparency issues" (n=4), "better maintenance" of lines near homes (n=3), "reduced delivery charges" (n=2) and improvements to "call centre hours" (n=1). Nearly two-thirds (n=102) did not have any suggested improvements.

- The two general service customers who responded suggested improvements to the "call centre hours" (n=1) and more generally to "customer service" (n=1).

Figure 4 RC: Suggested Improvements to Service [OPEN]

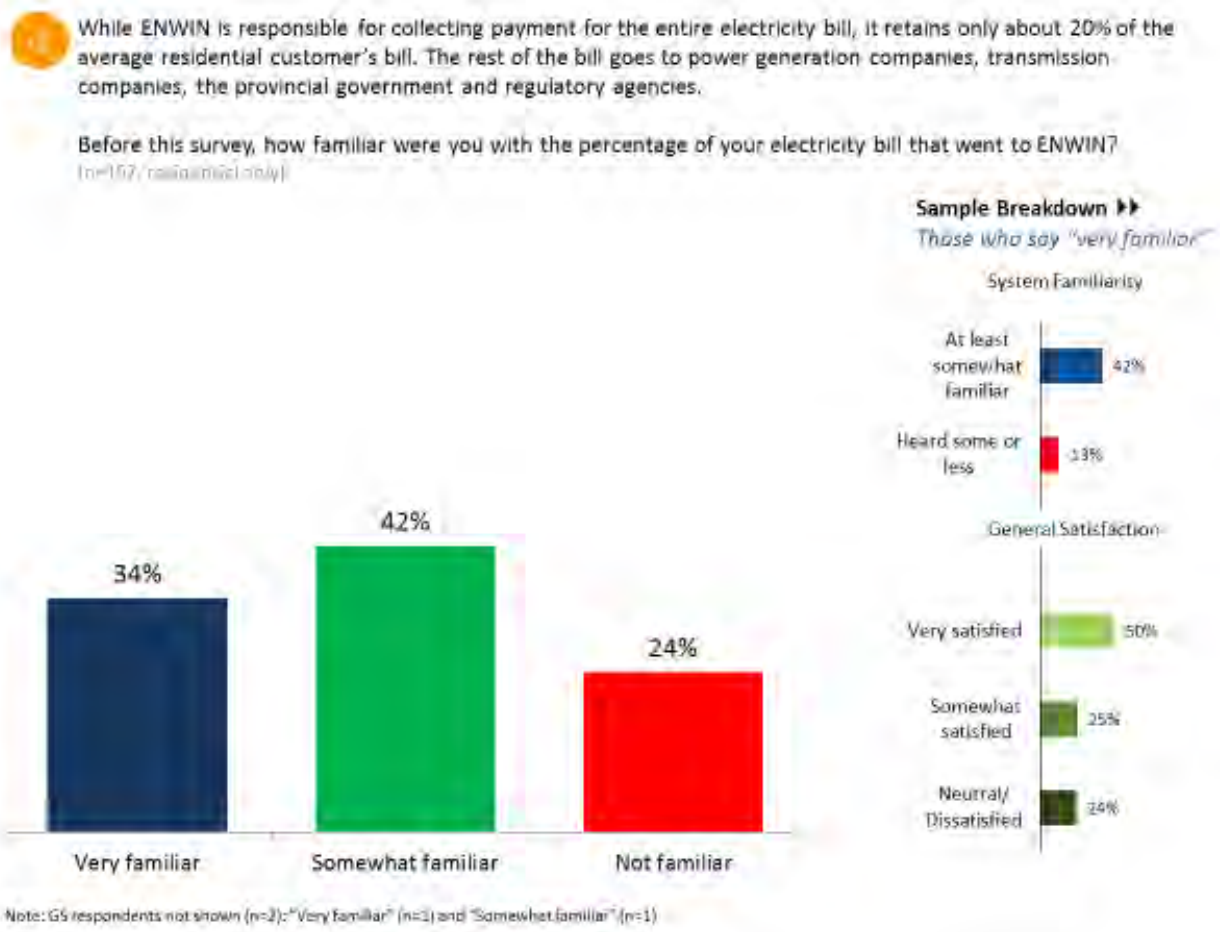


Note:GS respondents not shown (n=2): "Call centre hours" (n=1) and "Improve customer service" (n=1).

After reading that EnWin "retains only about 20% of the average residential customer's bill", about 1-in-3 (34%) residential customers said that, before the survey, they were "very familiar" with the percentage of their bill directed to EnWin. More than 4-in-10 (42%) self-reported as "somewhat familiar" and 1-in-4 (24%) felt that, before the survey, they were not familiar with the 20% allocation to EnWin.

- Those at least somewhat familiar with the system (42%) reported as much more familiar with the amount of their bill that goes to EnWin, compared to just 13% of those unfamiliar with the distribution system.
- Very satisfied (50%) residential customers self-reported as much more familiar than less satisfied ones (somewhat: 25%; Neutral/dissatisfied: 24%).
- Of the two general service customers who responded, both were familiar ("Very": 1; "Somewhat: 1).

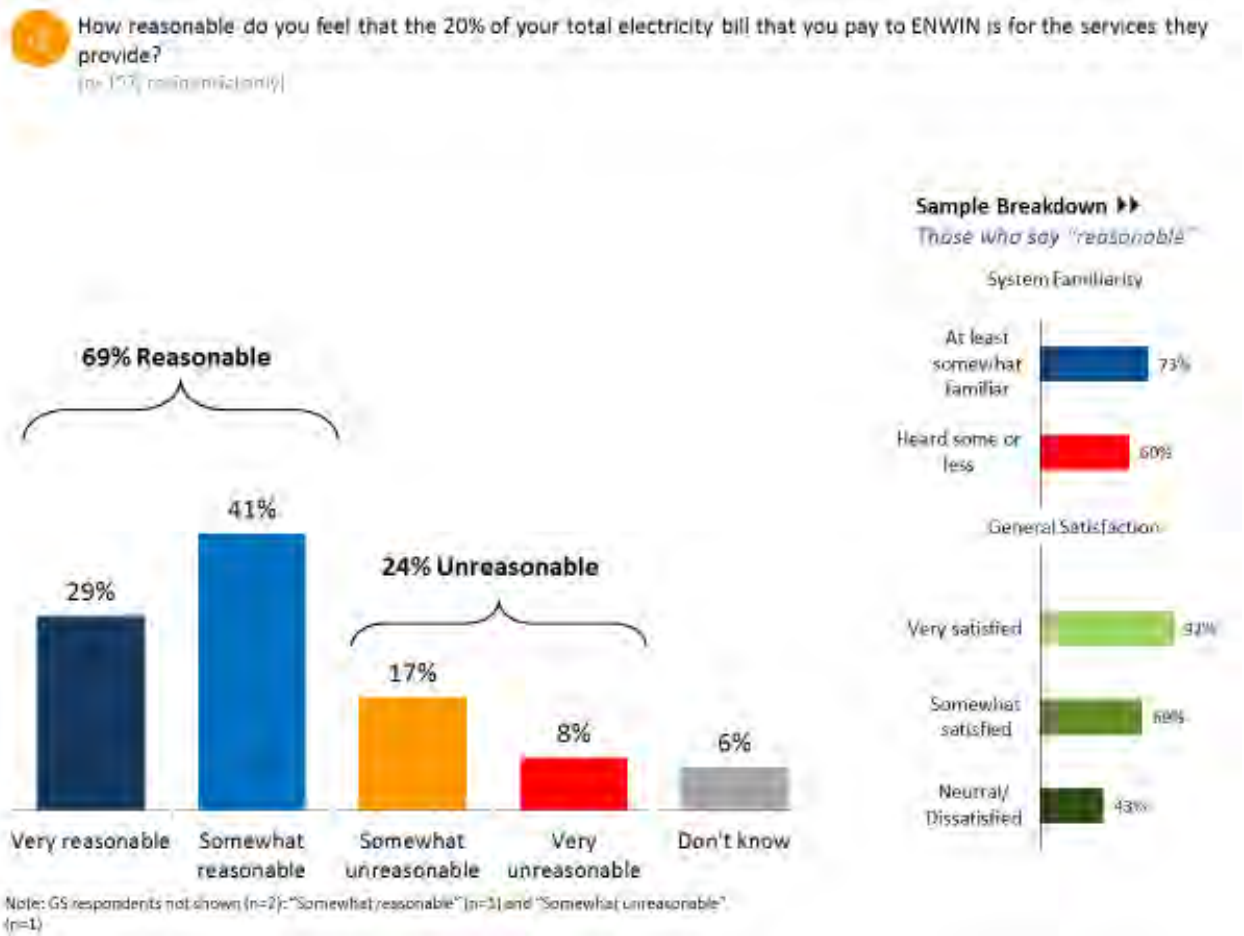
Figure 5 RC: Familiarity with Bill Percentage to EnWin



Nearly 7-in-10 (69%) of the remaining 157 residential customers felt that the 20% they paid to EnWin of their bill was reasonable. About 3-in-10 (29%) considered it a "very reasonable" amount and 4-in-10 (41%) said it was "somewhat reasonable". Nearly a quarter (24%) of residential customers thought the amount was unreasonable ("somewhat unreasonable: 17%; "very unreasonable": 8%) and 6% didn't know how to answer.

- Residential customers who were at least somewhat familiar with the distribution system were more likely to feel the percentage was reasonable than less familiar ones (73% to 60%).
- When it came to their bill breakdown, there was a striking difference between satisfied and unsatisfied residential customers. Nearly all (92%) of the very satisfied residential customers thought that the 20% EnWin takes is reasonable. Yet this number dropped sharply for "somewhat satisfied" (68%) and "neutral/dissatisfied" (43%).
- The two general service customers thought the amount was either "somewhat reasonable" (n=1) or "somewhat unreasonable" (n=1).

Figure 6 RC: Reasonable Allocation of Electricity Bill

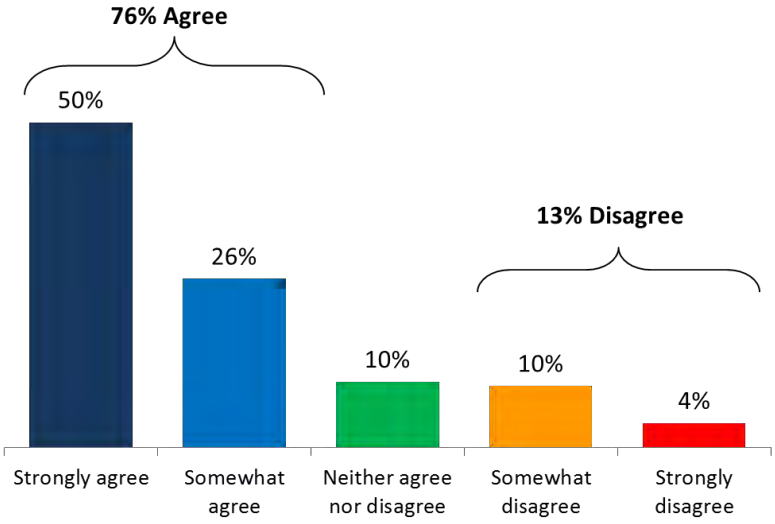


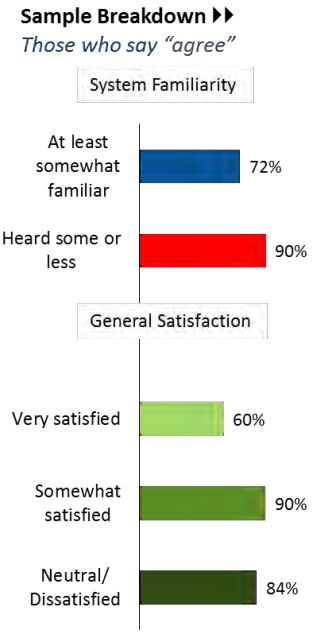
More than three-quarters (76%) of residential participants agreed with the statement: *"the cost of my electricity bill has a major impact on my finances and requires I do without some other important priorities"*. Intensity was high, with half (50%) who strongly agreed. Just 13% disagreed and 10% didn't have a strong opinion either way.

- Those less familiar ("Heard some or less": 90%; "At least somewhat familiar: 72%) with the system and those less satisfied ("Very satisfied": 60%: "Somewhat satisfied": 90%; "Neutral/Dissatisfied": 84%) were much more likely to feel their bill had a major impact on their finances.
- Of the two general service customers who responded, both "strongly agreed" that the cost of their electricity bill had a major impact on their finances.

Figure 7 RC: Electricity Bill, Major Impact

Please indicate the extent to which you agree or disagree with the following statement:
The cost of my electricity bill has a major impact on my finances and requires I do without some other important priorities.
[n=157, residential only]





Note: "Don't know" (<1%) not shown. GS respondents not shown (n=2): "Strongly agree" (n=2)

System Reliability and Key Priorities

Before the next set of questions on system reliability, customers were shown a series of charts and graphs that showed a downward trend in the number and length of outages for EnWin customers with an accompanying explanation of the most frequent causes of power outages. Then the workbook outlined how much it cost to run EnWin's distribution system and how EnWin sets its budgets based on OEB approval.

Summary: System Reliability and Key Priorities

More than two-thirds (67%) of residential participants experienced at least one outage and a strong majority (61%) of those who experienced an outage reported it lasted at least 15 minutes.

- A quarter (25%) of residential participants reported more than 2 outages (the quoted average in the workbook). 2-in-10 (20%) had not experienced any outages longer than a minute in 2016.
- The less familiar, less satisfied and those financially impacted reported the longest outages ("Heard some or knew nothing" about the system: 74%; "Neutral/Dissatisfied" with EnWin: 66%; "Agree", electricity bill had a major impact: 63%).

For most residential participants (51%), outages barely had an impact, "just a bit of inconvenience".

- Over 1-in-3 (35%) residential participants said the outage had a "minor impact" and 11% felt a "significant impact in their household".
- Those who claimed the most financial difficulty paying their electricity bill reported as the most impacted by an outage (59%).

Residential participants were divided and indecisive on whether to pay more for reliability.

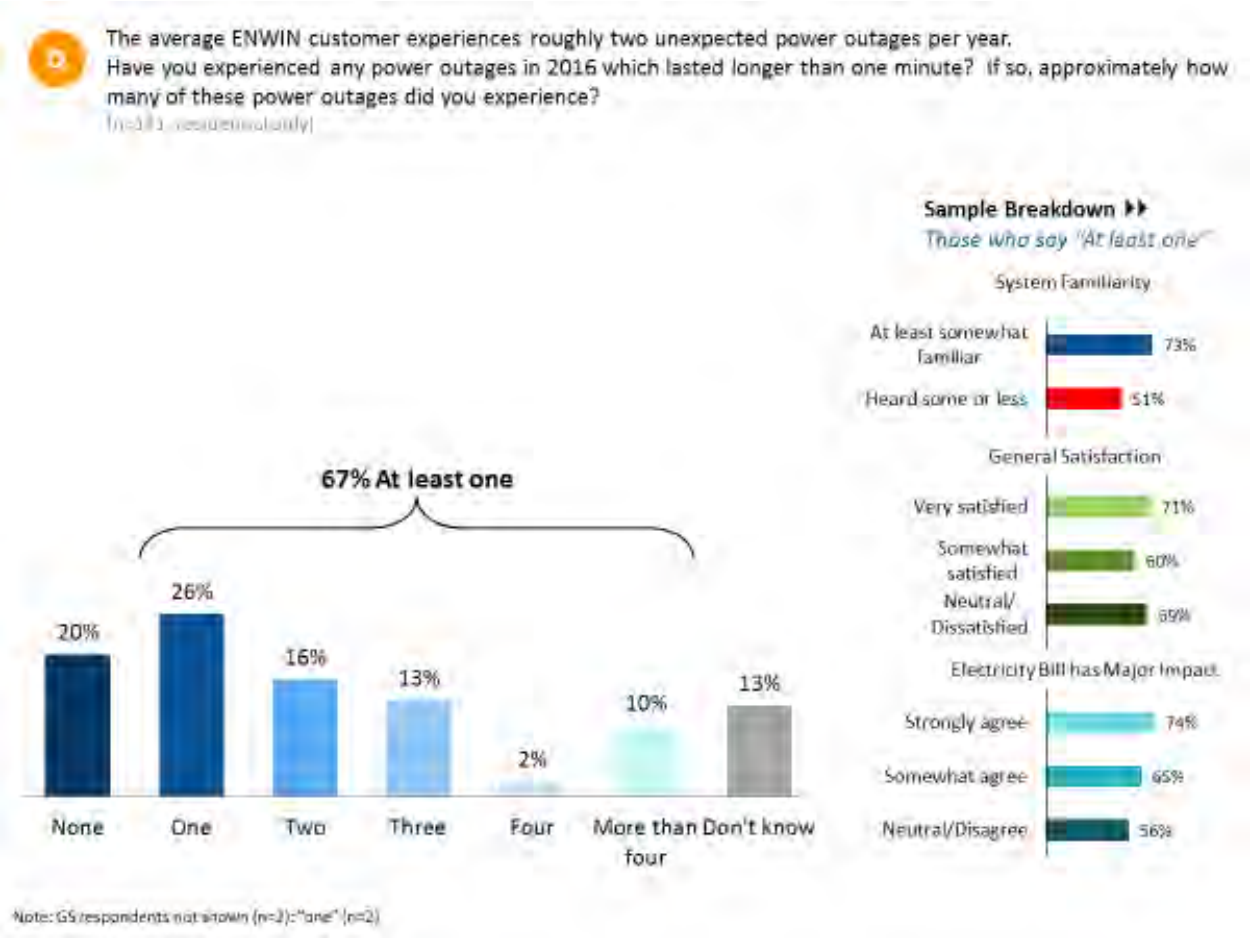
- Over a third (35%) would accept worse system reliability for a smaller bill impact and about the same number (36%) would be willing to pay more, either to maintain (26%) or to improve reliability (9%). Almost 3-in-10 (29%) didn't know how to respond.
- "Very satisfied" (58%) residential participants were much more willing to pay than those either ambivalent or unsatisfied (14%).
- Only 22% of those who "strongly agree" their bill had a major impact on their finances would choose to maintain and pay slightly more.

The number one priority for EnWin should be, according to residential participants, cost. Reliability was a distant but strong second. The third critical priority was safety.

- 88% of residential participants thought that "delivering reasonable electricity prices" should be among EnWin's top-three priorities. And nearly 2-in-3 (63%) thought it should be EnWin's number one priority.
- The second top priority was reliable electricity service: more than 2-in-3 (67%) thought it should be a top-three priority with 2-in-10 (20%) who considered it the number one priority.
- The third key priority for EnWin, according to residential participants, was safety. More than 6-in-10 (63%) thought it should be a top-three priority and 1-in-10 (9%) felt it needed to be EnWin's top concern.

- The handful of participants who answered the follow-up open-ended question also mentioned rates (n=6) as well as "improving management efficiency and spending" (n=10) as top concerns.

Figure 8 RC: Number of Outages, 2016

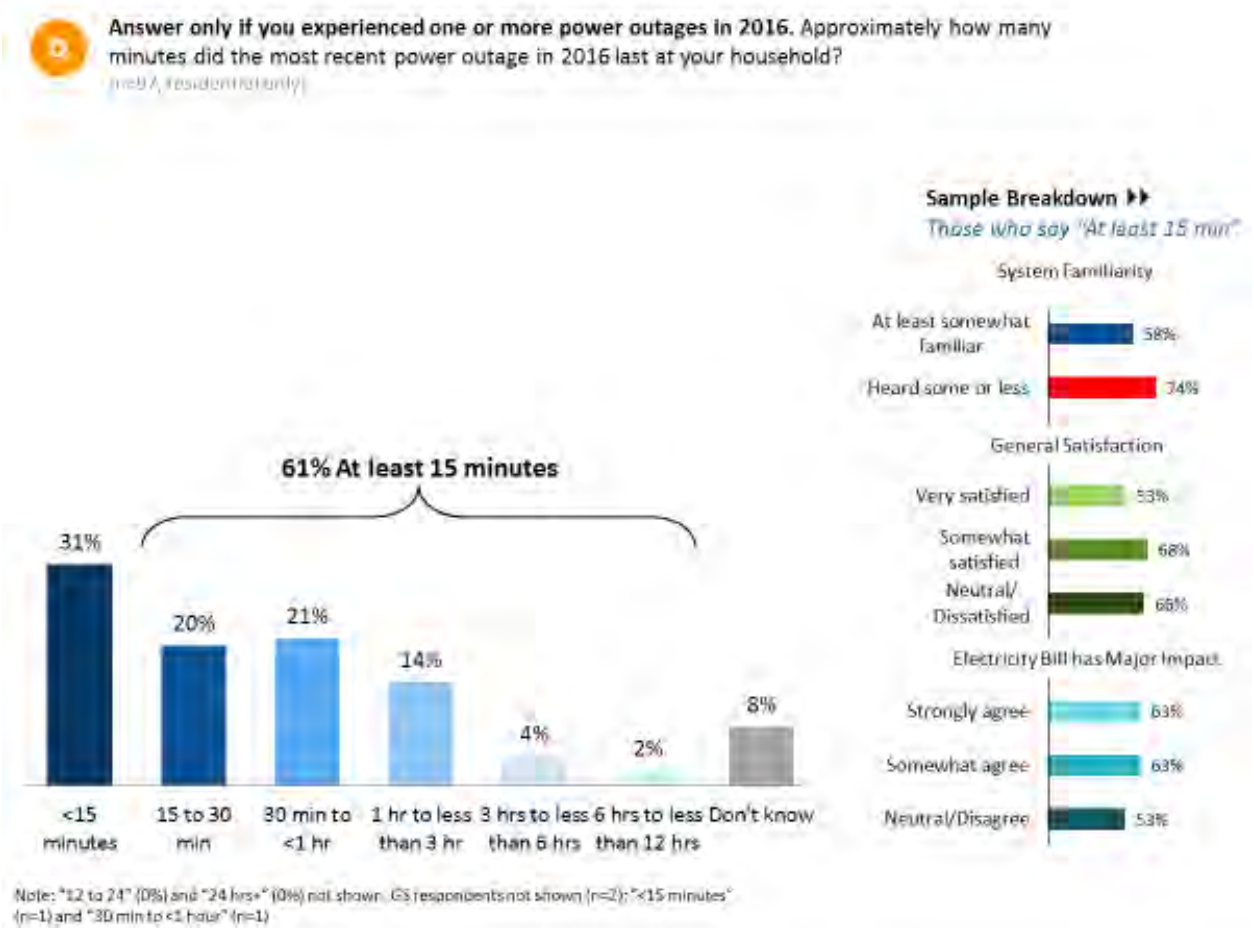


(Customers were instructed to answer the next question only if they had experienced one or more outage in 2016.)

A strong majority (61%) of those residential customers who experienced an outage reported it lasted at least 15 minutes. 2-in-10 (20%) participants reported outages lasting an hour or more. Less than a third (31%) of residential customers who experienced an outage said it lasted less than 15 minutes and 8% didn't know how to answer.

- Residential customers less familiar with the system, those less satisfied, and those who felt their bill makes an impact on their finances reported the longest outages ("Heard some or knew nothing" about the system: 74%; "Neutral/Dissatisfied" with EnWin: 66%; "Agree", electricity bill has major impact: 63%).
- The two general service participants both experienced outages less than an hour ("less than 5 minutes" n= 1; "30 minutes to less than an hour" n=1).

Figure 9 RC: Length of Outages, 2016

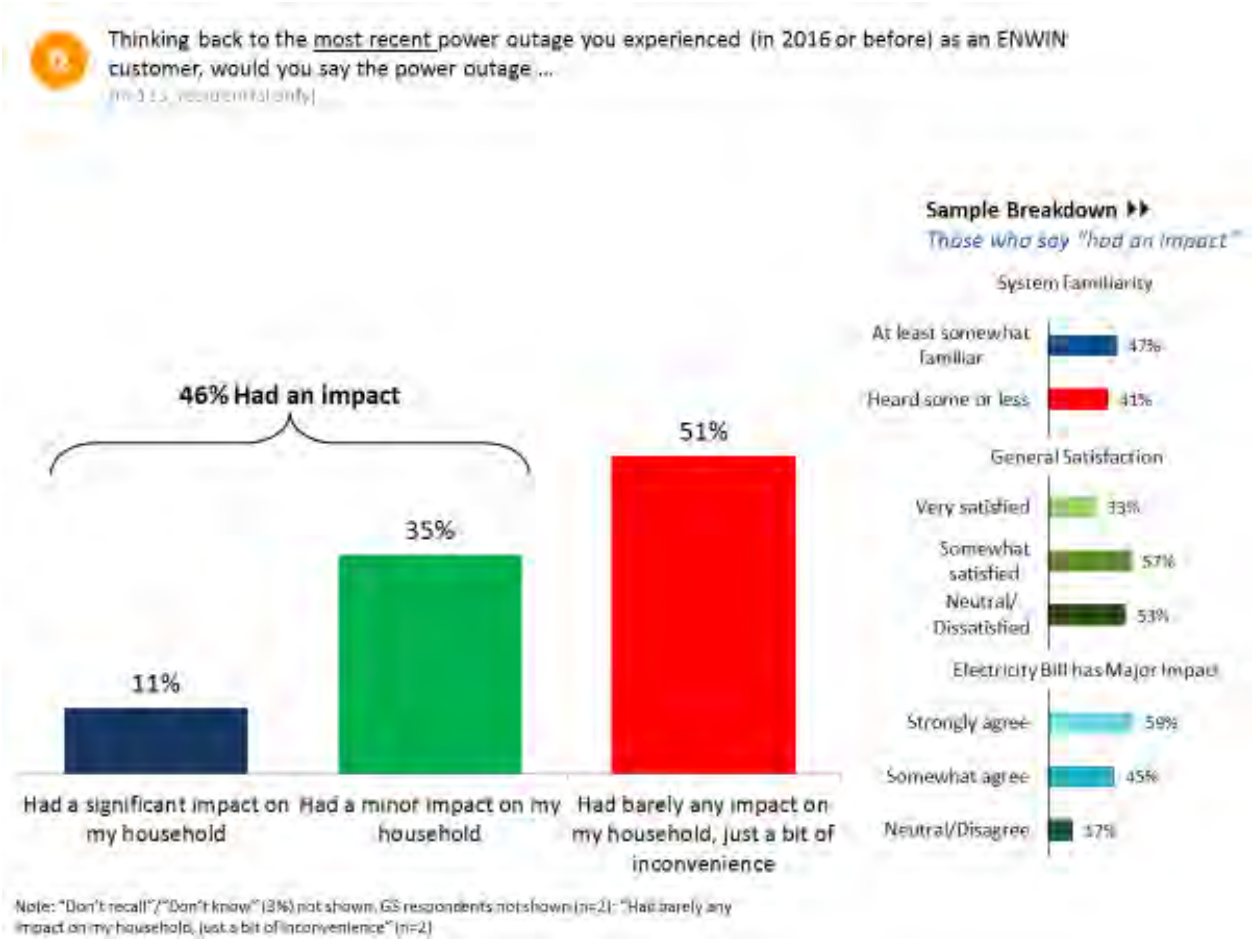


Note: "12 to 24" (0%) and "24 hrs+" (0%) not shown. GS respondents not shown (n=2); "<15 minutes" (n=1) and "30 min to <1 hour" (n=1)

When asked to recall the effect of their most recent power outage, a slim majority of residential participants (51%) stated that the outage barely had an impact, "just a bit of inconvenience". More than a third (35%) of residential participants said it "had a minor impact" and just 11% felt it had a "significant impact" on their household.

- Those who "strongly agreed" their electricity bill had a major impact were the most likely to feel their last outage had an impact on them personally (59%).
- Both general service participants did not felt impacted by their last outage- "just a bit of inconvenience".

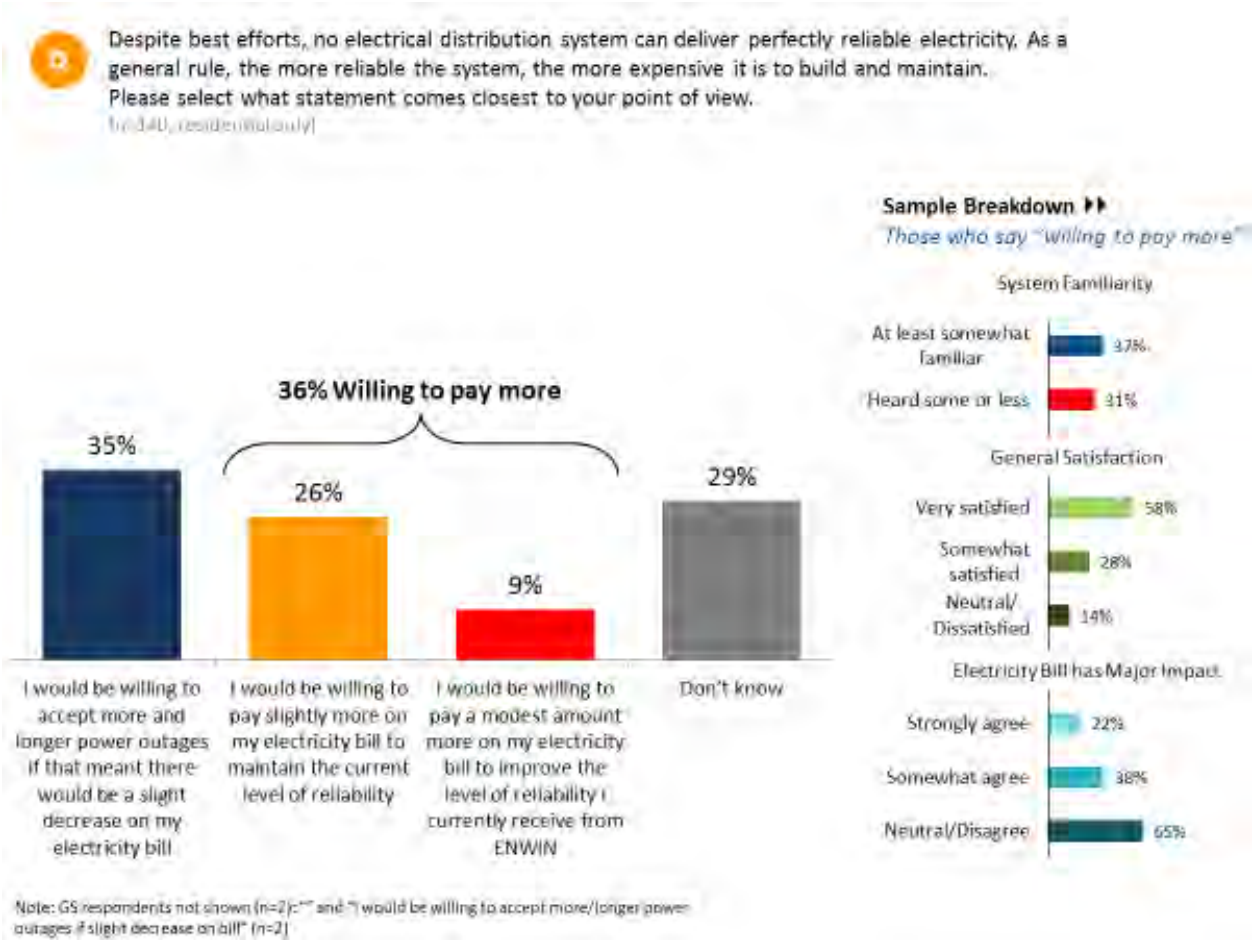
Figure 10 RC: Impact of Outages, 2016



Residential participants appeared divided or indecisive on whether to pay more for reliability. More than a third (35%) were willing to accept worse system reliability for a decrease in their bill. About the same number (36%) preferred to pay, either slightly more to maintain reliability (26%) or a "modest amount" more to improve reliability (9%). Nearly 3-in-10 (29%) residential participants didn't know which statement to choose.

- "Very satisfied" (58%) residential participants were much more willing to pay than those "somewhat satisfied" (28%) or those either ambivalent or unsatisfied (14%).
- Just 22% of those who "strongly agreed" their bill majorly impacted their finances were willing to pay even slightly more to maintain the system.
- Both general service participants would have accepted longer and more frequent outages for a break on their monthly bills.

Figure 11 RC: Outages Cost Trade-off



Note: GS respondents not shown (n=2): "" and "I would be willing to accept more/longer power outages if slight decrease on bill" (n=2)

When asked to rank what EnWin's top priorities should be, the top priority for residential participants, by far, was cost.

Nearly two-thirds (64%) of residential participants ranked "delivering reasonable electricity prices" as their top priority. Less than 2-in-10 (18%) ranked it as their second-most important issue and for 8% rank it was their third top issue; all in all, 88% of residential participants thought that, for EnWin, it should be the top priority.

In the ranking, reliable electricity service was a distant, but strong second: more than two-thirds (67%) of residential participants thought it should be a top-three priority. 2-in-10 (20%) thought it should be EnWin's number one priority; more than a third (35%) thought it should be second, and 12% thought it should be the third-most important priority for EnWin.

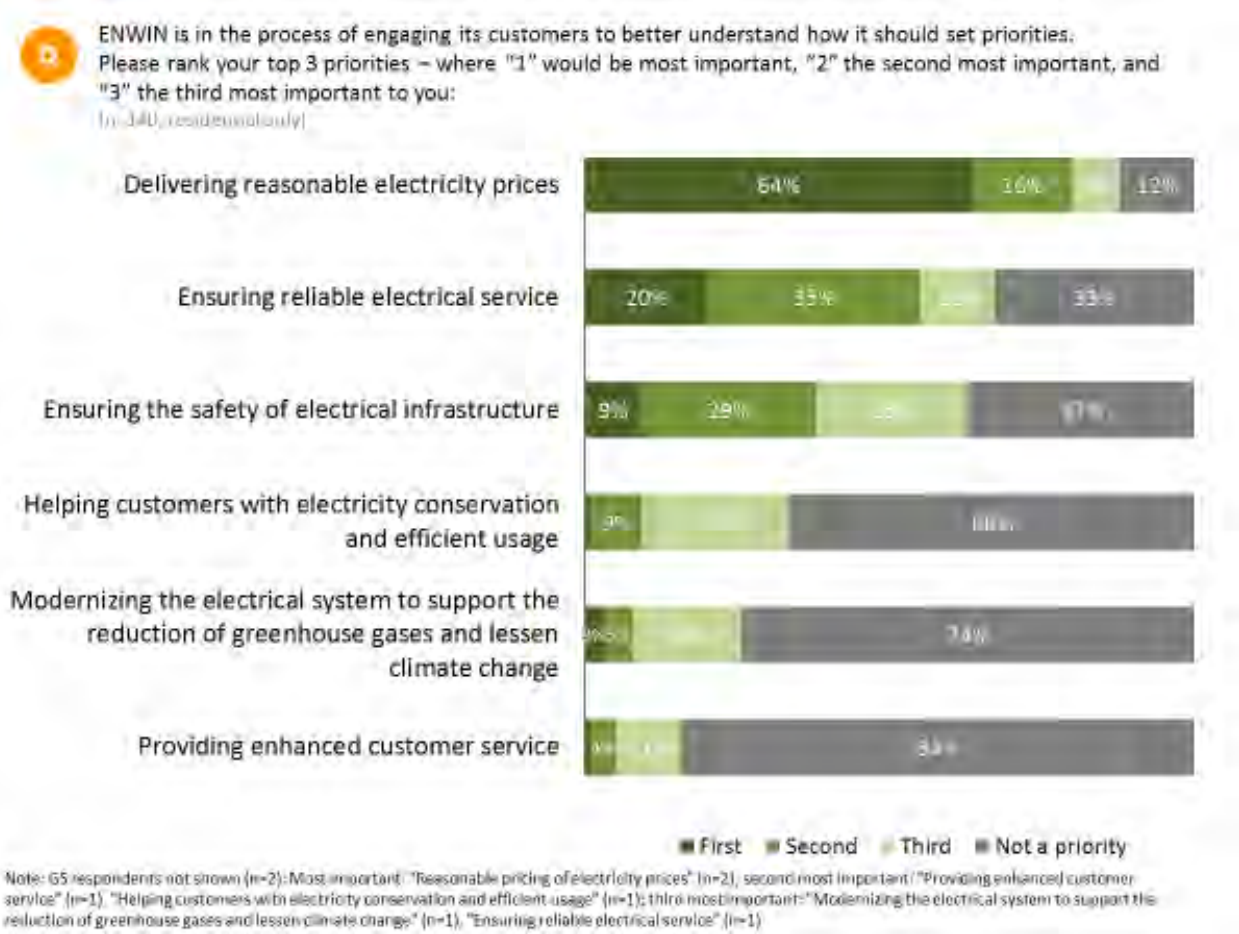
Safety was the third critical priority. More than 6-in-10 (63%) residential participants consider it a top-three priority: 1-in-10 (9%) felt it should be EnWin's number one concern; 3-in-10 (29%) thought it should be their second priority, and 1-in-4 (25%) thought it should be their third priority.

Less critical concerns in the ranking were "helping customers with electricity conservation and efficient usage" (top-three concern: 34%) and "modernizing the electrical system" to help fight climate change (top-three concern: 26%).

Of the six priorities listed, the least important to residential participants was "enhanced customer service"- just 16% thought it was a top-three concern.

- The two GS participants both considered price their top concern (n=2). Second key concerns included "enhanced customer service" (n=1) and "helping customers conserve" (n=1). Their third key priorities for EnWin were "modernizing the system to support the reduction of greenhouse gases" (n=1) and "ensuring reliable service" (n=1).

Figure 12 RC: Key Priorities, Ranked



Note: 65 respondents not shown (n=2): Most important: "Reasonable pricing of electricity prices" (n=2), second most important: "Providing enhanced customer service" (n=1), "Helping customers with electricity conservation and efficient usage" (n=1); third most important: "Modernizing the electrical system to support the reduction of greenhouse gases and lessen climate change" (n=1), "Ensuring reliable electrical service" (n=1)

Looking at top three priorities by key attitude, safety was a bigger priority for those participants familiar with the system (67%), those most satisfied (76%) and those whose who were less impacted by their electricity bills (77%).

The most satisfied participants were also a bit more likely to feel "modernizing the system to reduce greenhouse gases" was a top priority (33%).

And those ambivalent or dissatisfied towards EnWin were the most likely group to want to prioritize "enhanced customer service" (33%).

Figure 13 RC: Top 3 Priorities by Key Attitudes

Top 3 Priority by Key Attitudes

	Overall Top 3 Priority	System Familiarity		General Satisfaction			Electricity Bill, Major Impact		
TOPIC PRIORITY		At least somewhat	Heard some or less	Very satisfied	Somewhat satisfied	Neutral/ Dissatisfied	Strongly agree	Somewhat agree	Neutral/ Disagree
Delivering reasonable electricity prices	88%	87%	91%	84%	91%	90%	90%	88%	84%
Ensuring reliable electrical service	67%	69%	63%	69%	70%	62%	65%	73%	65%
Ensuring the safety of electrical infrastructure	63%	67%	51%	76%	49%	60%	59%	58%	77%
Helping customers with electricity conservation and efficient usage	34%	30%	46%	27%	56%	19%	28%	45%	32%
Modernizing the electrical system to support the reduction of greenhouse gases and lessen climate change	26%	26%	26%	33%	26%	17%	26%	25%	26%
Providing enhanced customer service	16%	15%	17%	9%	7%	33%	20%	10%	13%

Participants were asked a follow-up open-ended question: "are there any other important priorities that EnWin should be focusing on not mentioned above?"

Of the 51 residential customers who responded, some suggested "improving management efficiency and spending" (n=10), "keeping rates down" (n=6), "better line maintenance" (n=4), "better communication with customers" (n=4), "improvements to smart meters" (n=3), "help to senior or other low-income users" (n=3), "investment in renewable and clean power" (n=3), "less political interference" (n=2) and "getting customers to conserve more" (n=2). Nine of the 51 who responded did not have anything else to add.

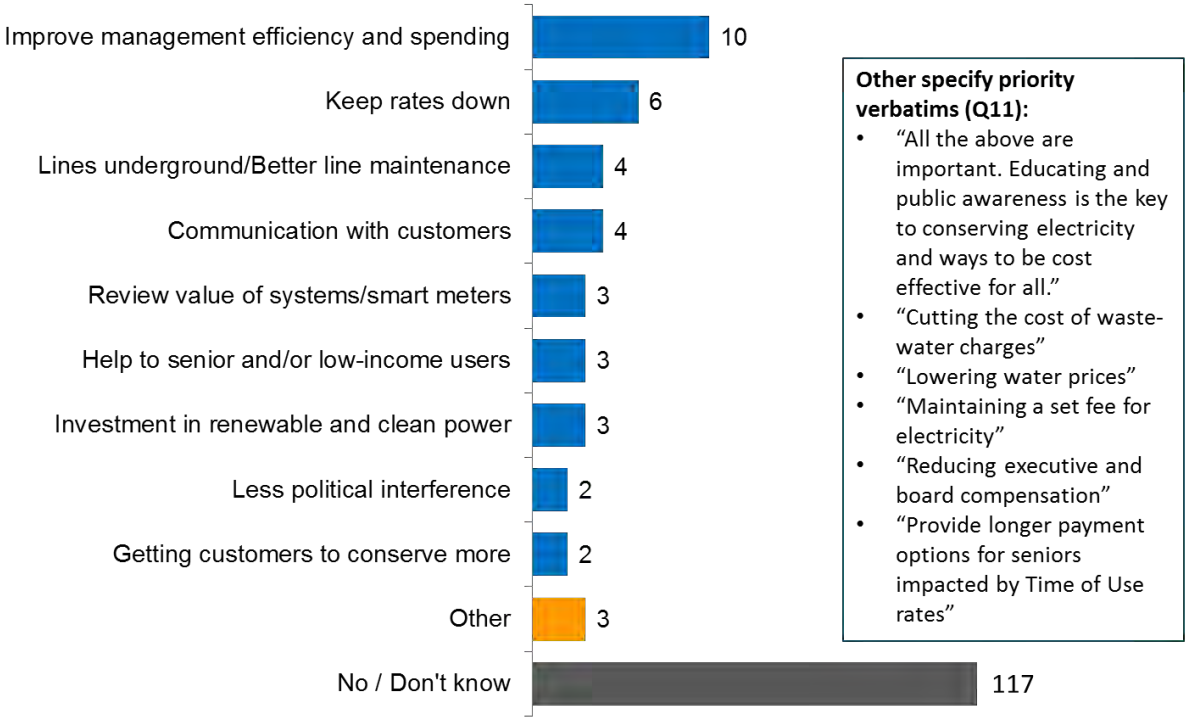
In the previous question, there were also 10 "other- please specify" selected in the ranking. Below were some of those verbatim suggestions on top priorities:

- *"All the above were important. Educating and public awareness is the key to conserving electricity and ways to be cost effective for all"*
- *"Cutting the cost of waste-water charges"*
- *"Lowering water prices"*
- *"Maintaining a set fee for electricity"*
- *"Reducing executive and board compensation"*
- *"Provide longer payment options for seniors impacted by Time-of-Use rates"*

(The two general service responses were coded as "communication with customers" (n=1) and "Other" (n=1)).

Figure 14 RC: Other Important Priorities [OPEN]

Are any other important priorities that ENWIN should be focusing on, not mentioned above?
[n=159, residential only]



Other specify priority verbatims (Q11):

- "All the above are important. Educating and public awareness is the key to conserving electricity and ways to be cost effective for all."
- "Cutting the cost of waste-water charges"
- "Lowering water prices"
- "Maintaining a set fee for electricity"
- "Reducing executive and board compensation"
- "Provide longer payment options for seniors impacted by Time of Use rates"

GS respondents not shown (n=2): "Communication with customers" (n=1) and "Other" (n=1).

Capital Investments, Operating Expenses, and Specific Initiatives

The next section outlines how participants felt about EnWin's response to the pressures on the distribution system, the company's proposed capital investment plan and potential initiatives dedicated to improving customer service.

Summary: Capital Investments, Operating Expenses, and Specific Initiatives

Most residential participants thought it was important that EnWin spends what is needed to maintain the system (67%) and a plurality (49%) want EnWin to invest in aging infrastructure.

- Almost 1-in-4 (22%) thought EnWin should make do with the "IT and systems it has" and just 9% said it should increase investment and replacing aging infrastructure at a slight cost to consumers.
- EnWin's most satisfied customers ("very satisfied": 75%) and those less impacted by their electricity bill were the most likely to want EnWin to spend what is needed.
- 49% preferred investing in aging infrastructure over "lowering investment to reduce bill impact" (31%). Again, the most satisfied and least financially stressed residential participants were the most likely to support investing what's needed.

Residential participants were more divided on investment in new technology: 47% thought it would increase reliability and save money in the long run, while 40% felt the investment would be "more of a luxury than a necessity".

- These attitudes varied widely by satisfaction and bill impact: among the most satisfied and least impacted residential participants, a strong majority felt that investment in tech increases reliability.

When it comes to the value of accurate and timely information about outages, residential participants seemed divided on paying more for it.

- 36% agreed and 34% disagreed with the statement, "I value accurate and timely information about outages and restoration during a storm, even if it costs me a little bit more for EnWin to provide this service."
- Half of the "very satisfied" (50%) agreed with the above statement compared with just 21% of those neutral or dissatisfied with EnWin.

Over a small sample of open-ended responses about EnWin's expenses and expenditures, there were repeated mentions about "keeping rates down" and reducing management costs and holding the company executives accountable.

When asked to rank seven customer service items from most positive to least positive impact, "tools to manage usage and consumption" showed as the top item. The 2nd and 3rd top items relate to improving reliability.

- More than half (55%) ranked usage and consumption tools as their top three item with 1-in-4 (25%) who ranked it number one.
- The second and third key items were providing "more accurate estimates of when power is restored", and "reducing the number of quality issues such as flickering". Nearly 4-in-10 (38%) residential participants chose "more accurate estimates of when power is restored"

as a top three service item (1st: 9%; 2nd: 15%; 3rd: 15%) and about the same number chose "power quality" (top-three: 37%; 1st: 12%; 2nd: 15%; 3rd: 11%).
- Residential participants most financially impacted by their bills were the most likely group to choose "improving the format and presentation of bills" as a top issue.

Reaction to e-billing appeared lukewarm: 3-in-10 felt interested in the service while 34% were either "not very interested" (16%) or "not at all interested" (18%). (33% had already signed up.)

- In the small sample of residential participants who responded to the open-ended question on e-billing, a plurality focused on how much they like receiving it in paper form, or that paper seems to be a better reminder for them than email (n=22 total).

Among the listed customer service initiatives, more than 3-in-4 residential participants were not willing to pay even a few cents more for customer service upgrades like online service, website enhancements, and social media updates.

- More than 2-in-10 would have paid a very small amount for mobile apps (24%), self-service forms (24%) or a better website portal (22%).

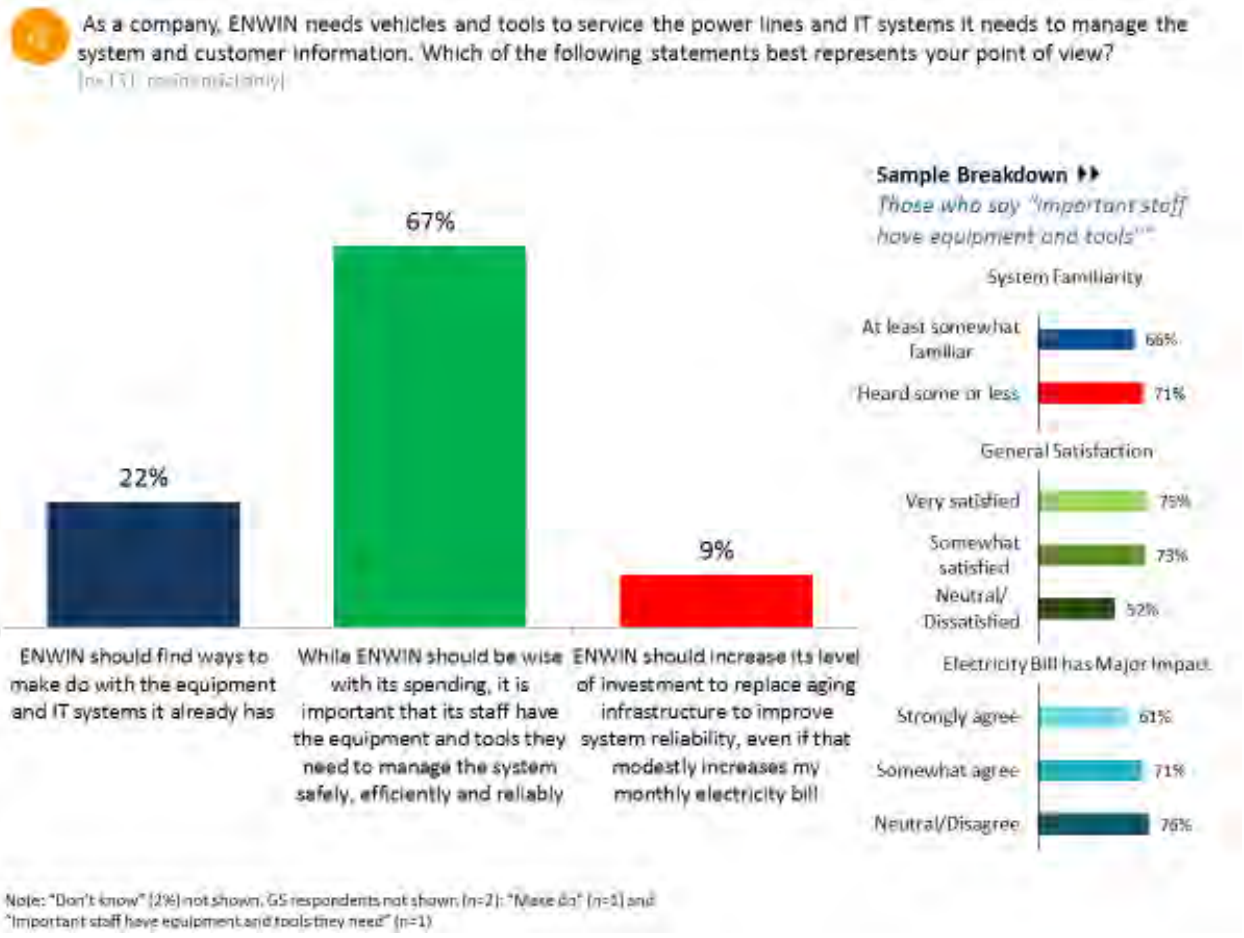
Half of the residential participants (52%) have not participated in an EnWin conservation program, but they appeared willing to do so in the future.

- Only 2-in-10 (20%) claimed to participate in a program and 3-in-10 (28%) didn't know.
- In a follow-up question, 42% said they were likely to participate in future EnWin conservation programs compared to just 17% who said they were unlikely to do so. 41% were not sure if they would participate in future programs.

Two out of every three (67%) residential participants thought that, while EnWin should be wise with its spending, it was important EnWin staff have what they need to maintain the system "safely, efficiently and reliably". Nearly a quarter (22%) felt that EnWin should "make do with the equipment and IT systems it already has"; just 9% said EnWin should, at a modest cost to consumers, increase its investment and replace old infrastructure to improve reliability.

- Residential participants who were most satisfied with EnWin (75% vs. 52% "Neutral/Dissatisfied") and those who did not feel a large financial impact from their bill were more likely to stress the importance of EnWin's staff "having the equipment and tools they need to manage the system".
- Of the two general service customers, one suggested EnWin should "make do with the equipment and IT systems it already has" and the other said EnWin's staff should have the equipment and IT needed to maintain the system.

Figure 15 RC: Replacement of Equipment and IT

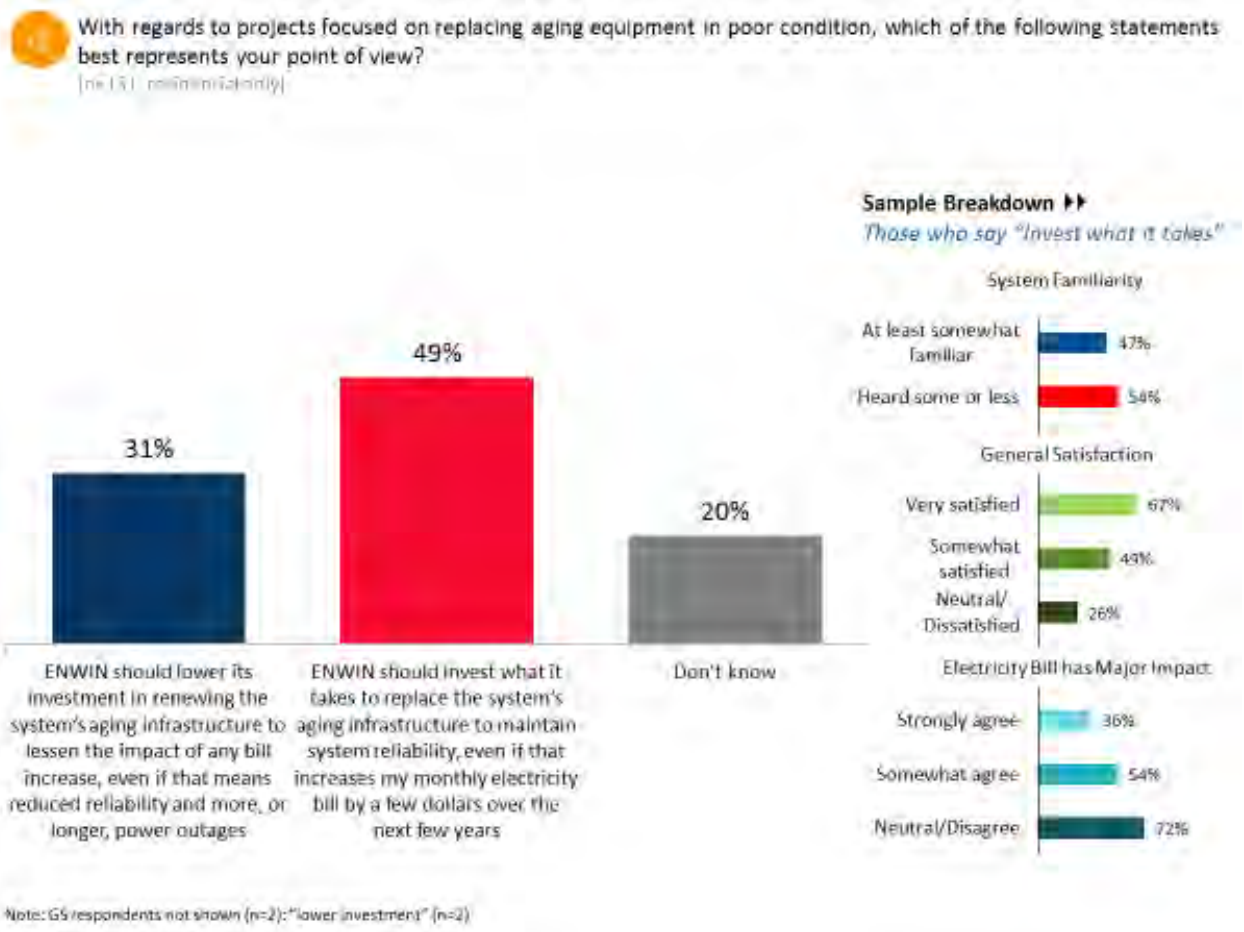


Note: "Don't know" (2%) not shown. GS respondents not shown (n=2): "Make do" (n=1) and "Important staff have equipment and tools they need" (n=1)

When asked to choose between "investing what it takes to replace aging infrastructure" even if it increases their monthly bill and "lowering investment to lessen the bill impact, even if that means reduced reliability or longer outages", a plurality (49%) of residential participants chose the former. Just 3-in-10 (31%) said that EnWin should lower investment in replacing aging infrastructure to reduce bill impact and 2-in-10 (20%) didn't know which response to choose.

- Two-thirds (67%) of "very satisfied" residential participants said EnWin should "invest what it takes", a striking 41-point difference from the 26% of "neutral/dissatisfied" customers who felt the same.
- Those who felt the financial crunch from their electricity bill were much less likely to say EnWin should "invest what it takes" ("strongly agree": 36%; "somewhat agree": 54%; "Neutral/Disagree': 72%)
- Both general service customers who answered this question felt EnWin should lower investment to lessen the impact of any bill increase, "even if it means reduced reliability and more or longer outages".

Figure 16 RC: Replacement of Aging Infrastructure

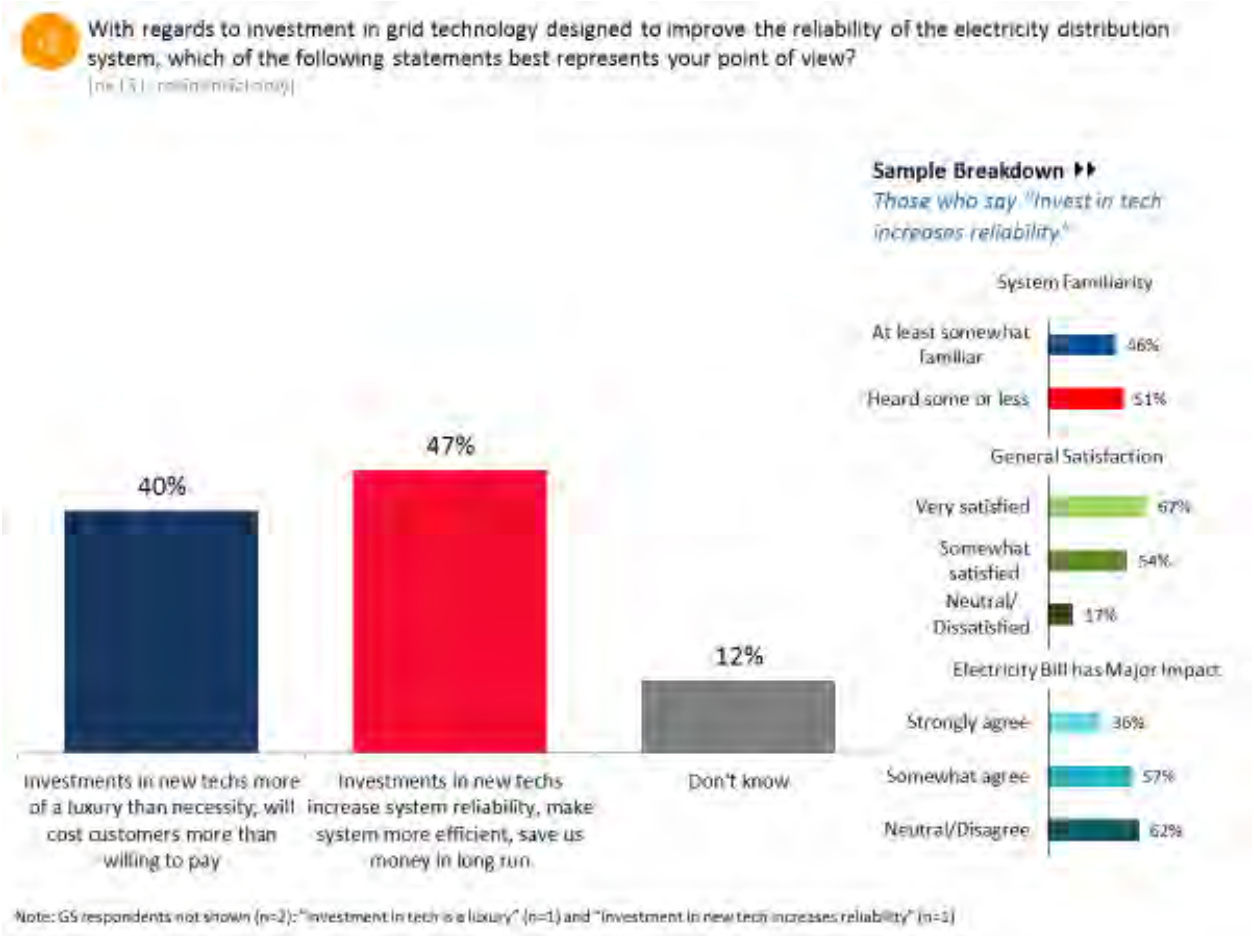


The next trade-off was focused on investment in grid technology: were investments in new technology important to increasing reliability and saving customers money in the long-run, or were they "more of a luxury than a necessity"?

Residential participants were divided on this statement. Nearly half (47%) of residential participants agreed that investment in tech would make the system more reliable and save money in the long-run while 4-in-10 (40%) said investment in new tech was "more of a luxury than a necessity and will cost customers more than they were willing to pay".

- Again, there were striking differences in satisfaction and economic struggle. The most likely groups to think "investment in tech increases reliability" were the most satisfied residential participants ("very satisfied": 67%) and those struggling the least ("Neutral/Disagree": 62%).
- The two general service participants were equally divided on whether investment in new technology was a luxury (n=1) or increased reliability (n=1).

Figure 17 RC: Investment in New Technology

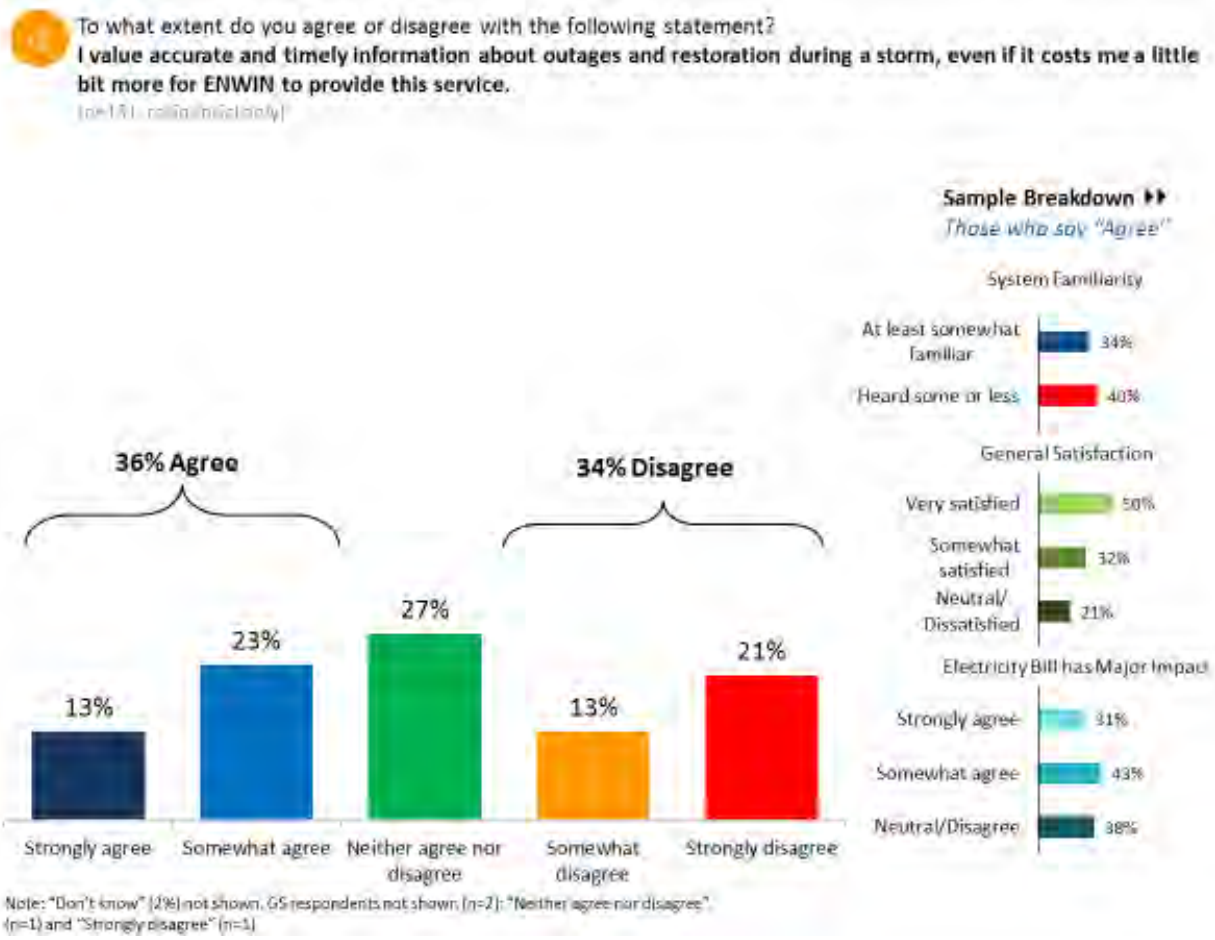


The final question on this page of the workbook asked participants whether they agreed or disagreed with this statement: *"I value accurate and timely information about outages and restoration during a storm, even if it costs me a little bit more for EnWin to provide this service".*

The 131 remaining residential participants were divided equally on how to respond: more than a third either agreed (36%) or disagreed (34%) with about 3-in-10 ("neither": 27%; "don't know": 2%) who didn't have a strong opinion or know how to respond.

- By satisfaction though, some key differences emerged on this attitude: 50% of "very satisfied" residential participants agreed that they valued the information, even if it cost them money. Just 2-in-10 (21%) of the "neutral" or "dissatisfied" felt the same.
- Of the two general service participants, one did not have a strong opinion either way (n=1) and one "strongly disagreed" (n=1).

Figure 18 RC: Attitudes towards Information during Outages



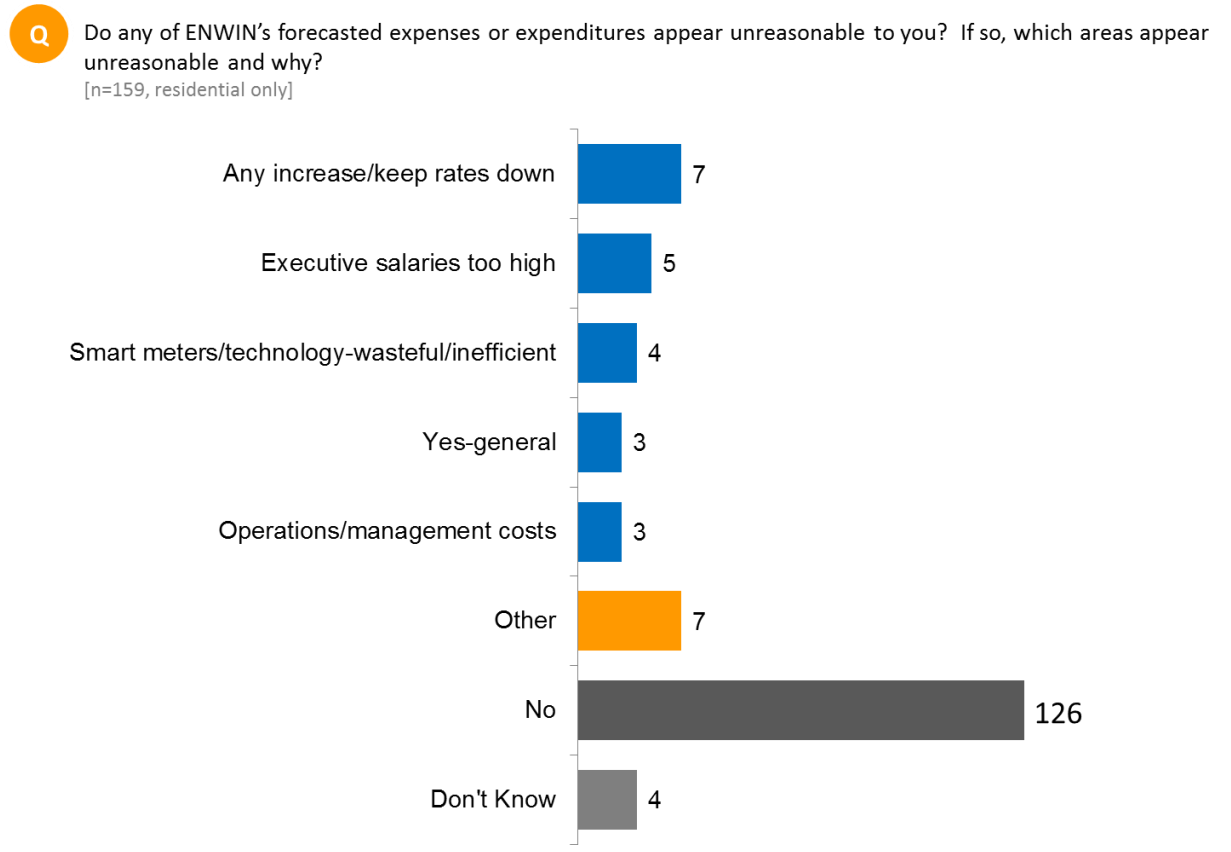
The following set of questions focused on EnWin's operating budget and the factors that drive up costs, such as increases in labour costs, apprentice funding, additional operating expenses to replace systems, and additional IT costs for items like technical support and cybersecurity. The workbook explained how EnWin found internal cost savings since its 2009 Cost of Service application, with supporting tracking data on EnWin's portion of their monthly bill, a comparison of rate increases against inflation and forecasted expenses over the next five years.

After all this information was shown to the participant, they were asked an open-ended question: *"Do any of EnWin's forecasted expenses or expenditures appear unreasonable to you? If so, which areas appear unreasonable and why?"*

Of the 59 residential participants who responded, nearly half (n=26) stated that "no", none of the expenses or expenditures looked unreasonable to them. Of the remaining responses, specific suggestions included "keeping rates down" (n=7), "executive salaries were too high" (n=5), "smart meters were wasteful or inefficient" (n=4), and reduced "operations and management costs".

(The one remaining general service participant stated that "no", there was nothing unreasonable in the forecast.)

Figure 19 RC: Unreasonable Expenses [OPEN]



Note: GS respondents not shown (n=1): "No"

Participants were then asked to rank the following 7 service items from most positive to least positive impact:

Service Items	Ranking
Billing: Improve the format and presentation of bills	
Ease of doing business: Provide customized customer service through phone, mobile or online	
Energy management: Provide tools so you can manage your usage and view your consumption	
Power outage restoration: Provide more accurate estimates of when your power will be restored	
Renewable generation: Enable customers to integrate their renewable energy devices into the grid.	
Electric vehicles and storage: Enable customers to use their high capacity home batteries and electric vehicle batteries to provide power during outages.	
Power quality: Monitor and reduce the number of power quality issues (e.g. flickering lights).	

"Tools to manage usage and consumption" was the top service item. More than half (55%) of residential participants ranked it a top three service item. 1-in-4 (25%) ranked it as the item with the most positive impact, nearly 2-in-10 (18%) ranked it second-highest and another 1-in-10 (11%) ranked it as the third-highest item.

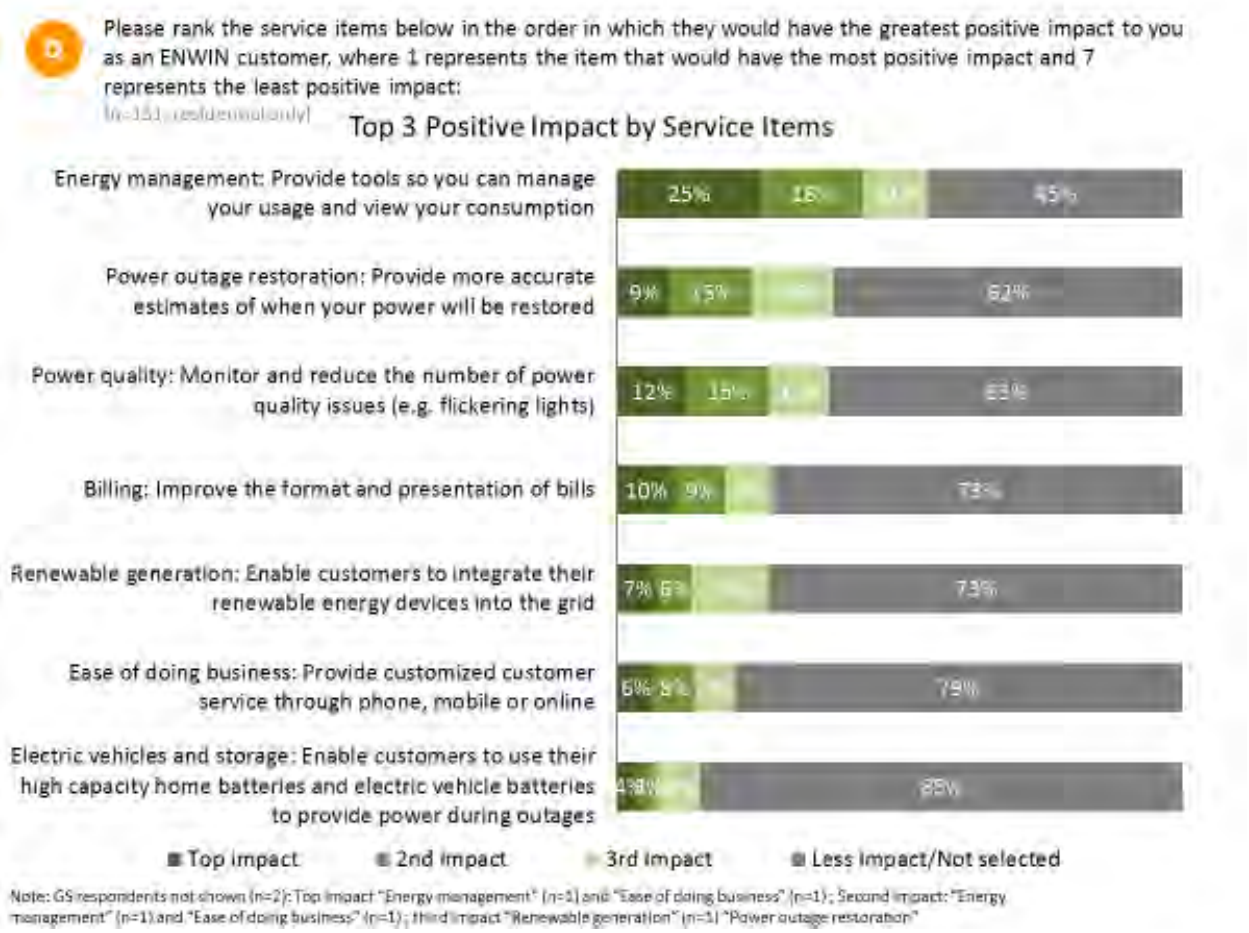
The second and third top service items related to power outages, providing "more accurate estimates of when power is restored", and power quality, "reducing the number of quality issues such as flickering". Nearly 4-in-10 (38%) residential participants chose "more accurate estimates as a top three service item (1st: 9%; 2nd: 15%; 3rd: 15%) and about the same number chose "power quality" (top-three: 37%; 1st: 12%; 2nd: 15%; 3rd: 11%).

Lower-ranked service items included improvements to billing (top-three item: 27%), enabling customers to connect renewable energy devices to the grid (top-three item: 27%) and "ease of doing business by providing customized customer service through phone, mobile or online" (top-three item: 21%).

The lowest ranked service item focused on electric vehicles and storage. Only 2-in-10 (21%) ranked "allowing customers to use batteries at home to provide replacement power during outages" as a top three service item. 85% felt it was less impactful or did not select it.

(Top three issues for the two general service respondents included "providing tools to manage usage and consumption" (n=2), "ease of doing business" (n=2), "renewable generation" (n=1) and "power outage restoration".)

Figure 20 RC: Service Items Ranking, Positive Impact



Note: GS respondents not shown (n=2): Top impact "Energy management" (n=1) and "Ease of doing business" (n=1); Second impact: "Energy management" (n=1) and "Ease of doing business" (n=1); third impact "Renewable generation" (n=1) "Power outage restoration"

In the breakdown by key attitudes, participants less familiar with the system were more likely to choose the following topics as impactful: "providing tools to manage usage and consumption" (71%), "monitoring and reducing power quality issues" (46%), "improving format and presentation of bills" (43%) and "enabling renewable device integration into the grid" (43%).

Less satisfied residential participants were a bit more likely to choose "monitor and reduce power quality issues" ("Neutral/Dissatisfied": 45%) and renewable device integration ("Neutral/Dissatisfied": 33%) as their most impactful issues.

Residents majorly impacted by their bills were more likely to consider "improving the format and presentation of bills" as a top issue.

Figure 21 RC: Service Items Ranking by Key Attitudes

Top 3 Impact by Key Attitudes

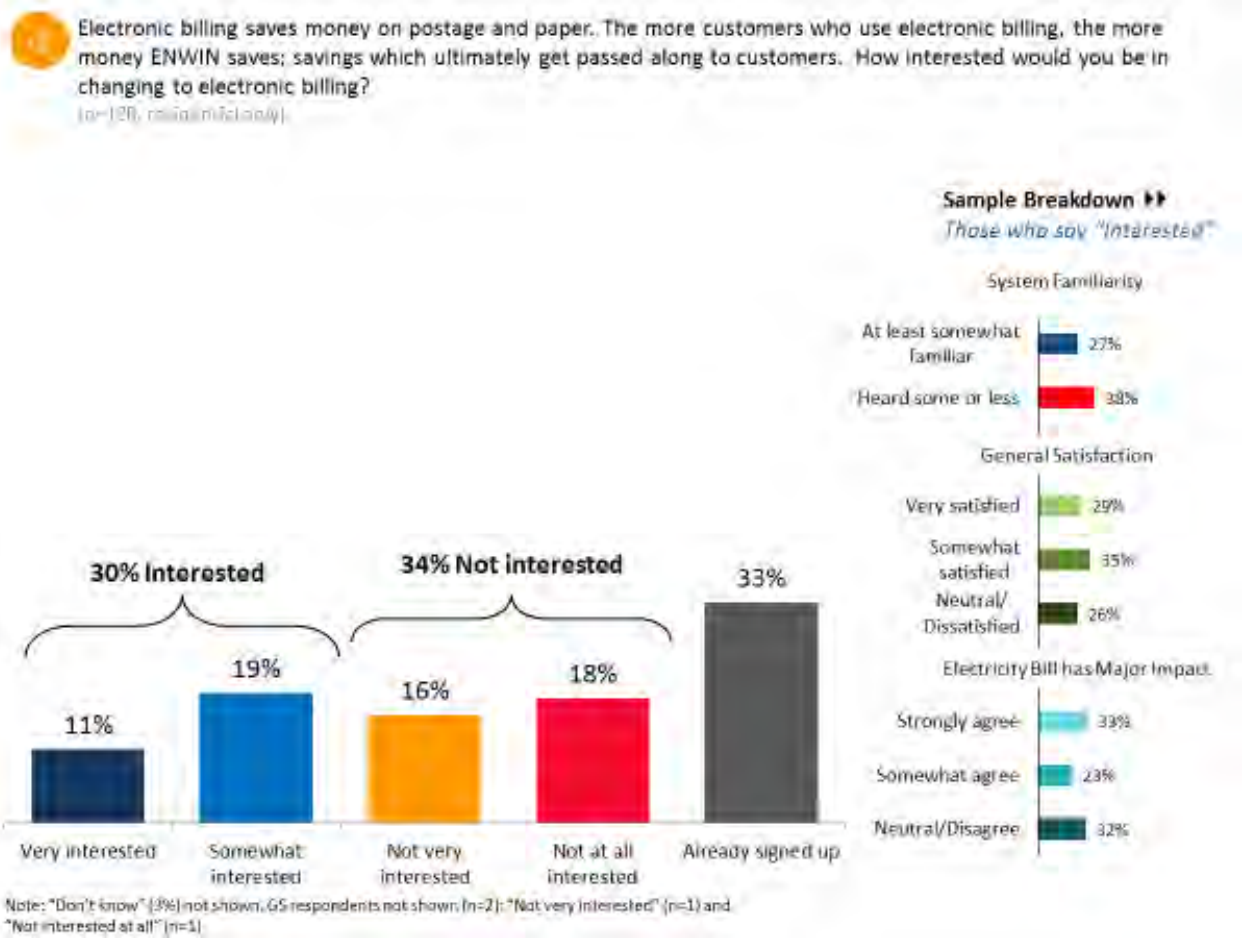
	Overall Top 3 Impact	System Familiarity		General Satisfaction			Electricity Bill, Major Impact		
TOPIC		At least somewhat	Heard some or less	Very satisfied	Somewhat satisfied	Neutral/ Dissatisfied	Strongly agree	Somewhat agree	Neutral/ Disagree
Provide tools to manage usage, consumption	55%	49%	71%	58%	57%	50%	52%	66%	48%
More accurate estimates on restore	38%	39%	37%	37%	38%	40%	39%	43%	31%
Monitor and reduce quality issues	37%	34%	46%	25%	46%	45%	39%	34%	38%
Improve format and presentation of bills	27%	22%	43%	25%	27%	31%	36%	26%	10%
Enable renewable device integration into grid	27%	21%	43%	21%	27%	33%	24%	29%	31%
Provide customized service through phone, mobile or online	21%	21%	20%	17%	16%	29%	19%	26%	17%
Allow home batteries to provide power during outages	15%	10%	26%	13%	16%	14%	10%	20%	17%

Questions in the workbook then turned to billing, gauging interest in e-billing and probing in an open-ended question why participants had not signed up for the service.

The remaining 120 participants were divided on interest in e-billing. (1-in-3 (33%) had already signed up.) 3-in-10 (30%) felt interested in the service while more than a third (34%) said they were "not very interested" (16%) or "not at all interested" (18%).

- The least familiar residential participants (38%) were a bit more interested in e-billing than those at least somewhat familiar with the system (27%).
- Neither of the two general service participants was interested ("not very interested" (n=1) and "not interested at all" (n=1).

Figure 22 RC: Interest in e-billing

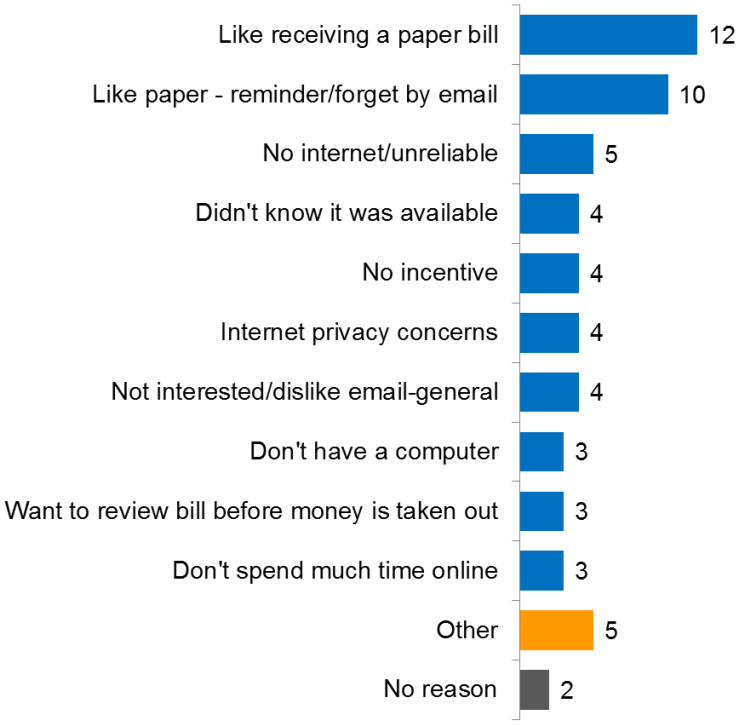


In the follow-up open-ended question asking, "why haven't you switched yet?", the top responses said that they "like receiving a paper bill" (n=12) or that mail is a good reminder- they would forget by email (n=10). Other key reasons included "no or unreliable internet" (n=5), "didn't know it was available" (n=4), "no incentive" (n=4), "internet privacy concerns" (n=4), "not interested/dislike email in general" (n=4), "don't have a computer" (n=3), "want to review the bill before money is taken out" (n=3) and "don't spend much time online" (n=3).

(The two general service participants stated their reasoning as "like receiving a paper bill" (n=1) and "no incentive" (n=1).

Figure 23 RC: Reason for not switching to E-billing [OPEN]

Q Why haven't you switched to e-billing yet?
[n=59, residential only]



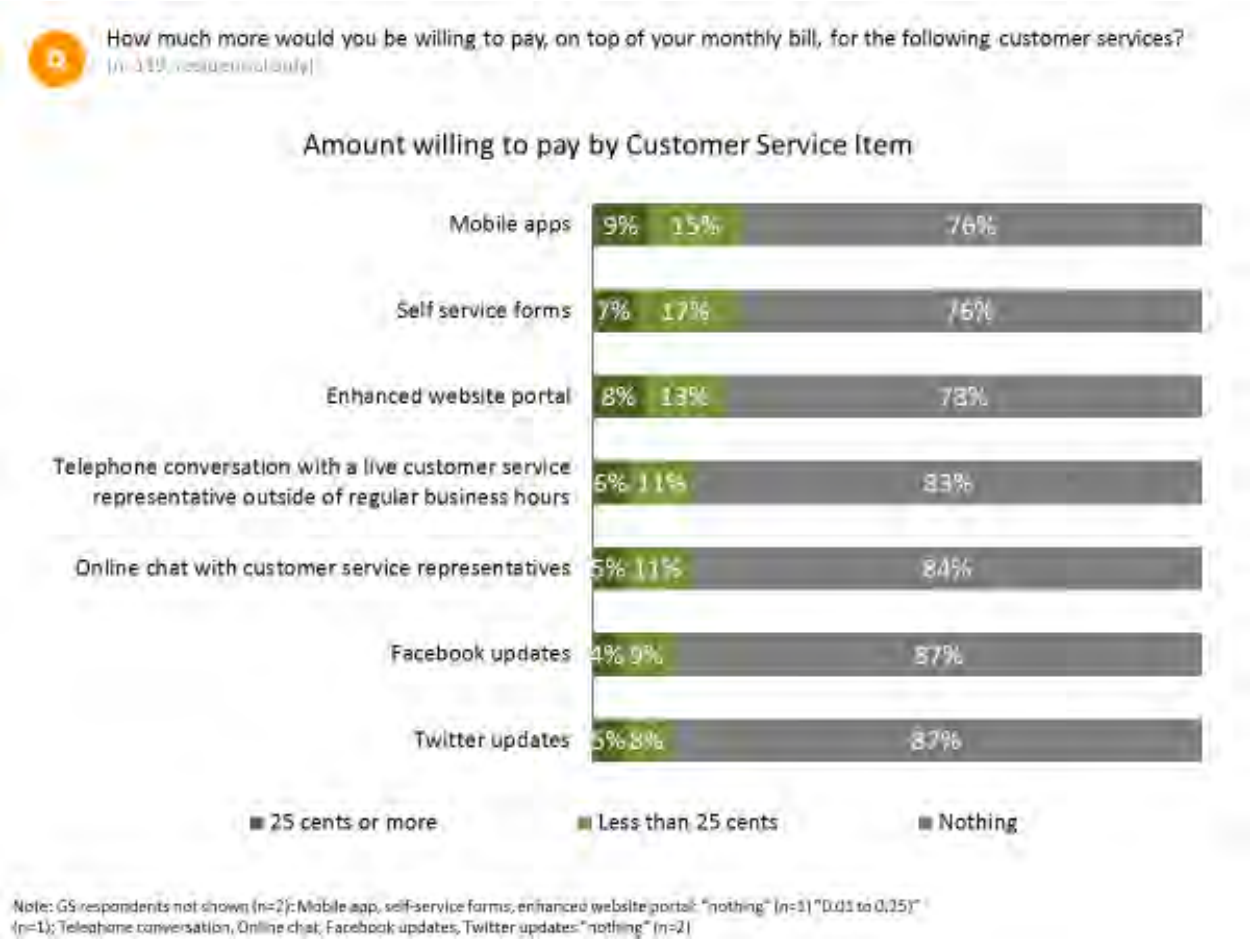
Note: GS respondents not shown (n=2): "Like receiving a paper bill" (n=1) and "No incentive" (n=1)

As for specific customer service initiatives, it appears that most residential participants were not willing to pay even a few cents more for additional customer service items like online service, website enhancements, and social media updates.

More than 2-in-10 considered paying a small amount for mobile apps (24%), self-service forms (24%) or an enhanced website portal (21%). And less than 2-in-10 would have paid even a little for telephone conservations with live representatives (17%), online chat functions (16%), or social media updates (13%).

(The only items the two general service participants would have paid money for were mobile apps ("less than 25 cents": (n=1)) and a better website portal ("less than 25 cents": (n=1)).

Figure 24 RC: Amount Willing to Pay for Customer Service Items



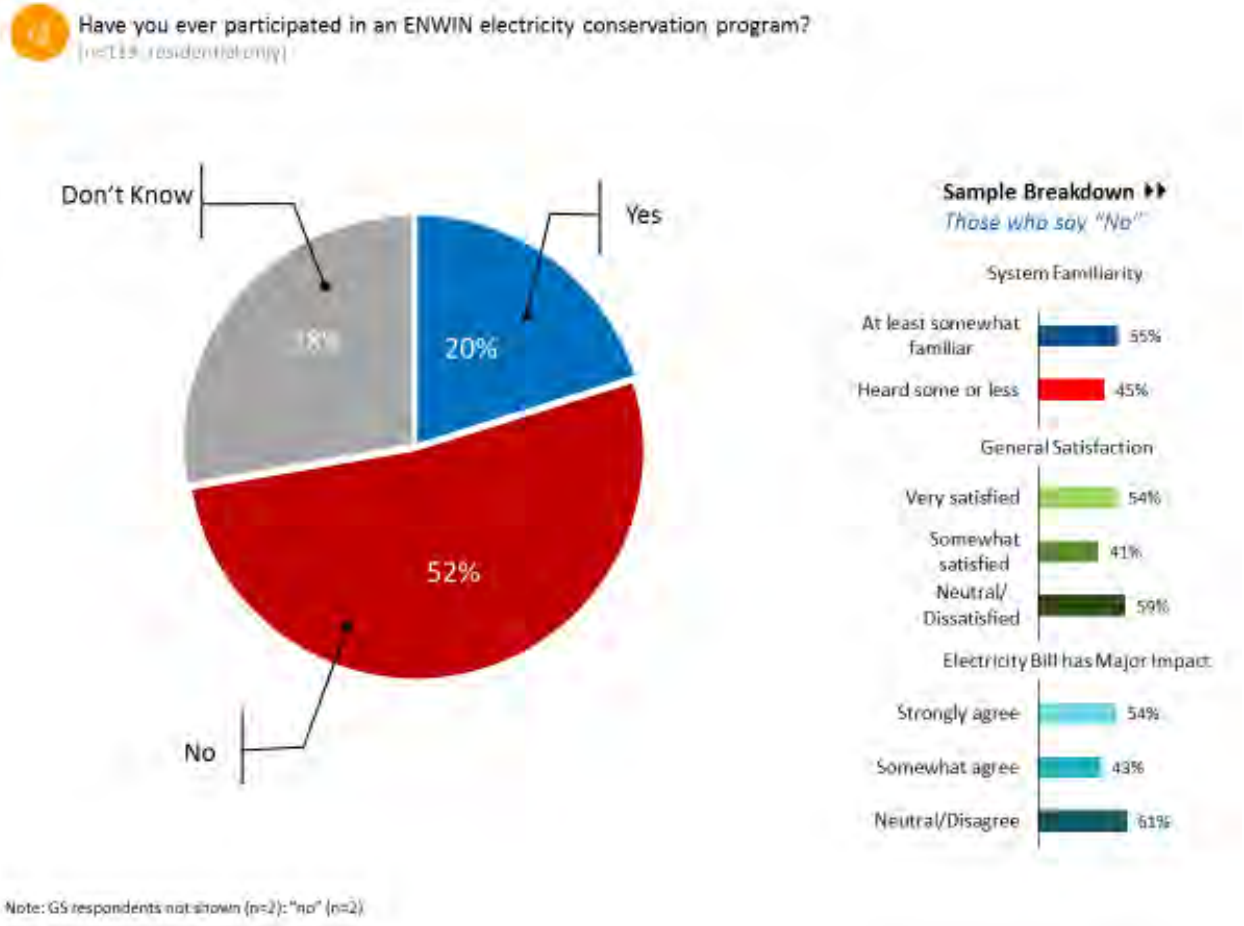
Note: GS respondents not shown (n=2): Mobile app, self-service forms, enhanced website portal: "nothing" (n=1) "0.01 to 0.25)" (n=1); Telephone conversation, Online chat, Facebook updates, Twitter updates: "nothing" (n=2)

The last two questions in this section of the workbook asked for feedback on EnWin conservation program.

A majority (52%) of the remaining 119 residential participants hadn't participated in the program. Just 2-in-10 (20%) confirm they had participated and nearly 3-in-10 (28%) don't know if they had or not.

- There were no consistent, clear trends on key attitudes on this question.
- Neither general service customer who responded participated in the EnWin conservation program.

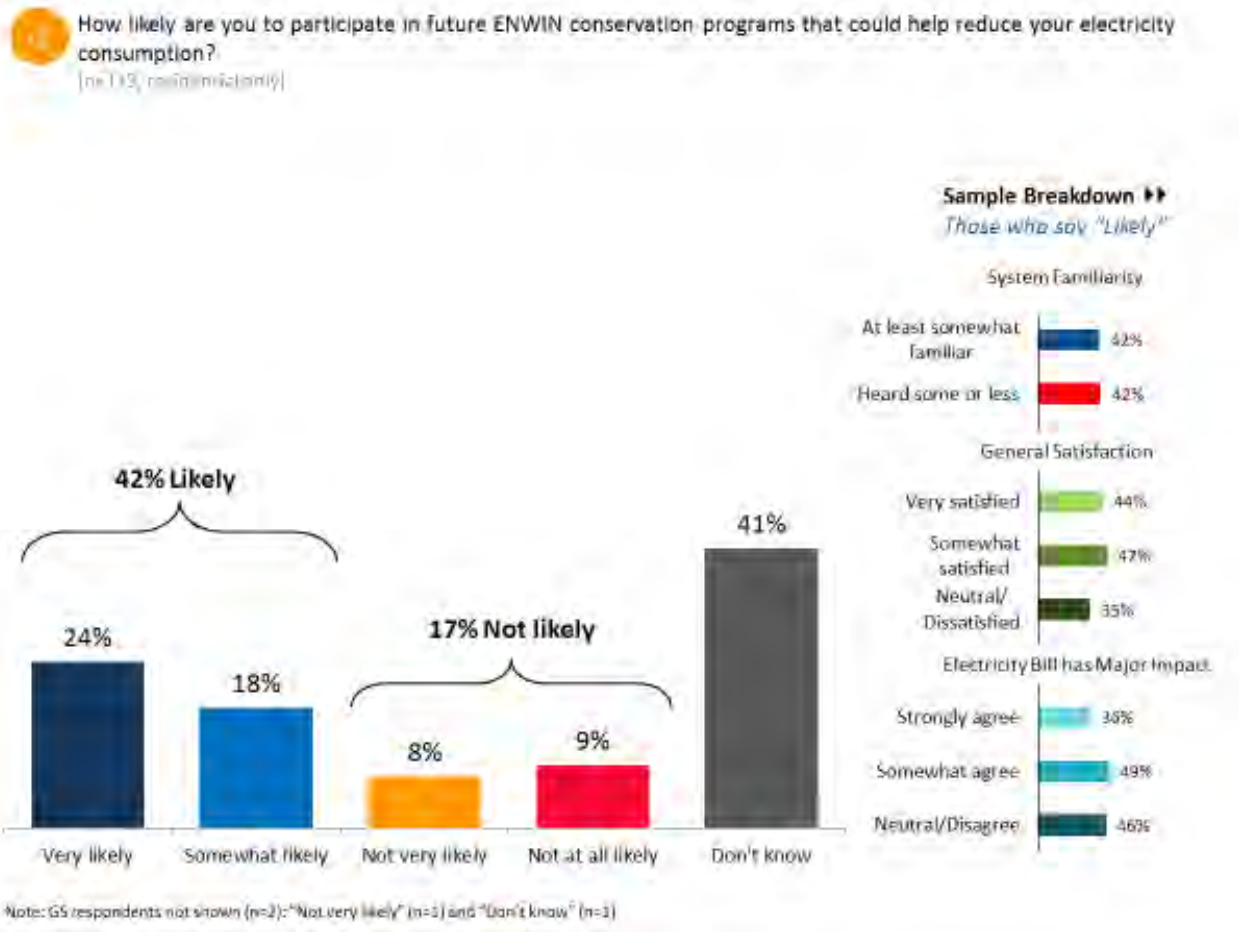
Figure 25 RC: Participation in EnWin Conservation Program



A strong plurality (42%) of residential participants said they were likely to participate in future EnWin conservation programs including 24% who said they were "very likely"; only 17% reported they were not likely (17%) to participate in the program. There seemed to be a great deal of ambivalence about participation, with 4-in-10 (41%) who didn't know whether they would or not.

- Dissatisfied residential participants (35%) and those who felt their bill majorly impacted their finances (36%) were the least likely groups to consider joining future EnWin conservation programs.
- Of the two general service participants, one was "not very likely" to participate and one responded, "don't know".

Figure 26 RC: Likelihood to Participate, EnWin Conservation Program



Assessment of Proposed Plan

The final core section of the workbook outlined the proposed cost of EnWin's plan to customers over the next five years, both residential and general service:

Residential

*"By 2023, it is estimated that the seven-year total EnWin increase for the average residential household could be between **$3.45** and **$5.25** per month."*

General Service

*"By 2023, it is estimated that the seven-year total EnWin increase for the average small business customer could be between **$7.90 and $12.00** per month."*

The last few questions ask for the customer's assessment of the proposed plan as well as ranked support for three alternative scenarios: **improving** reliability (a 9% delivery rate increase), **maintaining** reliability (a 6% increase) and **declining** reliability (a 3% rate increase).

Summary: Assessment

A plurality of residential participants did not support the rate increase.

- 48% thought the increase was unreasonable and oppose it.
- A third (32%) didn't like the increase but felt it was necessary.
- Only 9% thought it was reasonable and supported it.

More satisfied residential participants and those not struggling to pay their bills were much more likely to support the increase.

- 72% of those "very satisfied" supported the rate increase compared to just 14% of those neutral towards or dissatisfied with EnWin.
- Among those who did not feel their electricity bill majorly impacted their finances, 73% supported the rate increase. As for those who "strongly agreed" that their electricity bill had a major impact, just 27% felt the same.

Those who supported it cite the reasons given in the workbook: aging infrastructure or that it was necessary to improve the system.

Residential participants who opposed the rate increase and responded to the open-ended follow-up explained that their rates were already high enough (n=13) or that their wages weren't increasing and it was a strain on their cost of living (n=13).

When given three options -improve reliability and accept a 9% rate increase, maintain and accept a 6% increase or accept declining reliability and a 3% rate increase- a plurality (45%) of residential participants chose the smallest increase and declining reliability.

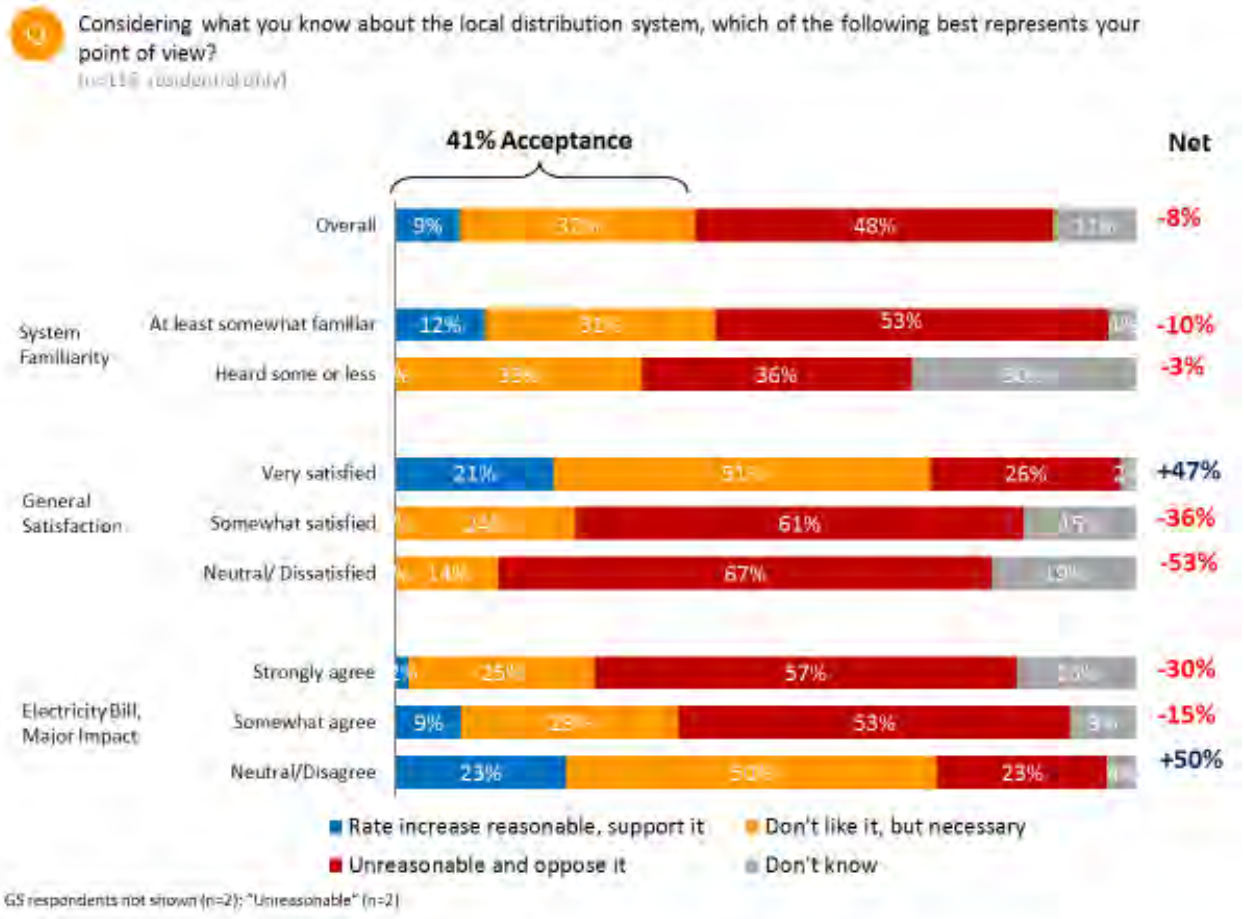
- Nearly 4-in-10 (39%) preferred to maintain the current system reliability and accept a 6% increase.
- Only 17% chose to improve reliability if it came with a 9% increase in their bill rates.
- Again, there is a strong divide on satisfaction and bill impact: 3-in-4 (74%) of those "neutral/dissatisfied" with EnWin preferred declining reliability and the smallest increase. And a majority (55%) of those residential participants who "strongly agreed" their electricity bill had a major impact also chose declining reliability and the 3% rate increase.

The majority of the remaining 116 residential participants did not appear to support the rate increase. Just 9% thought the rate was reasonable and supported it and a third (32%) "didn't like it, but thought it was necessary". Nearly half (48%) of participants thought the rate increase was "unreasonable and opposed it" with 1-in-10 (11%) who didn't know how to respond.

- Less satisfied customers and those struggling with their electricity bills were much less likely to support the rate increase. For example, just 1-in-4 (26%) "very satisfied" customers opposed the rate increase, compared with 61% of "somewhat satisfied" residential participants and 67% of those neutral/dissatisfied ones. And 57% of those who "strongly agreed" that their bill had a major impact financially opposed the rate increase versus just 23% who were ambivalent or disagree that their electricity bill had a major impact.
- Both general service participants thought the rate increase was "unreasonable and opposed it".

Note: the survey also included an "off-ramp" question for people quitting the survey, asking them a variant of the permission question to address why they were leaving. Of the five people that answered, one said they've "read enough to make up their mind" and that they didn't like the rate change, but thought it was necessary; three made up their mind and opposed it, and one person thought the survey was "just too long".

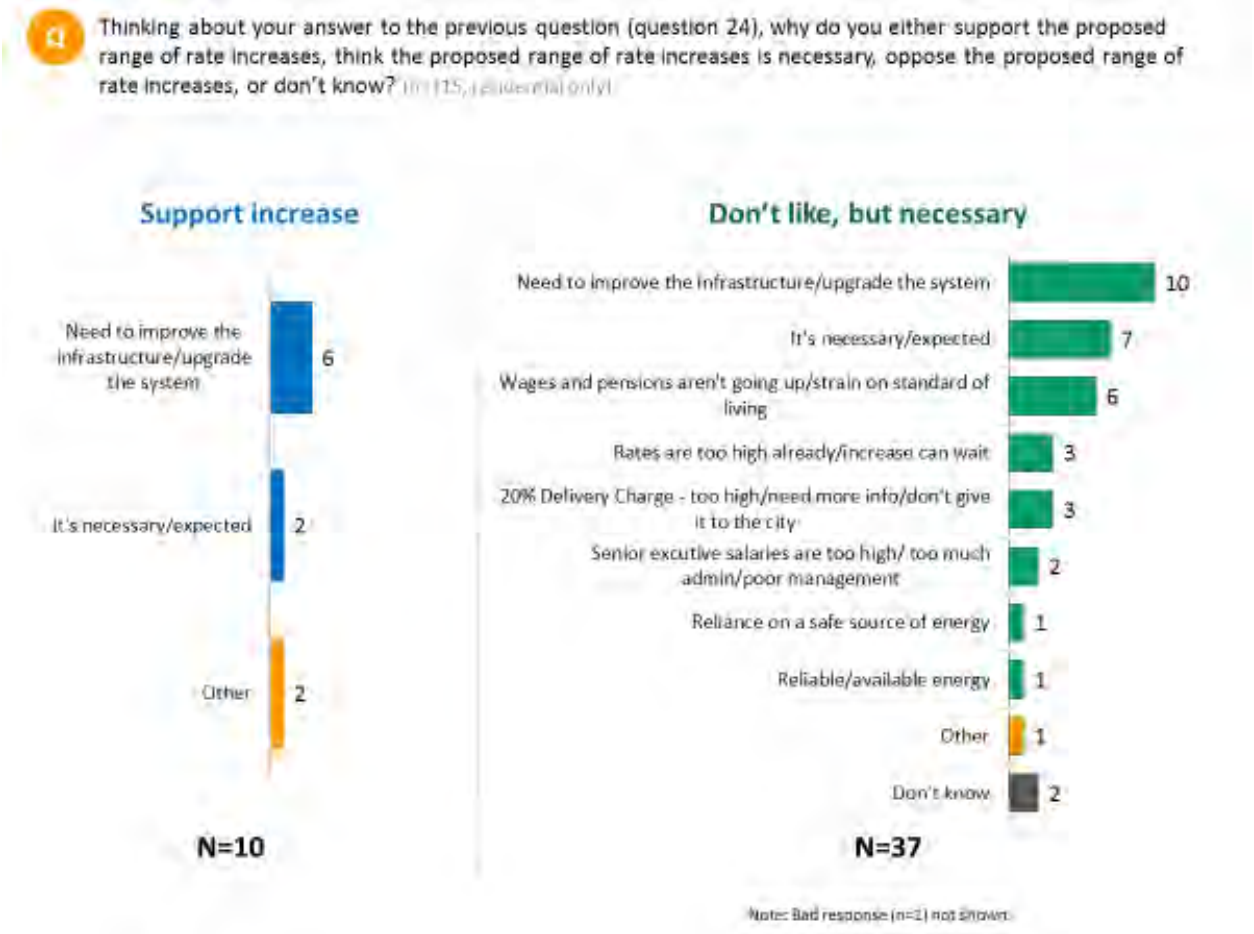
Figure 27 RC: Permission Question



Of the few (n=10) residential participants in support of the rate increase who responded to the follow-up, six cited the need to "improve infrastructure and upgrade the system" and two felt it was "necessary and expected".

Among the 37 who "don't like the increase, but thought it was necessary" and responded to the follow-up, there were no specific reasons that stood out from the rest. Some positive reasons listed included "the need to improve infrastructure and upgrade the system" (n=10), "it was necessary and expected" (n=7), and reliance on "safe" (n=1) and "reliable" (n=1) energy. Negative reasons mentioned stagnant wages and pensions and high cost of living (n=6), the "rates were too high already and the increase can wait" (n=3), "the 20% delivery charge was too high and they needed more information" (n=3), and that "senior executive salaries were too high" (n=2).

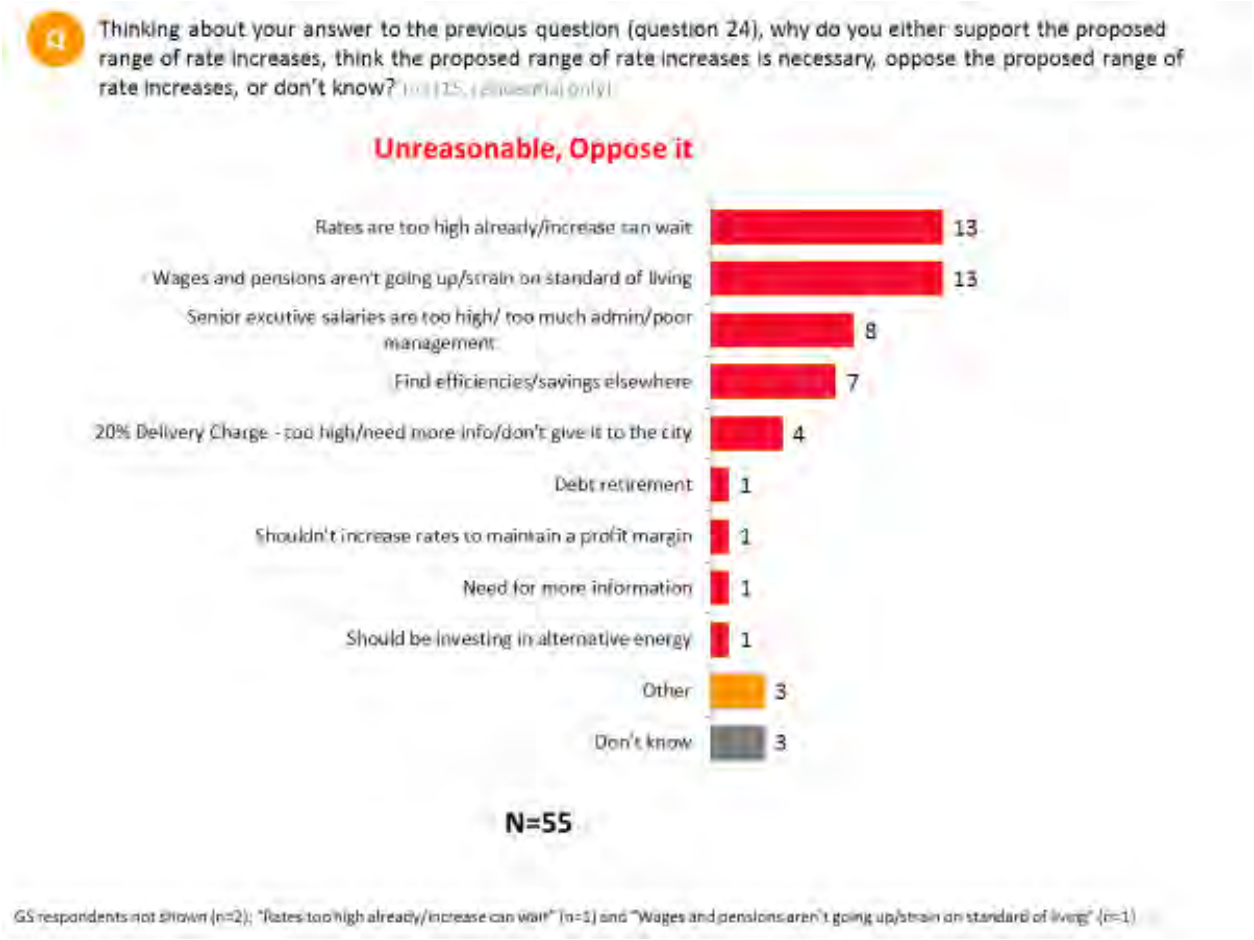
Figure 28 RC: Why Customers Accept Rate Increase (1 of 2) [OPEN]



As for those who didn't support the rate increase and responded to the follow-up (n=55), top reasons cited were that the "rates were too high already" (n=13) and that cost of living/stagnant wages was difficult enough to deal with already (n=13). Other reasons included: "senior executive salaries were too high and mismanagement" (n=8), "find efficiencies and savings elsewhere" (n=7) and the "20% delivery charge was too high" (n=4).

(Both general service respondents did not support the increase, and the reasons they cited were "rates too high already" (n=1) and "cost of living/wages" (n=1).)

Figure 29 RC: Why Customers Don't Accept Rate Increase (2 of 2) [OPEN]

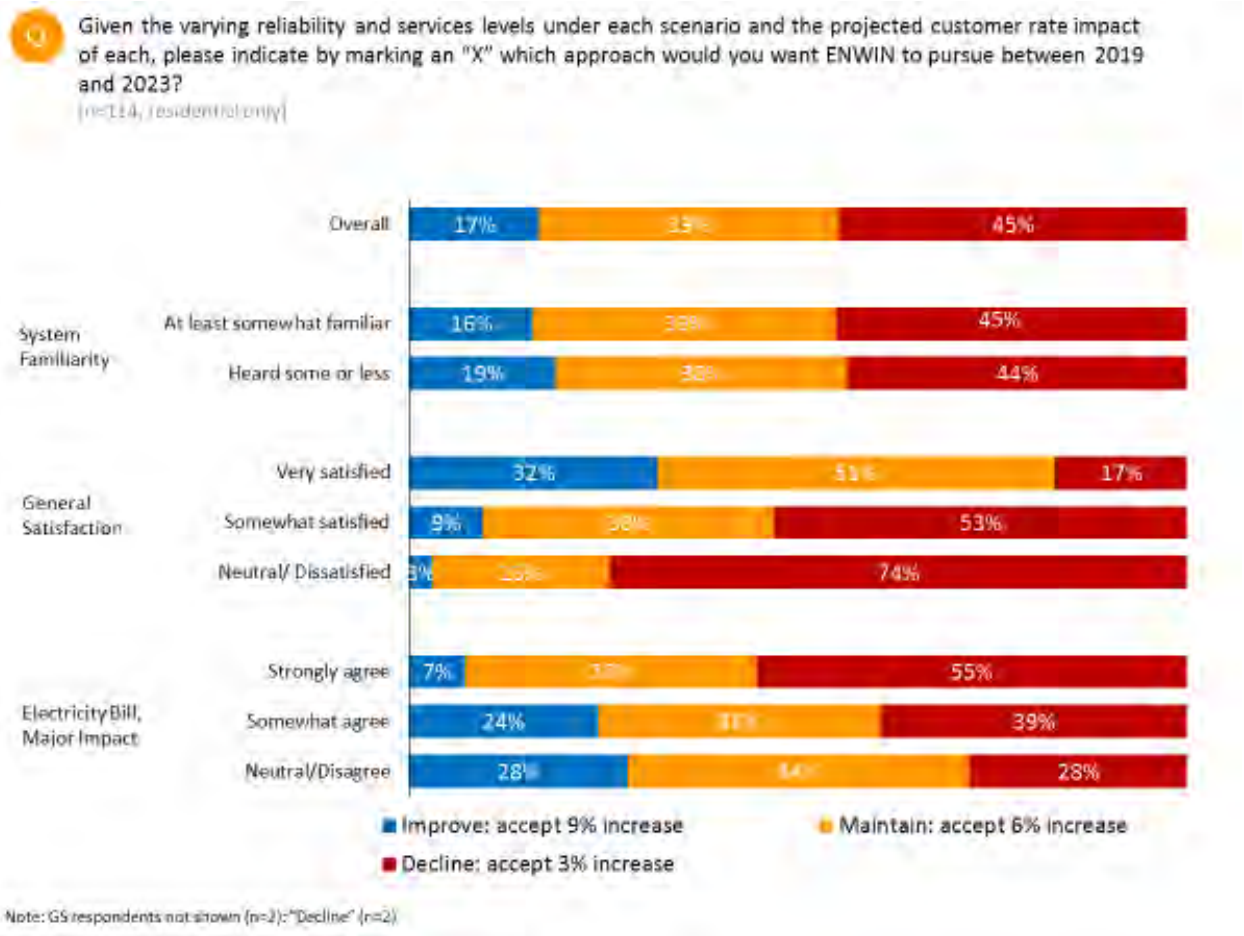


The final core question of the workbook asked customers to choose between three alternative scenarios: a five-year plan where reliability and service levels **decline,** resulting in a 3% distribution delivery rate increase; a plan where it **improves**, resulting in a 9% increase and one in which a 6% rate increase **maintains** the current system reliability.

Given those three choices, the majority would like to see services levels **maintained** (39%, or **improved** (17%). A plurality (45%) would rather accept a **decline** in service, in order to minimize the resultant increase.

- Satisfaction and financial impact of electricity bills might play a key role in support for alternative scenarios: 3-in-4 (74%) residential participants who were "neutral/dissatisfied" with EnWin chose the "decline" scenario, compared with just 17% of the "very satisfied". Similarly, 55% of those who "strongly agree" their bill had a major impact preferred "decline" versus just 28% who didn't felt their bill had a major impact.

Figure 30 RC: Alternative Scenarios



Note: GS respondents not shown (n=2): "Decline" (n=2)

Final Thoughts: Workbook Feedback

The appendix to the survey asked five open-ended questions about the workbook itself:

- **Overall Impression**: *"What did you think about the workbook?"*
- **Volume of Information**: *"Did EnWin provide too much information, not enough, or just the right amount?"*
- **Content Covered**: *"Was there any content missing that you would have liked to have seen included?"*
- **Outstanding Questions**: *"Is there anything that you would still like answered?"*
- **Suggestions for Future Consultations**: *"How would you prefer to participate in these consultations?"*

Final Thoughts Summary

Overall impression (n=91) from most residential participants was that the workbook was "informative and detailed" (n=21), it was "biased towards a rate increase" (n=19) or that it was "too long and contained too much information" (n=16).

As for the **volume of information**, a plurality of remaining residential customers thought it was "just the right amount" (n=36) while nearly the same amount felt it was too much (n=32).

The **content covered** was judged by nearly half of the remaining 74 residential participants to be complete. The rest wanted more information on several topics including "senior executives and admin" (n=6), "internal operations and costs" (n=5) and EnWin's relationship with the city

(n=5).

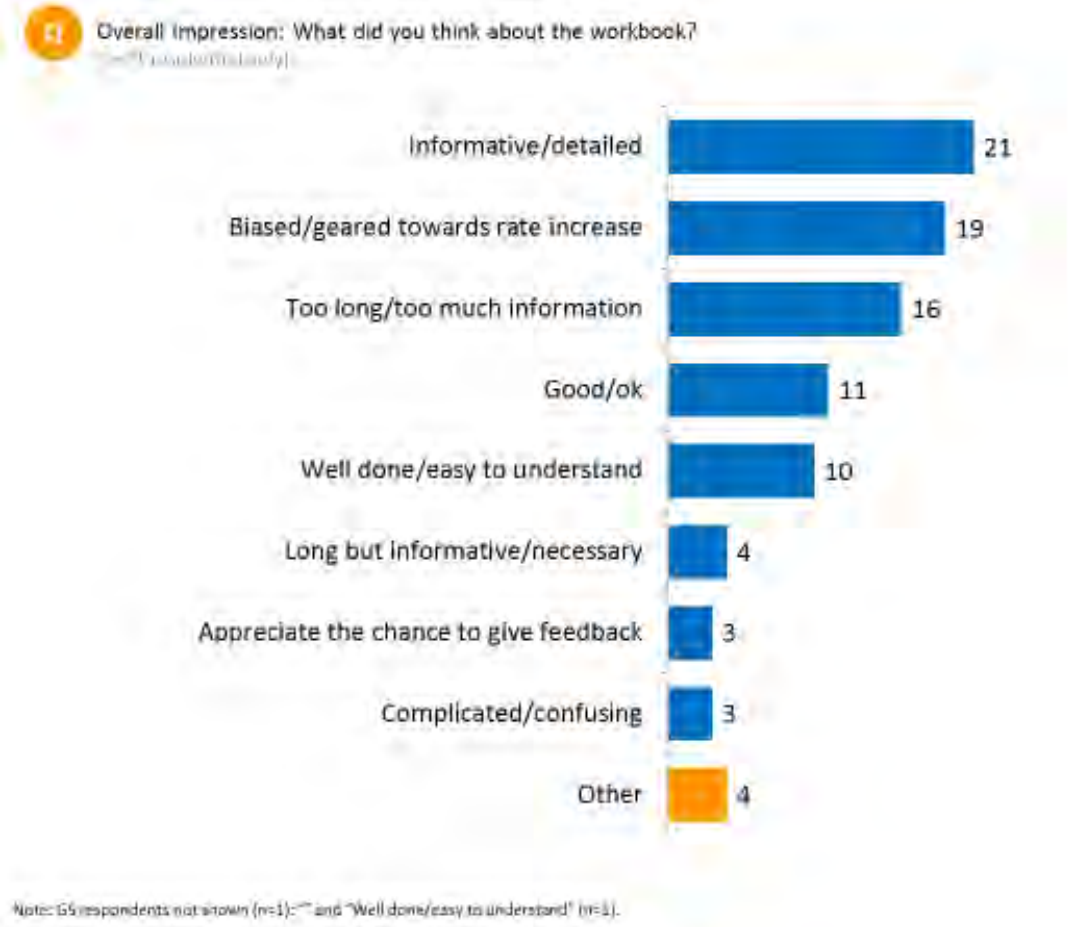
On the fourth feedback question, nearly half of the remaining 64 residential participants did not have any **outstanding questions**. Some wanted to know more about the transparency of EnWin decision-making (n=6), "justification for salary increases" (n=5) and "how to lower costs" (n=3).

In the last question, "**Suggestion for Future Consultations"**, the 59 residential participants who responded mostly suggested the "same way", i.e. an email/online option, was preferable (n=31). Other specific suggestions included phone or social media (n=5), "customer self-service learning tools" (n=3) or a public forum (n=2).

About a quarter of residential participants who completed the workbook felt that it was "informative and detailed" (n=21). More than a third thought it was either "too biased" (n=19) or "too long" (n=16). Other feedback included that it was "good or OK" (n=11), "well done and easy to understand" (n=10), "long, but informative and necessary" (n=4), they "appreciated the chance to give feedback" (n=3) and that it was "complicated and confusing" (n=3).

(The one general service participant remaining said that it was "well done and easy to understand" (n=1).)

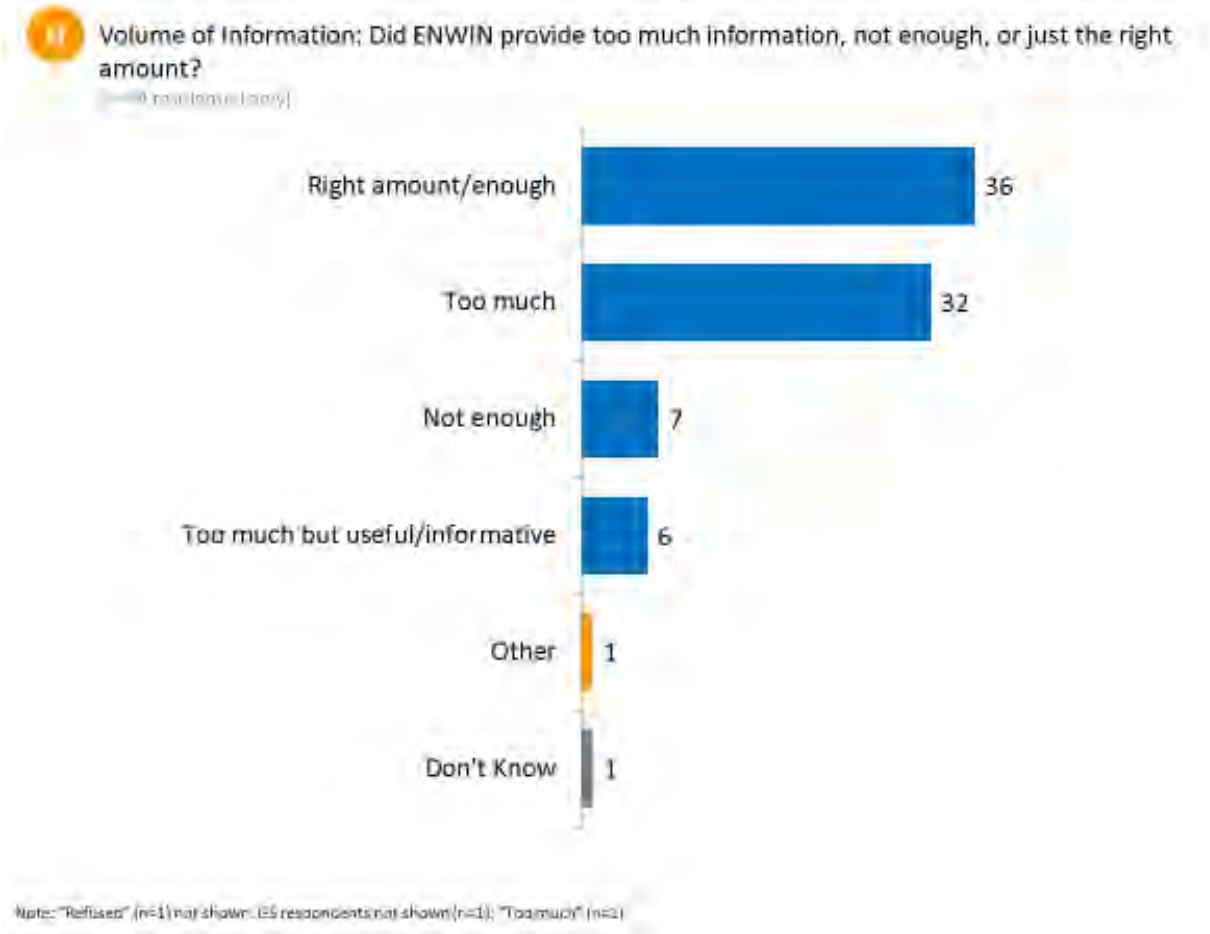
Appendix A: Overall Impression [OPEN]



Of the 84 residential participants remaining, 36 felt the workbook had the "right amount" of information, 32 felt it was "too much" and 7 said it was "not enough".

(The remaining general service participant felt there was "too much" information.)

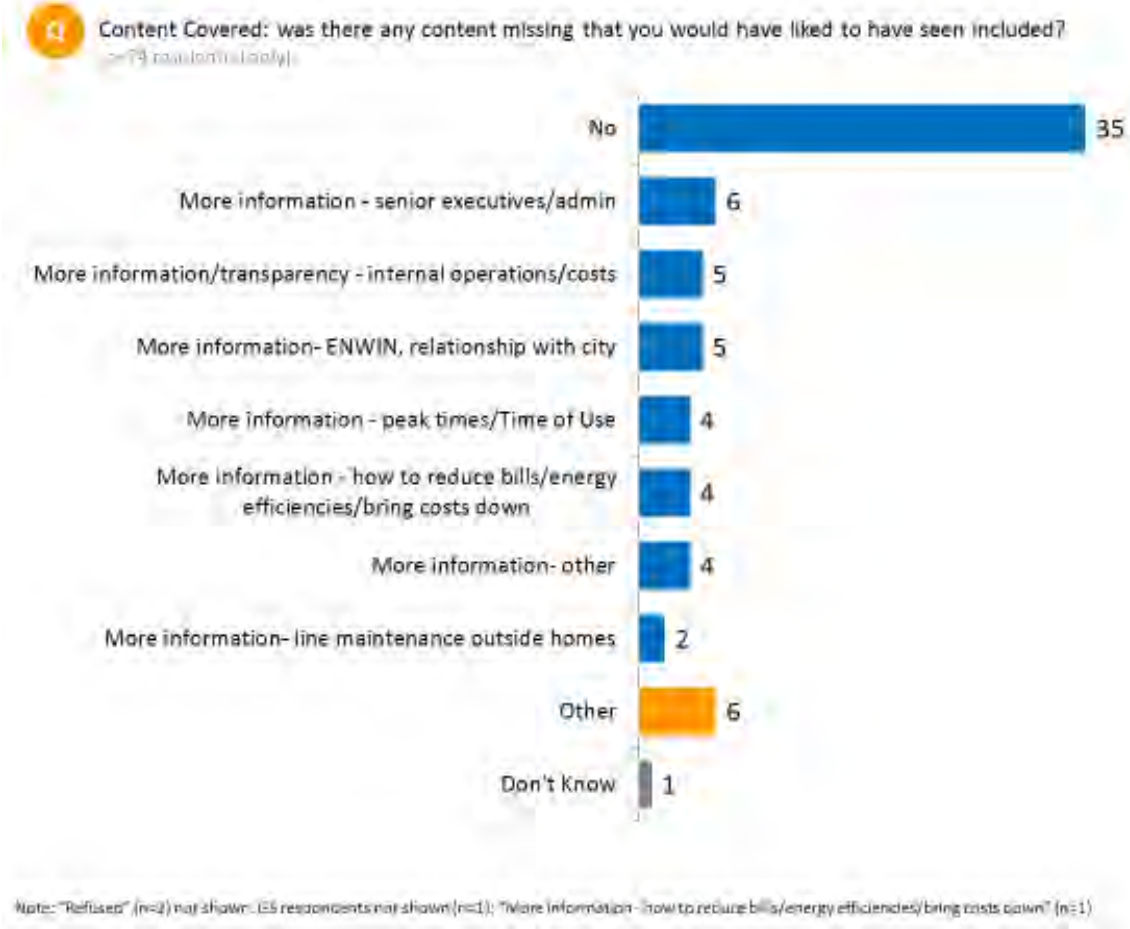
Appendix B: Volume of Information [OPEN]



Of the remaining 74 residential participants, 35 said that "no", there was no content missing they would have liked included. The remaining 30 participants who had specific suggestions focused on more information on topics such as: "senior executives and admin" (n=6), "internal operations and costs" (n=5), "EnWin and its relationship with the city of Windsor" (n=5), "Time of Use and peak time" (n=4), "how to reduce bills and create energy efficiencies" (n=4) and "line maintenance outside of homes" (n=2).

(The remaining general service participant wanted more information on how to reduce bills.)

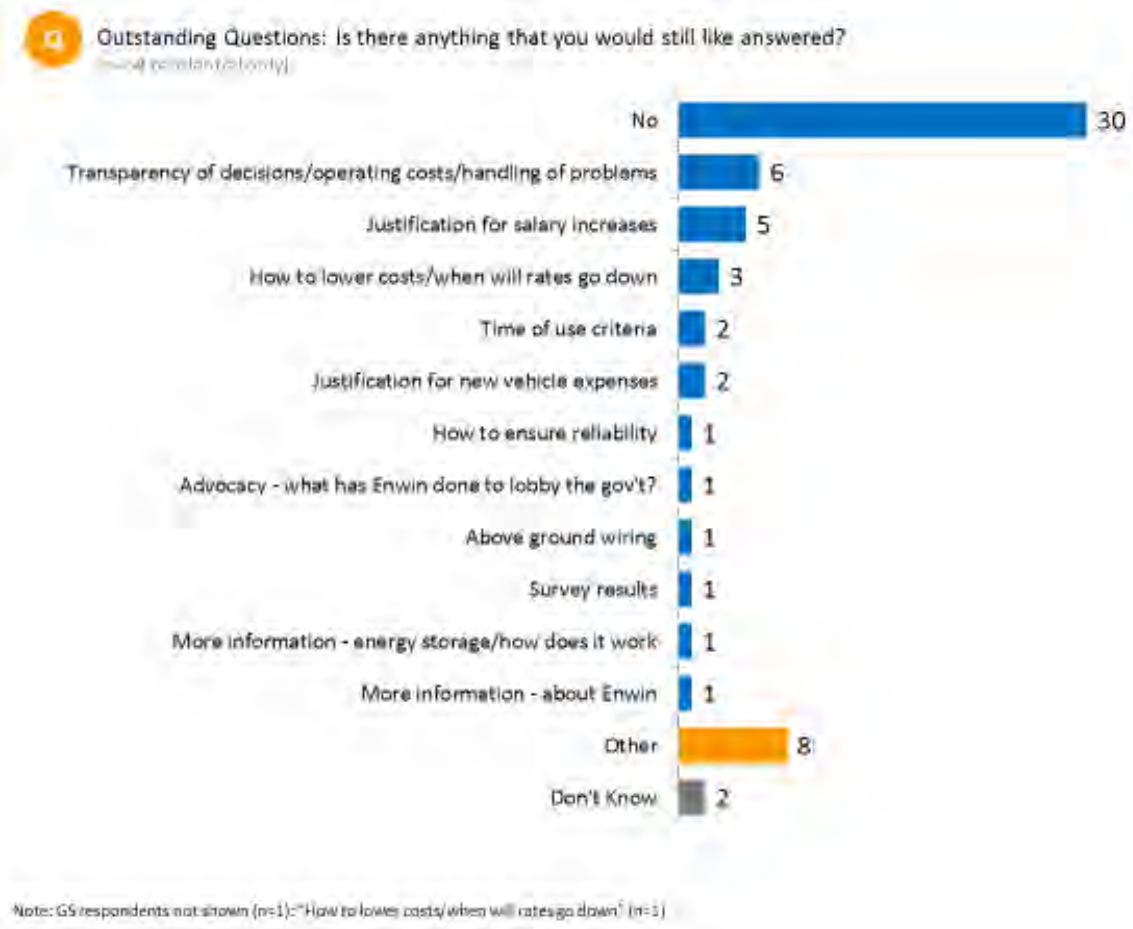
Appendix C: Content Covered [OPEN]



Almost half (n=30) of the remaining 64 residential participants did not have any **outstanding questions**. Some suggested topics outstanding included "transparency of decisions" (n=6), "justification for salary increases" (n=5) and "how to lower costs" (n=3).

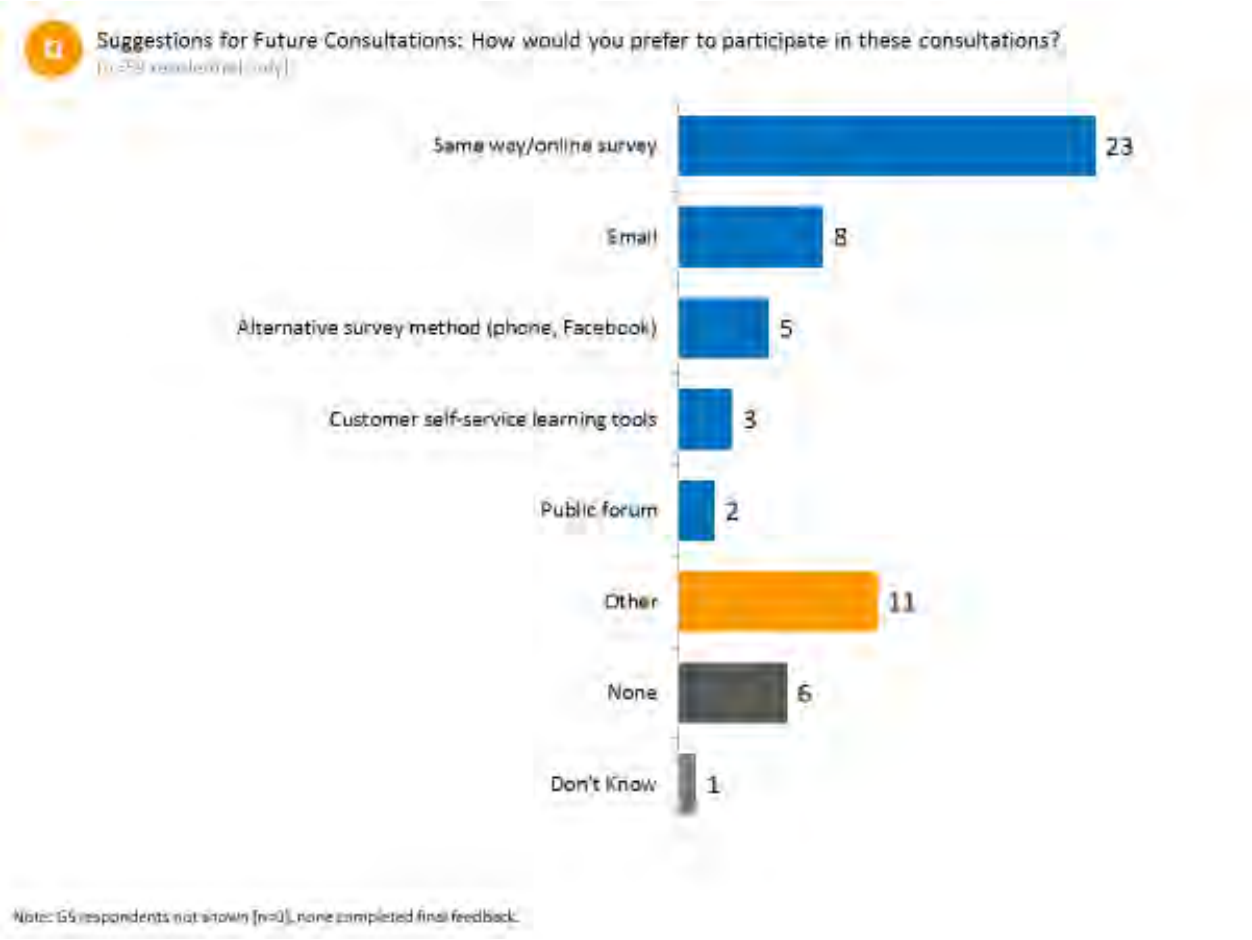
(The final general service participant wanted to know more about how to lower costs.)

Appendix D: Outstanding Questions [OPEN]



In the last question, "**Suggestion for Future Consultations"**, most suggested the same survey method, i.e. an email/online option (n=31). Other specific suggestions included phone or social media (n=5), "customer self-service learning tools" (n=3) or a public forum (n=2).

Appendix E: Suggestions for Future Consultations [OPEN]



Key Account Interviews

Methodology

Key Account Validation Interviews

Between April 24 and May 31, 2017, INNOVATIVE conducted five validation interviews with EnWin key account customers, EnWin's Large Use customers. EnWin staff presented key account customers the details of their proposed investment and spending plan throughout March and April 2017. INNOVATIVE followed-up by telephone with key account customers to validate the process and to verify that customers received the information needed to provide informed feedback on EnWin's proposed plan.

All of the validation interviews were conducted over the telephone and lasted approximately 10 to 15 minutes. Key account participants were encouraged to provide open and confidential feedback regarding the consultation process and their thoughts on the proposed plan.

NOTE: Results contained within this report are based on a very limited sample and should be interpreted as directional only. Customer names have been withheld in the report to protect confidentiality.

Recruiting Key Account Participants

As EnWin conducted their key account consultations, contact information for six organizations was shared with INNOVATIVE. Key account status – typically based on the largest electricity usage – was here based on EnWin's criteria. This consultation was in conjunction with regular engagement practices between EnWin and their key accounts.

Of the six key account contacts provided by EnWin, one could not be reached during the validation interview timeframe despite repeated attempts by email.

Key Account Consultation Process

EnWin and INNOVATIVE staff developed a comprehensive framework to consult with key accounts in order to gather feedback on the proposed Investment and Spending Plan. Key account customers will be uniquely affected by the proposed plan; understanding and responding to their preferences is a key component of the broader consultation.

Participant Feedback

The following section highlights the general feedback from the key account rate class group. Key account customers were encouraged to provide additional comments and feedback throughout the validation interviews with INNOVATIVE consultants.

Overall Take-Away

Overall, the key account customers interviewed by INNOVATIVE are satisfied with the consultation process, and the job EnWin has done in communicating the proposed Investment and Spending Plan. These customers feel that they received the information needed to understand how their organizations will be impacted by the proposed plan. They feel that the process of system renewal is on track and progressing at the right speed. Furthermore, customers felt they had the opportunity to raise concerns and ask questions during the meeting.

> *"Very good session."*
>
> *"We all participated very well."*
>
> *"Very focused on ensuring everyone gave them feedback."*
>
> *"Comprehensive presentation."*

Two key accounts understand the need for the rate increase, think it's reasonable, and support the plan. However, both characterized their approval as necessary, but somewhat grudgingly.

> *"The rate increase isn't EnWin's fault."*
>
> *"If we went and asked for such an increase our customers would laugh at us."*
>
> *"The climate for an increase is not good, and the government has messed up the province, but I can see that they need an increase, they haven't had one for a long time."*
>
> *"Necessary, but we still said they should go back and try to reduce it."*

Two were not satisfied with the options presented, stating that a "write-in" option was their preference:

> *"We gave them an option of our own, to increase the rate by 3% and enhance reliability (as in the 9% option) by finding the rest internally."*
>
> *"The choices were limited, there could have been other choices – there was no option for better service at the same price."*
>
> *"As a representative of my company, my goal is to contain costs. I know that they have to make investments, but I have an obligation to oppose rate increases – they just eat into our margins."*

The fifth did not accept any increase, emphasizing that their response as an organization was not towards EnWin specifically, but a matter of principle and considered in context of the cost of electricity across the entire system:

> *"It is impossible to support anything regarding the runaway train that is electricity. We think EnWin is great, we understand what they are facing, they are just a small part of a big*

machine, so it's not about them – they provide great customer service. But we have to say no (to any proposed rate increase) because any increase to EnWin is no different than increases to other players."

Customer Experience and Expectations

Overall, key account customers found EnWin's consultation to be helpful in understanding the proposed investment plan and the impacts to their organizations. Respondents felt the plan was well explained, regardless of their views of the plan itself. Several respondents remarked that they had learned a lot from meeting with EnWin, and had a better understanding of how the distribution system works in Windsor.

Customer service was seen as very good, and having improved recently.

"When I call them, their service has increased quite a bit, they have been very good in customer service."

The respondents who did not support any of the rate options presented were very positive on EnWin's customer service:

"We have had really good rapport with EnWin over the last few years, they have been doing way better in communicating."

However, those respondents felt that the main limiting factor affecting EnWin's planning was not entirely within their control:

"They are a bit hamstrung by their mandates."

Both the opposing respondents felt that the key issue, affecting their business, was not addressed. In those businesses, split second power interruptions cause significant downtime and cost. They did not see any solution to this presented in the discussion.

"No, because they are going to invest in ways that don't help us."

"Voltage sags are our key problem, their spending plan didn't have anything applicable to us."

"We disagree with their stats on reliability – their criteria is different (than ours), they only count when a breaker opens (not split second interruptions)."

Coverage of Distribution System Topics

The key accounts interviewed by INNOVATIVE stated that EnWin's Investment and Spending Plan covered the key areas they expected and was not missing any information. When going through the investment plan, EnWin explained the impact that the plan and the proposed rate increase would have on each organization.

"They covered it."

"They have followed up, discussions are ongoing."

Rate Impacts

Two key accounts felt the rate increase is necessary and justified, noting that EnWin has not had a rate increase in many years. But their approval was qualified – they did not like any rate increase, so grudgingly accepted it, and in that context, felt the proposed range is reasonable. Two supported a "third stream" – a lesser increase, but still executing the investment plan – making up the difference by internal cost savings, with the caveat that the reliability measures resolve the reliability issues affecting their businesses. The fifth rejected any rate increase outright.

> *"We understood their (EnWin) part of it, but it is still hard to justify any rate increase."*
>
> *"We are not answering specific to EnWin, who are great, but with respect to the OEB, the government, Hydro One and the electricity mess overall."*

That respondent, who was also the only respondent who felt the choices presented and responses to questions were not satisfactory, noted that their responses were informed by their overall view that the matter of evaluating components of the electricity system was not how they wished to provide their input:

> *"It would have been better to have everyone at the table – the OEB, Hydro One and so on, because it should be looked at holistically."*

Validation Interview Questionnaire Results

The following tables are the tabulations of key account customer feedback to validation questions INNOVATIVE asked when following up on EnWin's consultation sessions.

1. **Can you please confirm that you recently spoke with a representative of EnWin to discuss their investment and spending plan**?

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes	**1**	**1**	**1**	**1**	**1**	**5**
No	-	-	-	-	-	-

2. **Did EnWin ask you about how well they were meeting your needs as a customer?**

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes	**1**	**1**	**1**	**1**	**1**	**5**
No	-	-	-	-	-	-

3. **Did the EnWin representative ask how satisfied you are with various customer outcomes like affordable pricing, reliability, safety and enhanced customer service?**

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes	**1**	**1**	**1**	**1**	**1**	**5**
No	-	-	-	-	-	-

4. **Did the EnWin representative ask for your feedback on the customer service outcomes they should focus on in the development of their investment plan?**

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes	1	1	1	1	1	5
No	-	-	-	-	-	-

5. **Did the EnWin representative ask for your input on some of the choices they need to make as they develop their investment and spending plan?**

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes	1	1	1	1	1	5
No	-	-	-	-	-	-

6. **In general, how well were these choices explained to you, either by the EnWin representative or by the workbook they reviewed with you?**

Response	KA1	KA2	KA3	KA4	KA5	Count
Very Well	1	-	1	1	-	3
Fairly Well	-	1	-	-	-	1
Not Very Well	-	-	-	-	-	-
Not Well At All	-	-	-	-	1	1
Don't Know	-	-	-	-	-	-

7. **Were there any areas in particular that you felt needed additional explanation?**

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes	-	-	-	-	-	-
No	1	1	1	1	1	5

8. **Did you have a chance to ask questions?**

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes	1	1	1	1	1	5
No	-	-	-	-	-	-

9. **Were your questions answered to your satisfaction?**

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes, Completely	1	1	-	1	-	3
Yes, Somewhat	-	-	-	-	-	-
No, But They Are Following Up	-	-	1	-	-	1
No	-	-	-	-	1	1
Don't Know	-	-	-	-	-	-

10. Did the EnWin representative give you options for providing additional feedback after your meeting with them?

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes	1	1	1	1	1	5
No	-	-	-	-	-	-

11. Did your meeting with the representative of EnWin cover the key areas you expect?

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes, Completely	1	1		1	1	4
Yes, Somewhat	-	-	1	-	-	1
No	-	-	-	-	-	-

12. Did the EnWin representative adequately explain the next steps in their customer consultation process?

Response	KA1	KA2	KA3	KA4	KA5	Count
Yes	1	1	1	1	1	5
No	-	-	-	-	-	-

13. **From what you have experienced so far, how confident are you that EnWin is committed to addressing customer needs and preferences in their upcoming investment and spending plan for 2019 to 2023?**

Response	KA1	KA2	KA3	KA4	KA5	Count
Very Confident	1	1	-	-	-	2
Somewhat Confident	-	-	1	1	-	2
Not Very Confident	-	-	-	-	1	1
Not At All Confident	-	-	-	-	-	-
Don't Know	-	-	-	-	-	-

14. **Considering what you know so far about the local distribution system, which of the following best represents your organization's point of view?**

Response	KA1	KA2	KA3	KA4	KA5	Count
The proposed range of rate increases is reasonable and I support it	-	-	-	-	-	-
I don't like it, but the proposed range of rate increases is necessary	1	1	-	-	-	2
The proposed range of rate increases is unreasonable and I oppose it	-	-	1	1	1	3
Don't Know	-	-	-	-	-	-

Customer Telephone Surveys

Telephone surveys were completed with residential and small business (GS<50kW) customers. Results in this report do not include any customers >50kW.

Summary

8-in-10 residential (81%) and small business (80%) customers felt familiar with EnWin; and about the same number (residential: 74%; small business: 84%) felt satisfied with their service from EnWin.

On specific recall, roughly half of customers (residential: 44%; small business: 54%) were unfamiliar with the percentage of their bill that goes to EnWin. About the same proportion, nearly half of customers (both: 49%) thought that amount was reasonable.

Costs were the top priority for customers and the number one suggestion among customers to improve service was reduce costs.

- More than 6-in-10 (residential: 63%; small business: 65%) thought "delivering electricity at a reasonable price" was the most important customer priority. Only 13% of the residential customers and 11% of small business customers didn't consider cost a priority.
- When asked open-endedly how EnWin could improve service, 54% of residential customers and 43% of small business customers suggested "reducing their rates and charges." as an improvement to service.

Reliability and safety were top priorities as well, albeit distant behind cost. Most customers considered reliability and safety to be top-three priorities.

- Only 14% of residential customers and 17% of small business customers thought reliable service was the most important priority, and less than 1-in-10 (residential: 8%; small business: 5%) thought safety was the most important.

More than 8-in-10 residential and small business customers felt satisfied with their reliability on three key measures: number of outages (residential: 87%; small business: 93%), length of outage (residential: 88%; small business: 88%) and quality of power (residential: 85%; small business: 82%).

- When it comes to spending on reliability, about half preferred to "spend what is needed to maintain" the current level of outages (residential: 51%; small business: 49%).
- A strong plurality felt that EnWin should spend what is needed to maintain the current number of outages (residential and small business: 47%).

Most customers agreed with the economic, empathetic and long-term thinking arguments mentioned in the survey. They were:

- Worried about the impact of outages on vulnerable customers (residential, agree: 79%; small business: 74%);
- Agreed that reliable electricity is an economic advantage to retaining existing jobs and attracting new ones (residential: 77%; small business: 81%);
- That EnWin should pay its employees competitively (residential: 73%; small business: 75%);

- That we have an obligation to maintain the system for future generations (residential: 75%; small business: 75%);
- That we need to modernize the system (residential: 67%; small business: 67%); and
- That we need to invest in the system now while the economic conditions are right (residential: 66%; small business: 69%).

However customers seemed less interested in paying for these changes: just 1-in-3 (34%) residential customers and 27% of small business customers would elect to pay more for electricity if it meant better reliability.

Residential customers were divided on paying more to invest in aging infrastructure, while a plurality of small business customers wanted to spend what is needed (residential, "invest what it takes": 45% vs. "lower its investment": 44%; small business: 49% vs. 37%). A majority felt that EnWin should spend what is needed on equipment and tools for its staff (residential: 58%; small business: 50%) and roughly 7-in-10 (residential: 69%; small business: 73%) thought it important that EnWin modernize the grid now.

Most customers felt satisfied with the service provided (residential: 60%; small business: 70%) or the communications received (residential; 69%; small business; 75%) from EnWin, with small business customers a bit more satisfied on both measures.

Only a minority of customers (residential: 37%; small business: 30%) reported they have participated in EnWin's conservation program, but a majority (residential; 66%; small business: 63%) felt that EnWin does a "good job" of providing information about the programs to manage household consumption.

- Some suggestions from residential customers to improve communication on conservation included mailings (21%), emails (9%), and ads (7%).

More than half of customers (residential: 54%; small business: 59%) gave permission for a rate increase. But just 17% thought it was reasonable and support it.

- The primary reason residential customers opposed the increase is that their current bill costs too much.
- Reasons for support among residential customers mostly focused on the reasonableness of the amount, that it's necessary and that it's to be expected ("reasonable, support it"; 52%; "don't like it, but necessary"; 46%) as well as the importance of upgrading and maintaining the system for the future ("support": 31%; "necessary": 15%).

When asked to choose between three potential rate increase scenarios, a strong plurality of customers wouldn't accept any additional charges (residential: 39%; small business: 36%).

- 1-in-4 (24%) residential customers would accept $4.35 to maintain reliability and service performance and just 17% would accept the highest rate increase ($5.25) to see it improve. Less than 1-in-10 (9%) would accept an additional $3.45 for a potential decline reliability and service.
- Among small business customers the greatest support was for "$10/maintain" (25%), rather than "$12/improve" (11%) or "$7.90/eventual decline" (17%).

Bill impact on day-to-day finances seemed to go together with several negative attitudes related to cost and service and those most impacted appeared highly sensitive to cost increases. Residential customers who are strongly impacted by their monthly bills were**:**

- The most familiar with EnWin and the least satisfied;

- The least likely to feel the amount going to EnWin (20%) from their bill to be reasonable;
- Less willing to pay a bit more for reliability;
- Less likely to say EnWin should invest what it takes in infrastructure or make sure the staff has the equipment and staff it needs;
- Less satisfied with the service provided and communication received from EnWin;
- The most likely to want the choice to opt in to e-billing left to customers, rather than seeing EnWin charge those who don't or incentivize those who do; and
- Most importantly, by far they are the least likely to give permission for a rate increase. There is a 39-point gap on permission between residential customers who are strongly impacted (40%) and those who are not significantly impacted by their monthly bill (79%).

Methodology

Field and Design

For the quantitative section of the customer consultation, EnWin invited its residential and small business (<50kW) customers to participate in a 12-minute telephone survey. The residential survey fielded from April 10-20, 2017; the small business survey fielded from April 12 to May 17, 2017.

Overall, 561 residential customers and 201 small business customers completed the questionnaire. The margin of error for the residential sample of n=561 is ±4.2%, 19 times out of 20. For a sample of n=201 small business customers, the margin of error is considered accurate to within ±6.7%, 19 times out of 20. INNOVATIVE conducted all interviews through its computer assisted telephone interviewing (CATI) system.

Sample lists were provided by EnWin. Screening questions were designed to ensure only customers who received an electricity bill from EnWin were included. In addition, residential customers needed to have primary or shared responsibility over their household's electricity bill and only the organization's decision makers on energy use were included in the small business sample. Small business customers could also be household customers of EnWin, but were reminded to frame their responses from the perspective of their organization, as best as possible.

The survey followed a stratified random sampling methodology, dividing the population into smaller groups known as strata based on members' shared attributes or characteristics (in this case, customer service area or electricity usage). A random sample from each stratum is taken in a number proportional to the stratum's size when compared to the customer population. These subsets of the strata are then pooled to form a random sample.

In this survey, customers were divided into quartiles based on annual electricity usage to ensure the sample has a proportionate mix of customers from low, medium-low, medium-high, and high electricity usage households/small businesses.

The table below illustrates the strata divisions, targets, actual results and final weighted numbers:

Residential Consumption Quartiles

	Target	Actual	Difference	Weighted
Low consumption	n=140	n=128	-12	n=140
Medium-low consumption	n=140	n=141	+1	n=140
Medium-high consumption	n=140	n=151	+11	n=140
High consumption	n=140	n=141	+1	n=140
Total	**n=560**	**n=561**		**n=560**

GS < 50 kW Consumption Quartiles

	Target	Actual	Difference	Weighted
Low consumption	n=50	n=42	-8	n=50
Medium-low consumption	n=50	n=57	+7	n=50
Medium-high consumption	n=50	n=56	+6	n=50
High consumption	n=50	n=46	-4	n=50
Total	**n=200**	**n=201**		**n=200**

Adapting the Workbook: Content Covered

The online workbook, created and tested in the earlier qualitative phase of EnWin's rate application, informed the content of the telephone survey. Due to time and cost restraints for telephone calling, questions needed to be precise while providing a minimum of background information. Pages of background information and detailed yearly tracking charts from the workbook were either trimmed to a few concise statements or eliminated altogether.

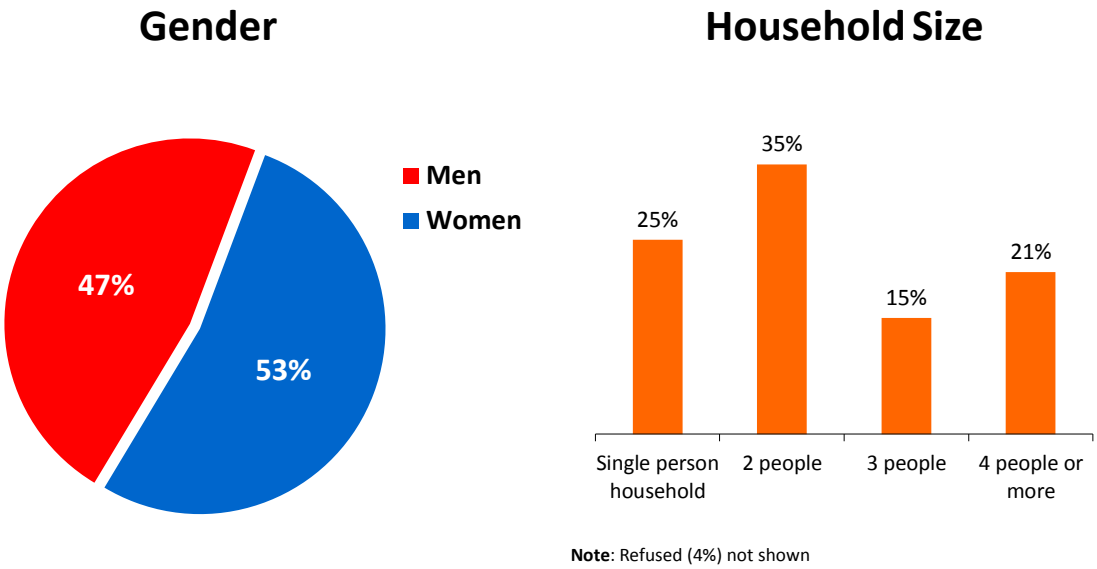
The questions were also designed to accurately reflect the differences in each rate class. As shown in the survey at the end of this report, figures of costs and proposed rate changes differed depending on whether the respondent was a residential or small business customer.

Demographics and Firmographics

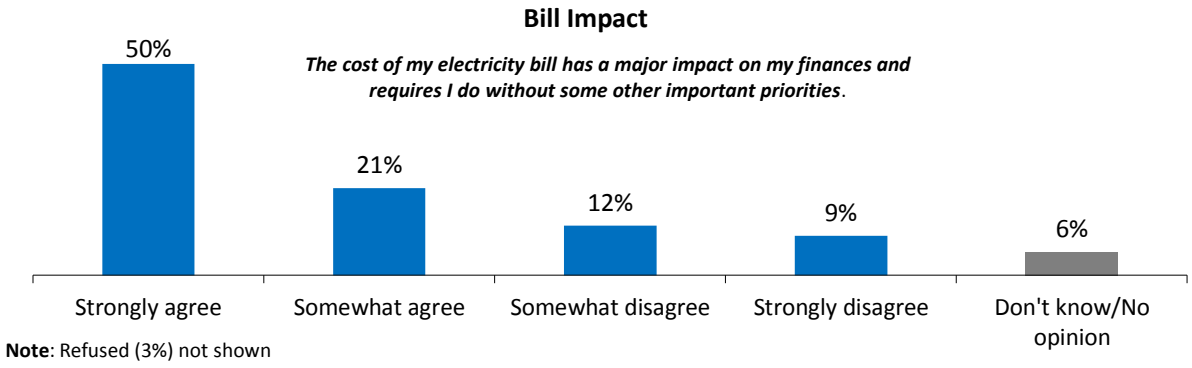
Looking at the demographic breakdown of EnWin's 561 residential respondents:

- **Gender:** More than half (53%) identified as women;
- **Household size:** 1-in-4 (25%) lived in a single-person household, 35% had two people in their household, 15% were in a 3-person household and 2-in-10 (21%) had 4 or more people living in their home;
- **Economic difficulty:** 7-in-10 (71%) agreed with the statement, *"the cost of my electricity bill has a major impact on my finances and requires I do without some other important priorities".* Half of residential respondents "strongly agreed" with that statement. Only 2-in-10 (21%) disagreed.
- **Customers well-served:** More than 6-in-10 (62%) agreed with the statement, *"customers are well served by the electricity system in Ontario"* while less than 1-in-4 (23%) disagreed.

Figure 1R: Demographics



Note: Refused (4%) not shown



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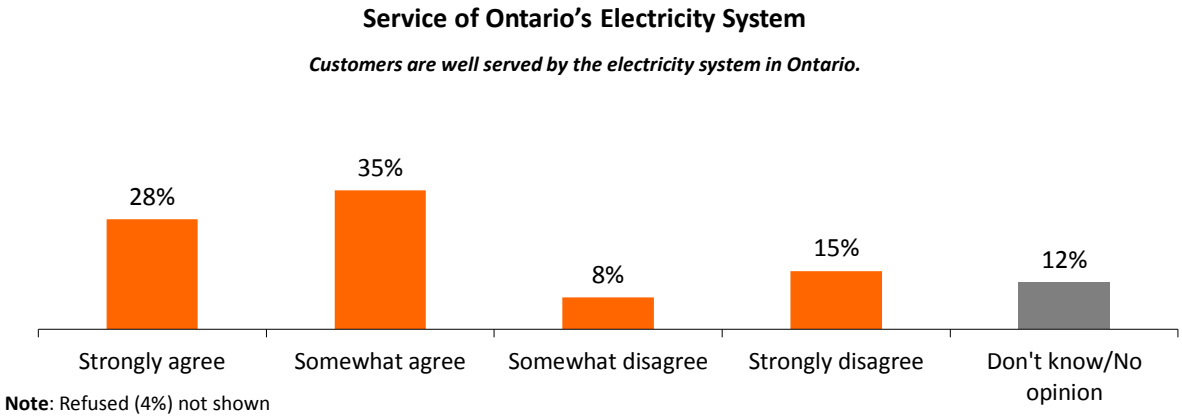
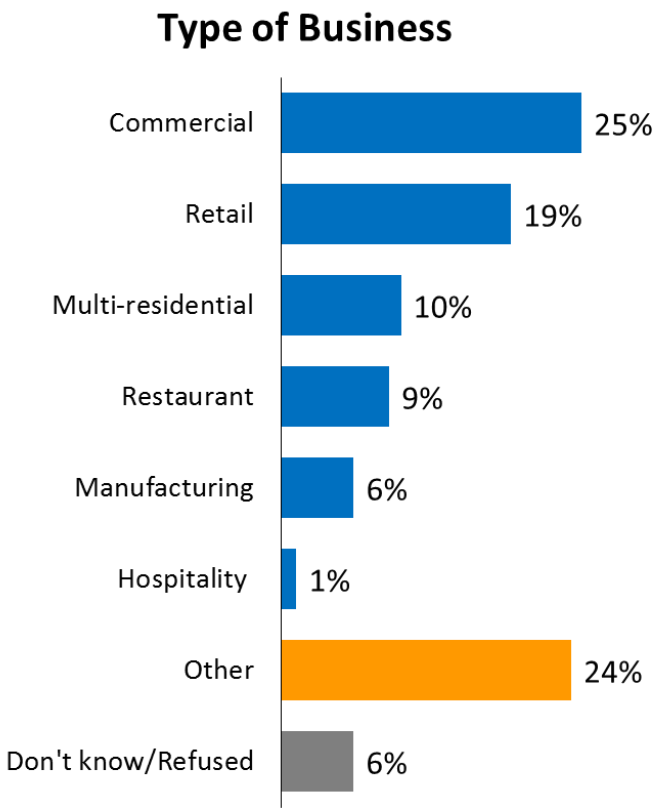


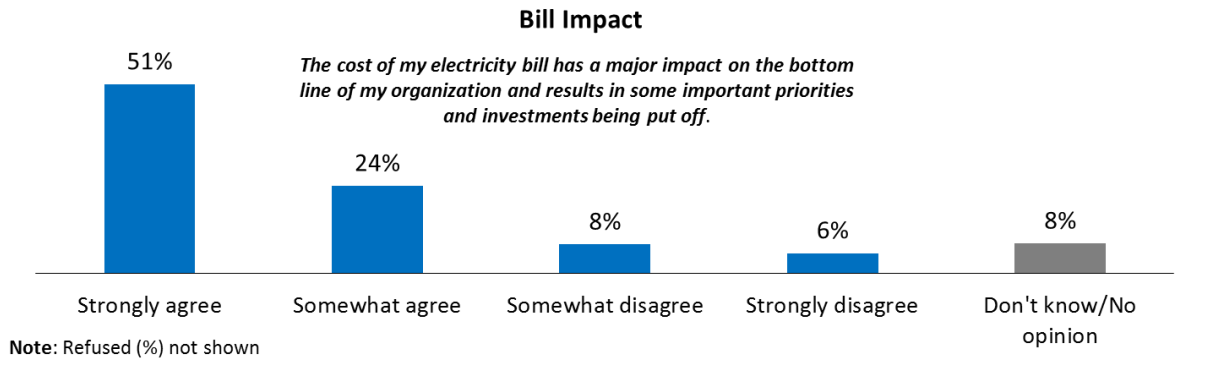
Note: Refused (4%) not shown

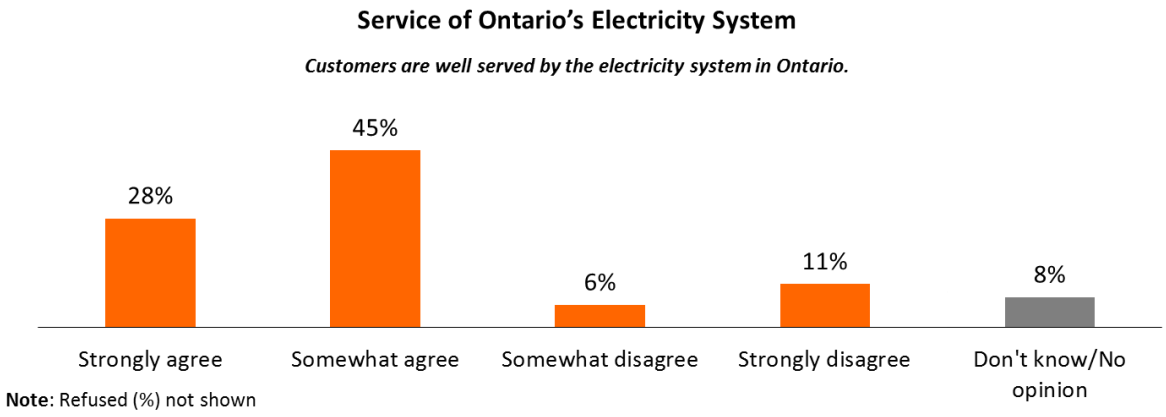
The firmographics of EnWin's 201 small business respondents break down as follows:

- **Business Type:** A plurality of small business respondents worked in commercial (25%) or retail (19%). Other business types included multi-residential (10%), restaurants (9%), manufacturing (6%) and hospitality (1%).
- **Economic difficulty:** 7-in-10 (70%) small business customers felt impacted by their monthly electricity bills, including 50% who strongly agreed with the statement, "*the cost of my electricity bill has a major impact on the bottom line of my organization…*" Only 2-in-10 (21%) small business respondents didn't feel impacted by their monthly bill and 6% didn't know or had no opinion.
- **Customers well-served:** More than 6-in-10 (62%) small business customers felt well-served by the electricity system in Ontario. 1-in-4 (23%) did not feel well-served and 12% didn't know or had no opinion.

Figure 1GS: Firmographics




Bill Impact
The cost of my electricity bill has a major impact on the bottom line of my organization and results in some important priorities and investments being put off.
51%
24%
8%
6%
8%
Strongly agree
Somewhat agree
Somewhat disagree
Strongly disagree
Don't know/No opinion
Note: Refused (%) not shown


Service of Ontario's Electricity System
Customers are well served by the electricity system in Ontario.
28%
45%
6%
11%
8%
Strongly agree
Somewhat agree
Somewhat disagree
Strongly disagree
Don't know/No opinion
Note: Refused (%) not shown

Respondent Feedback

The first section of respondent feedback outlines familiarity with the system and EnWin, satisfaction with services provided, suggestions to improve services and both familiarity and reasonableness of the 20% EnWin receives from customers' bills.

Familiarity, Satisfaction and Bill Feedback

Summary: Familiarity, Satisfaction and Bill Feedback

8-in-10 residential (81%) and small business (80%) customers said they were familiar with EnWin and the distribution system.

3-in-4 residential customers (74%) and more than 8-in-10 (84%) small business customers felt satisfied with their service from EnWin.

When asked for suggestions on how to improve service, the number one issue by far was cost.

- More than half (54%) of residential customers and 43% of small business customers suggested "reducing their rates and charges" as an improvement to service.
- 3-in-10 (29%) residential and 40% of small business customers felt that there was nothing additional EnWin could do to improve its services.

Roughly half of EnWin customers (residential: 44%; small business: 54%) were unfamiliar with the amount of their bill that goes to EnWin. About the same number, nearly half of residential and small business customers (49%) thought that amount was reasonable.

- When asked the reasonableness of the 20% allocated to EnWin for its services, 1-in-4 (25%) residential customers didn't know how to respond.
- Those significantly impacted by the cost of their bills and low consumption residential customers were the least familiar with their bill breakdown and the least likely to feel the amount was reasonable.

Before the core question on familiarity, respondents were provided with a brief introduction to EnWin and the survey:

"To begin, I'd like to ask you some questions about your electricity service.

*Today we want to talk about **EnWin Utilities** and the local electricity system in your community. This is the system that takes the electricity from provincial transmission towers and brings it to your home through a network of wires, poles and other equipment that is owned and operated by **EnWin.**"*

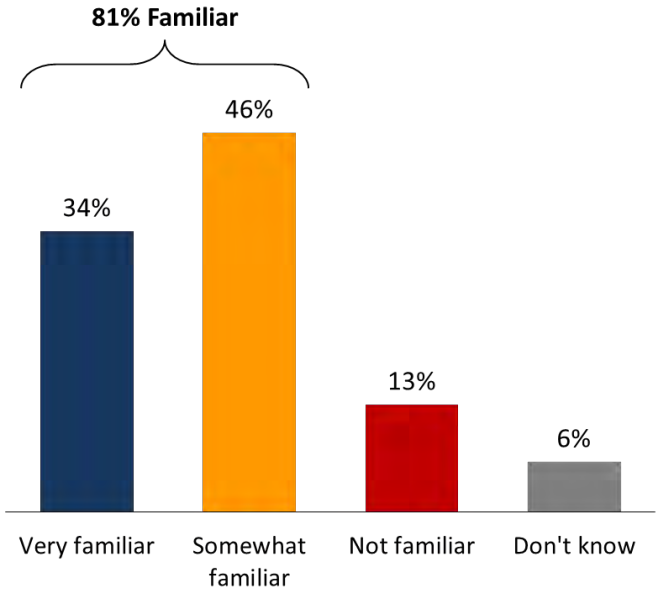
Roughly 8-in-10 (81%) residential customers reported they were familiar with EnWin and the distribution system. 1-in-3 (34%) said they were "very familiar" and nearly half (46%) stated they were "somewhat familiar". Just 13% responded they were "not familiar" and 6% of residential customers didn't know how to respond.

- Those who feel least well served by the system are more familiar (89%) with it than other cohorts.

Figure 2R: System Familiarity

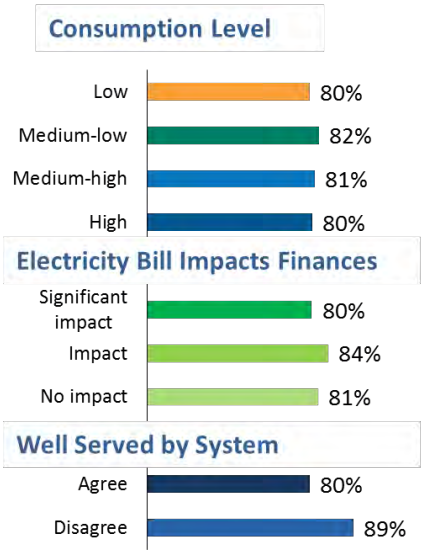
Q How familiar are you with **EnWin**, which operates the electricity distribution system in your community? Would you say you are *very familiar, somewhat familiar, not familiar* or would you say you *don't know*?

[asked of all respondents; n=560]



Sample Breakdown ▸▸

*Those who say "**Familiar**"*



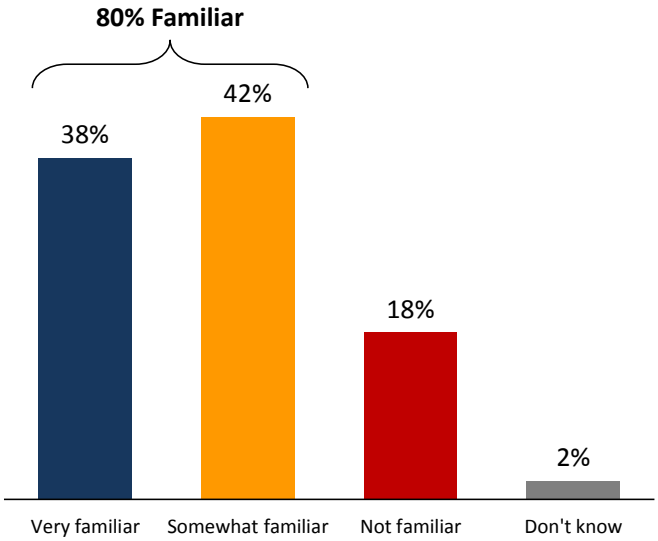
8-in-10 (80%) small business customers reported they were familiar with EnWin and its role in the distribution system. Less than 2-in-10 (18%) said they were not familiar and 2% didn't know how to respond to the question.

- Small business respondents who felt well-served by the system (82%) were a bit less familiar then those who didn't feel well-served (90%).

Figure 2GS: System Familiarity

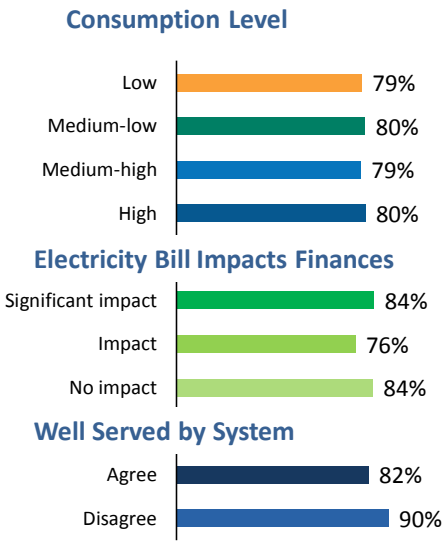
Q How familiar are you with **EnWin**, which operates the electricity distribution system in your community? Would you say you are *very familiar, somewhat familiar, not familiar* or would you say you *don't know*?

[asked of all respondents; n=200]



Sample Breakdown ▸▸

*Those who say "**Familiar**"*



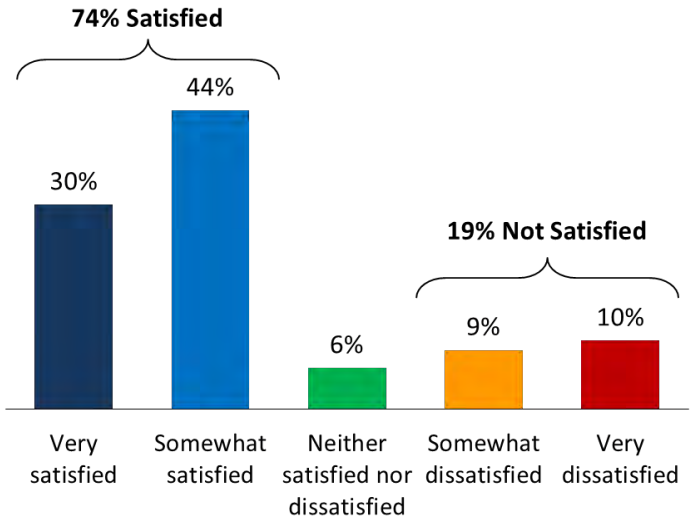
3-in-4 (74%) residential customers felt satisfied with the service they receive from EnWin. 3-in-10 (30%) stated they were "very satisfied" and less than half (44%) were "somewhat satisfied". Less than 2-in-10 (19%) felt dissatisfied with the company and 6% didn't feel strongly one way or another.

- Those who feel least well served by the electricity system (66%), those significantly impacted by their bills (67%) and higher volume residential customers (Medium-high: 69%; High: 72%) felt the least satisfied.

Figure 3R: General Satisfaction

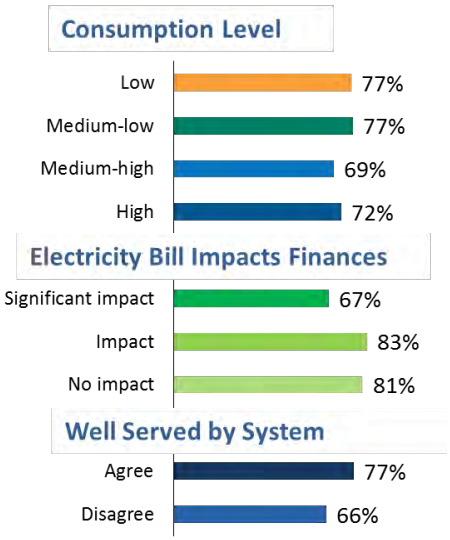
Q In general, how satisfied or dissatisfied are you with the services that you receive from **EnWin**? Would you say you are *very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied* or would you say you *don't know enough to say*?

[asked of all respondents; n=560]



Note: 'Don't know' (1%) not shown

Sample Breakdown ▸▸
*Those who say "**Satisfied**"*



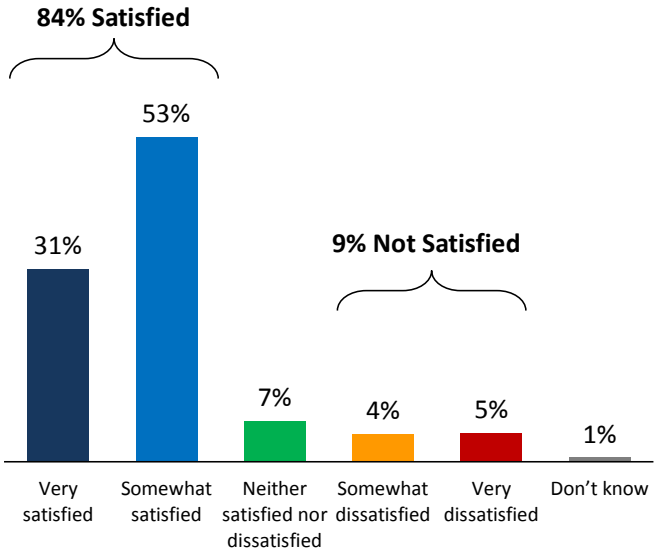
More than 8-in-10 (84%) small business customers felt satisfied with their service from EnWin and only 1-in-10 (9%) felt dissatisfied. Less than 1-in-10 were either ambivalent (7%) or unsure (1%) how to respond.

- Those small business customers significantly impacted by their bills (78%) and those who did not feel well-served by the system (74%) were the least satisfied groups.

Figure 3GS: General Satisfaction

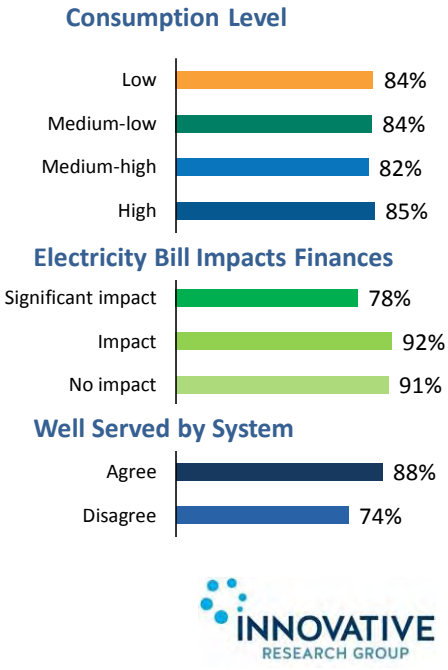
Q In general, how satisfied or dissatisfied are you with the services that your organization receives from **EnWin**? Would you say you are *very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied* or would you say you *don't know enough to say*?

[asked of all respondents; n=200]



Sample Breakdown ▸▸

*Those who say "**Satisfied**"*

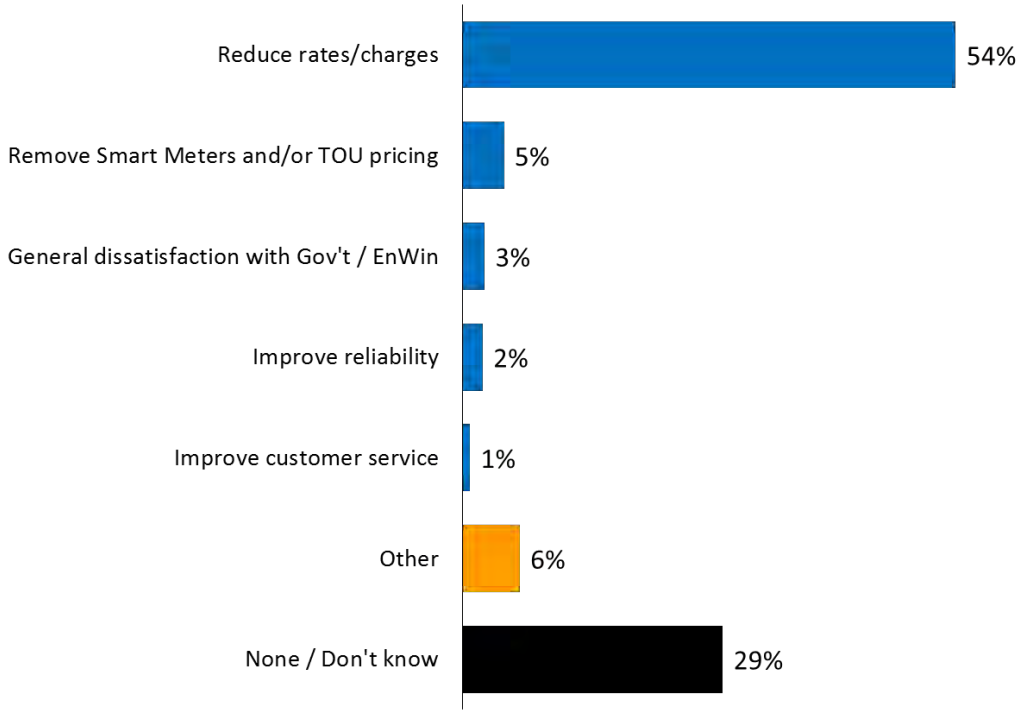


Customers were then asked to provide suggestions: “Is there anything in particular EnWin can do to improve its service to you?”

For residential customers, cost appeared top-of-mind on service improvements: just over half (54%) residential customers wanted EnWin to “reduce rates and charges”. Other suggestions included “remove Smart Meters and/or TOU pricing” (5%), “general dissatisfied with government and/or system operators” (3%), “improve reliability” (2%), and “improve customer service” (1%). 3-in-10 (29%) residential customers either “didn’t know” or said “no”, there was nothing they could think of to improve services.

Figure 4R: Suggestions to Improve Service [OPEN]

Q Is there anything in particular that **EnWin** can do to improve its service to you?
[asked of all respondents; n=560]

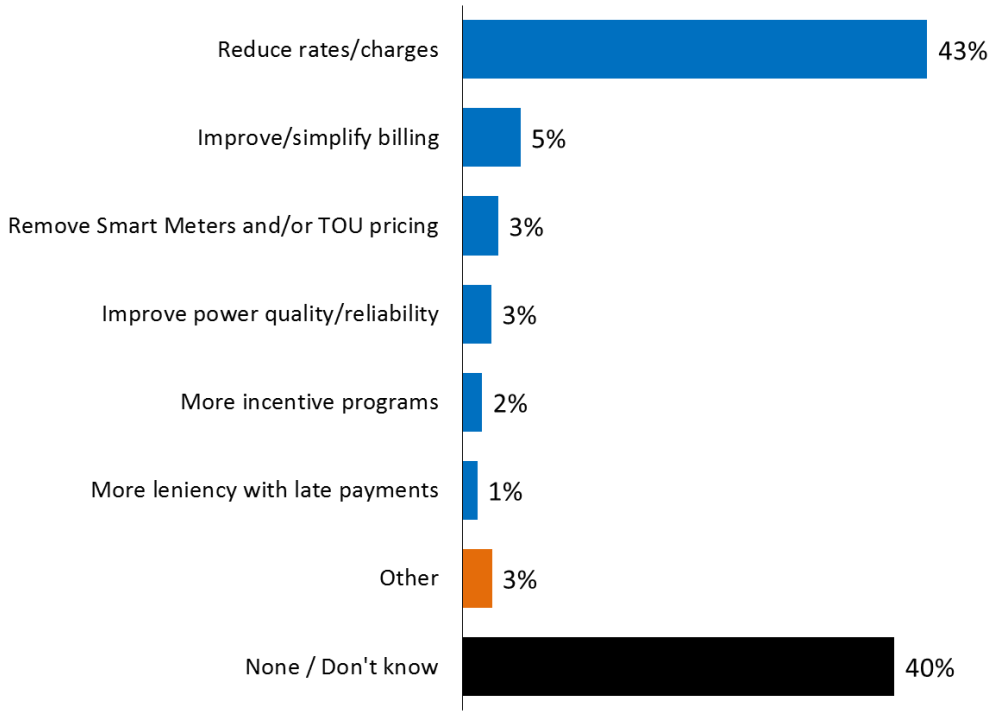


Small business customers were also ask how EnWin would improve service to their organizations.

Like residential customers, cost appeared top-of-mind on service improvements: more than 4-in-10 (43%) residential customers wanted EnWin to "reduce rates and charges". Other suggestions included "improve or simplify billing" (5%), "remove Smart Meters and/or TOU pricing" (3%), "improve power quality and reliability" (3%), "more incentive programs" (2%), and "leniency with late payments" (1%). 2-in-5 (40%) small business customers said there was nothing EnWin could do to improve services, or didn't have an opinion.

Figure 4GS: Suggestions to Improve Service [OPEN]

Q Is there anything in particular that **EnWin** can do to improve its service to your organization?
[asked of all respondents; n=200]



The next set of questions on bill knowledge and impact began with the following preambles for residential customers (small business customer text is in brackets):

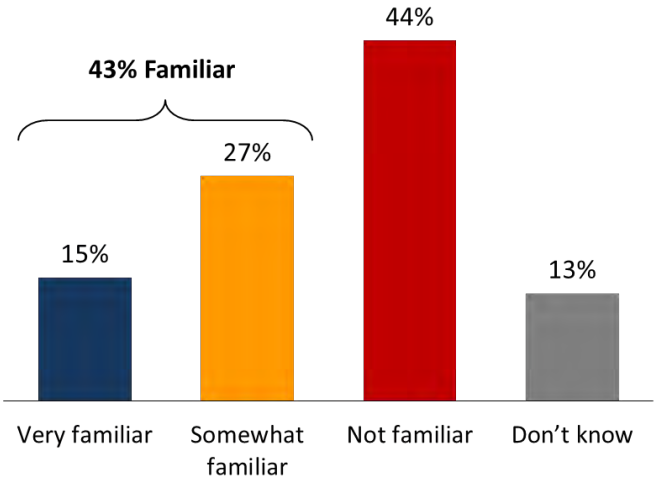
"While EnWin is responsible for collecting payment for the entire electricity bill, they retain only about 20% of the average residential customer's bill ***[17% of the average small business customer's bill].*** *This is about $27****[$62]*** *on an average $135****[$362]*** *monthly electricity bill. The rest of the bill goes to power generation companies, transmission companies, the provincial government and regulatory agencies."*

A strong plurality (44%) of residential customers stated they were "not familiar" with the percentage of their bill that goes to EnWin. Only 15% said they were "very familiar" and roughly a quarter (27%) of residential customers felt "somewhat familiar. More than 1-in-10 (13%) did not know how to respond.

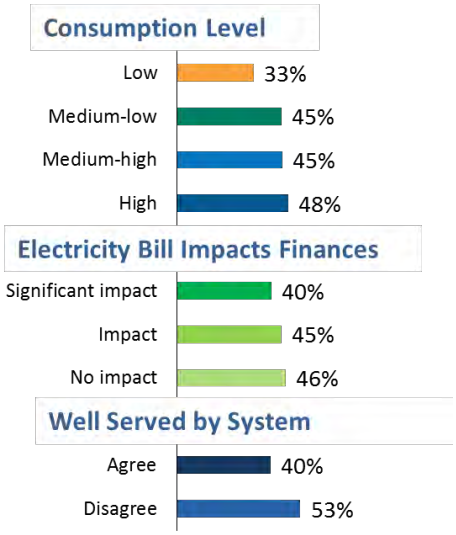
- Well served (40%), significantly impacted (40%) and low consumption (33%) residential customers were the least familiar with their bill breakdown.

Figure 5R: Familiarity with Bill Percentage to EnWin

Q Before this survey, how familiar were you with the percentage of your electricity bill that went to **EnWin**? Would you say you were *very familiar, somewhat familiar, not familiar* or would you say you *don't know*?
[asked of all respondents; n=560]



Sample Breakdown ▸▸
*Those who say "**Familiar**"*

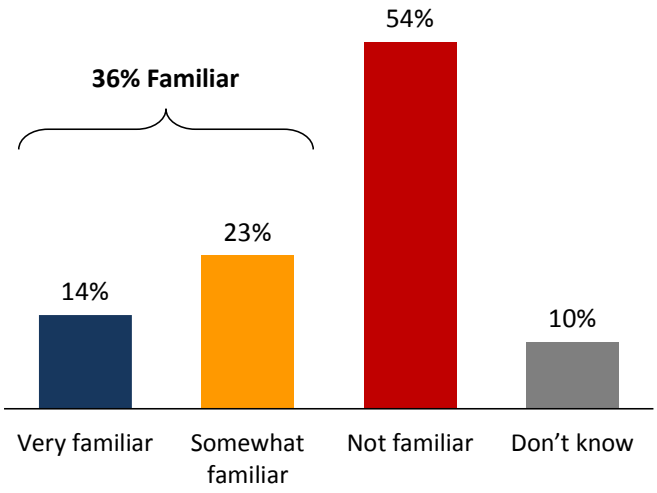


Less than 4-in-10 (36%) small business customers said they were familiar with the bill percentage sent to EnWin, while a majority (54%) were unfamiliar. 1-in-10 (10%) didn't know how to respond.

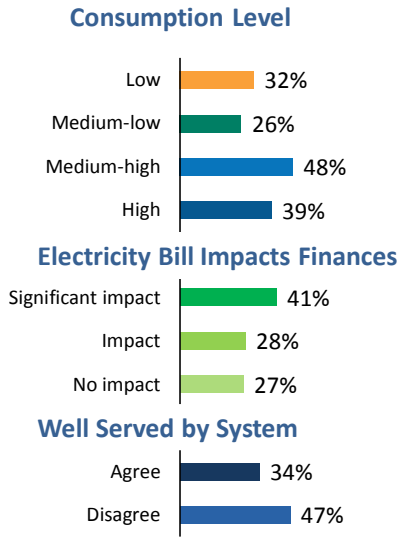
- Small business customers most impacted (41%) by their electricity bills and those who didn't feel well-served by the system (47%) were the most familiar groups.

Figure 5GS: Familiarity with Bill Percentage to EnWin

Q Before this survey, how familiar were you with the percentage of your organization's electricity bill that went to **EnWin**? Would you say you were *very familiar, somewhat familiar, not familiar* or would you say you *don't know*?
[asked of all respondents; n=200]



Sample Breakdown ▸▸
*Those who say "**Familiar**"*

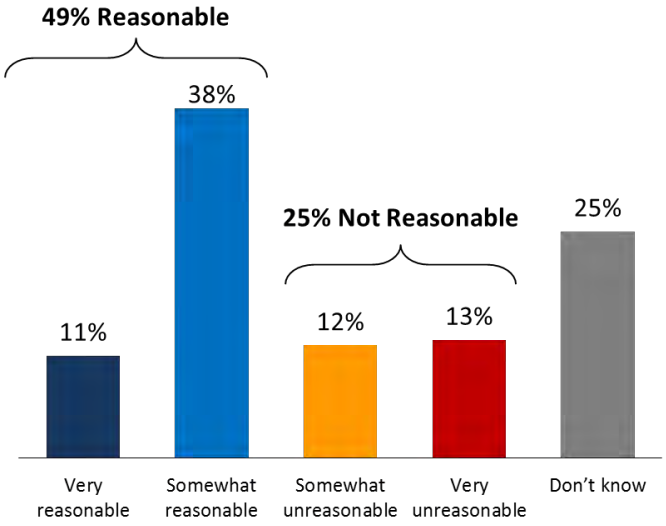


Nearly half (49%) felt the 20% of their bill that goes to EnWin is "reasonable" and just 1-in-4 (25%) think it is unreasonable. There is a great deal of uncertainty on this question with 1-in-4 (25%) who don't know how to respond.

- Those significantly impacted (45%) by their electricity bill and low-volume (46%) residential customers were a bit less likely to think the amount paid to EnWin is reasonable.

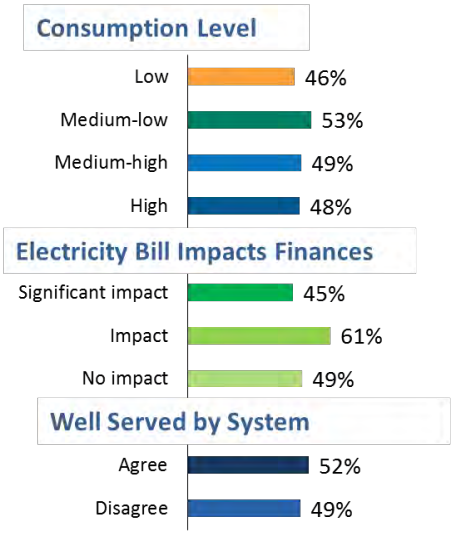
Figure 6R: Reasonableness of Bill Percentage to EnWin

Q Do you feel that the **20%** of your total electricity bill that you pay to **EnWin** for the services they provide is *very reasonable, somewhat reasonable, somewhat unreasonable, very unreasonable* or would you say you *don't know*?
[asked of all respondents; n=560]



Note: 'Refused' (1%) not shown

Sample Breakdown ▸▸
*Those who say "**Reasonable**"*



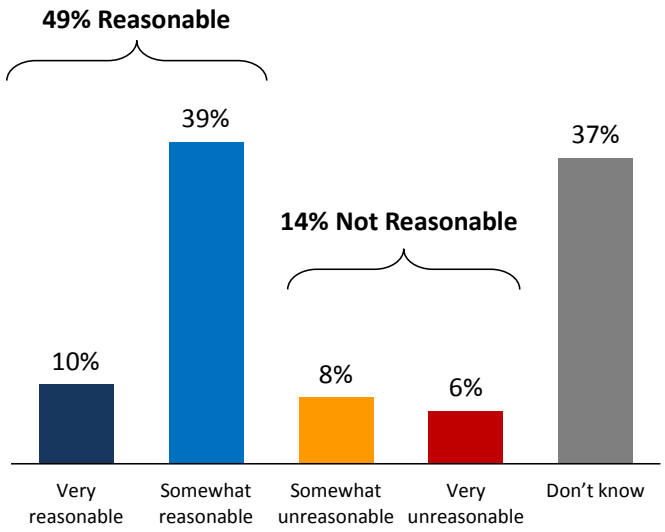
About half (49%) of small business customers felt that the 17% put towards their bill for EnWin was reasonable and only 14% felt the amount was unreasonable. Nearly 4-in-10 (37%) were unsure how to respond to the question.

- High-consumption level customers ("reasonable": 63%) and those who felt well-served by the system (52%) were the most likely groups to feel the remittance was reasonable.

Figure 6GS: Reasonableness of Bill Percentage to EnWin

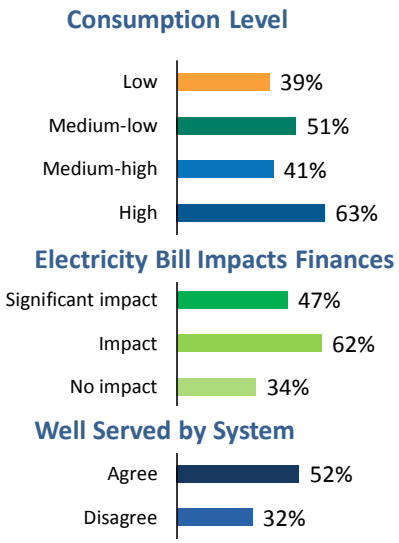
Q Do you feel that the **17%** of your total electricity bill that you pay to **EnWin** for the services they provide is *very reasonable, somewhat reasonable, somewhat unreasonable, very unreasonable* or would you say you *don't know*?

[asked of all respondents; n=200]



Sample Breakdown ▸▸

*Those who say "**Reasonable**"*



Customer Priority and System Reliability

The next section outlines opinions on EnWin's key priorities as well as attitudes towards system reliability vis-à-vis the number and length of outages as well as the overall quality of power.

Summary: Key Priorities and System Reliability

By more than a 4-1 to margin, customers' top priority was cost. More than 6-in-10 (residential: 63%; small business: 65%) thought "delivering electricity at a reasonable price" was the most important customer priority.

- Only 13% of the residential customers and 11% of small business customers didn't consider cost a priority.

Reliability and safety were top priorities as well, although far behind cost. Most residential and small business customers felt that these were at least a top-three priority.

- Only 14% of residential customers and 17% of small business customers thought service was the most important priority, and less than 1-in-10 (residential: 8%; small business: 5%) thought safety was the most important.

Again, the top mention in the open-ended question was cost-related for residential (8%).Most (90%) small business customers couldn't think of any other priorities that EnWin should focus on.

A strong majority of residential and small business customers felt satisfied with their reliability on three key measures: number of outages (residential, satisfied: 87%; small business: 93%), length of outage (residential or small business: 88%); and quality of power (residential: 85%; small business: 82%).

When it comes to spending on reliability, about half preferred to "spend what is needed to maintain" the current level (residential: 51%; small business: 49%) of outages.

Around half felt that EnWin should spend what is needed to maintain the current duration of outages (residential: 47%; small business: 50%).

The survey provided the following introduction to the customer priorities section:

*"**EnWin** regularly holds discussions with its customers to better understand how it should set spending priorities with ratepayer dollars.*

*In recent conversations with customers, a number of company goals were identified as priorities for **EnWin**."*

When asked to rank six customer priorities, residential customers overwhelmingly focused on cost. More than 6-in-10 (63%) chose "delivering electricity at a reasonable price" as their most important priority, 16% chose it as their second most important and nearly 1-in-10 (8%) felt it was their third key priority. All-in-all, 87% of residential customers felt "delivering electricity at a reasonable price" was a top-three priority.

"Ensuring reliable electrical service" was a strong, but distant second to cost. More than 6-in-10 (64%) residential customers felt that reliability was a top-three priority, with 14% who felt it should be 1st, 35% who chose it 2nd, and 14% who felt it was their 3rd priority.

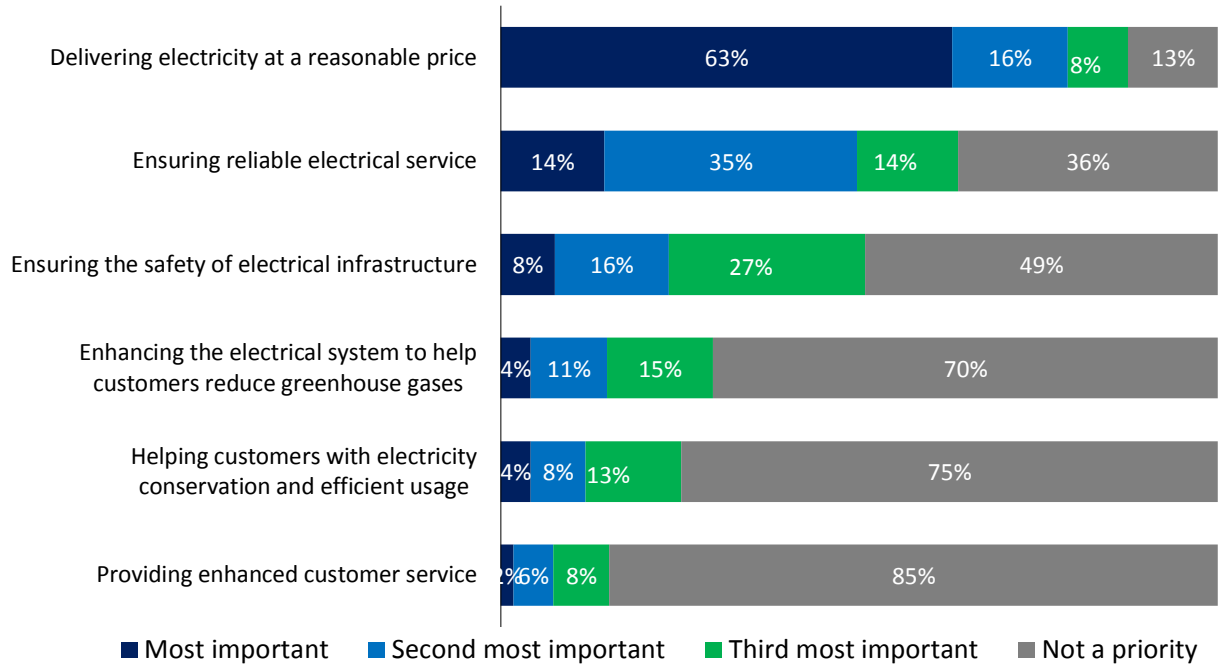
Safety was considered a distant third with a slight majority (51%) of the sample who felt it was a top-three priority (1st: 8%; 2nd: 16%; 3rd: 27%).

"Enhancing the electrical system to help customers reduce greenhouse gases (1st: 4%; 2nd: 11%; 3rd: 15%) and "helping customers with electricity conservation and efficient usage" (1st: 4%; 2nd: 8%; 3rd: 13%) were considered less important customer priorities.

"Providing enhanced customer service" was considered by residential customers to be the least important outcome- just 15% felt it was in their top three priorities.

Figure 7R: Customer Priority Ranking

Q Among the following priorities, which one is most important to you as an **EnWin** customer? What is the next most important priority? And what do you consider the third most important priority?
[asked of all respondents; n=560]



By far, the most important customer priority for small business customers was price. 9-out-of-10 (89%) small business customers felt "delivering electricity at a reasonable price" was an important issue, including 2-in-3 (65%) who felt it was the most important issue.

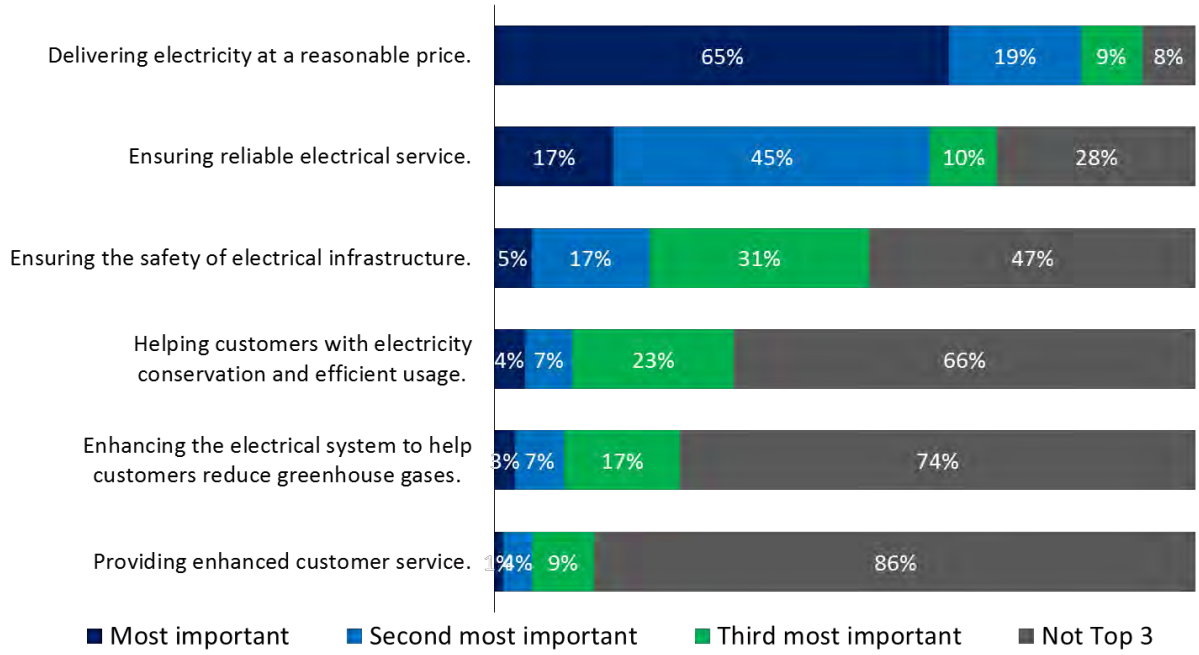
In distant second, 2-in-3 (66%) small business customers felt that "ensuring reliable electricity service" was a top-three issue. Less than 2-in-10 (17%) considered it their top issue.

Less than half of small business customers considered "ensuring safety" (49%), "enhancing the system to reduce greenhouse gases" (27%), and "helping customers with conservation" (25%) a top three-issue.

The least important priority for small business customers was enhancing customer service: just 16% felt it was a top-three issue and only 3% felt it was their most important one.

Figure 7GS: Customer Priority Ranking

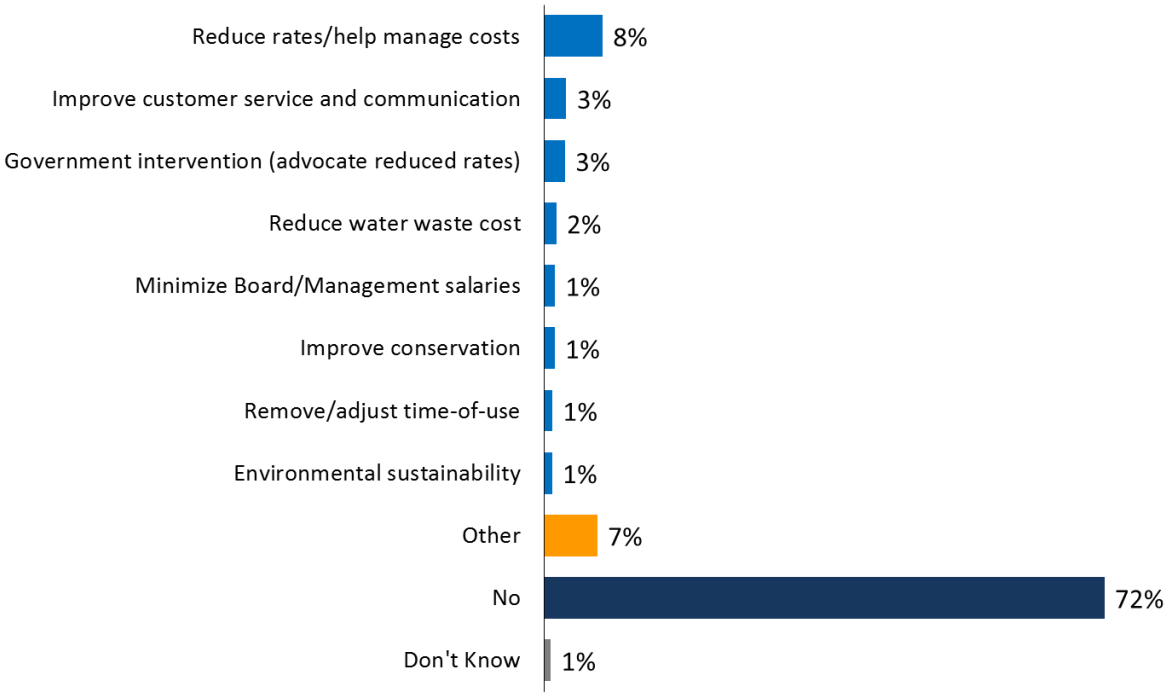
Q Among the following priorities, which one is most important to your organization as an **EnWin** customer? What is the next most important priority? And what do you consider the third most important priority?
[asked of all respondents; n=200]



When asked to think of any other priorities in an open-ended follow-up question, most (72%) residential customers couldn't think of any. The top specific mention (8%), again related to cost: requests to reduce rates, help manage costs particularly for vulnerable, low-income residents. Other mentions included "improve customer service and communication" (3%), government intervention (3%), "reduce water waste costs" (2%), "minimize the Board/management salaries" (1%), "improve conservation" (1%), "remove/adjust Time of Use pricing" (1%) and "environmental sustainability" (1%).

Figure 8R: Other Priorities [OPEN]

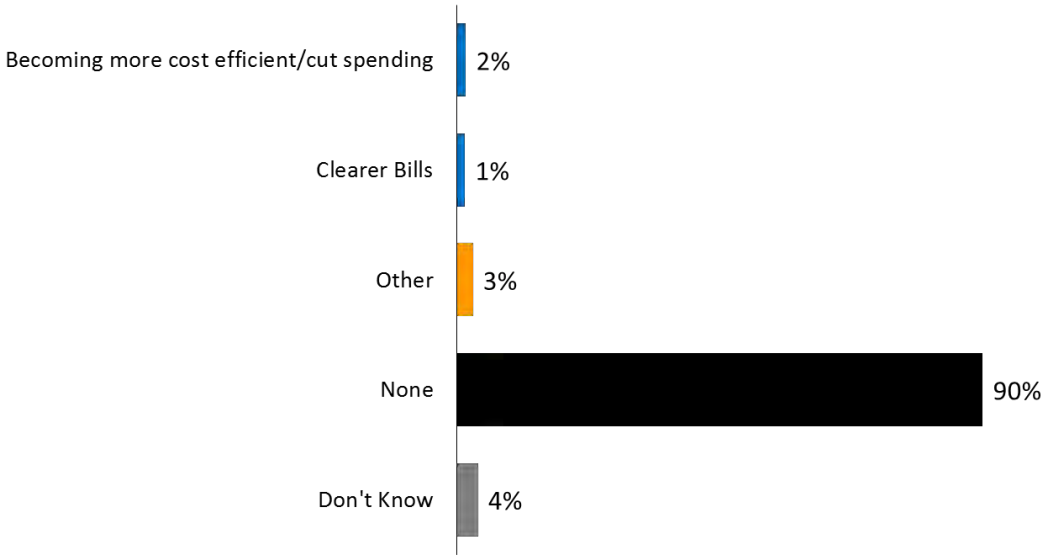
Q Are there any other priorities that **EnWin** should be focusing on that weren't included in the previous list?
[asked of all respondents; n=560]



Compared to residential, fewer small business customers have ideas for alternative priorities. 90% of small business customer had no additional priorities from the list previously presented, while 4% don't know.

Figure 8GS: Other Priorities [OPEN]

Q Are there any other priorities that **EnWin** should be focusing on that weren't included in the previous list?
[asked of all respondents; n=200]



Before answering the next set of questions on system reliability, respondents were read this preamble:

"Despite best efforts, no electrical distribution system can deliver perfectly reliable electricity. As a general rule, the more reliable the system, the more expensive the system is to build and maintain.

*With that said, the average **EnWin** customer experiences **two** unexpected power outages per year."*

A strong majority of residential customers felt satisfied with the reliability of their service considering the number of outages, the amount of time it takes to restore power when outages occur and the quality of their power.

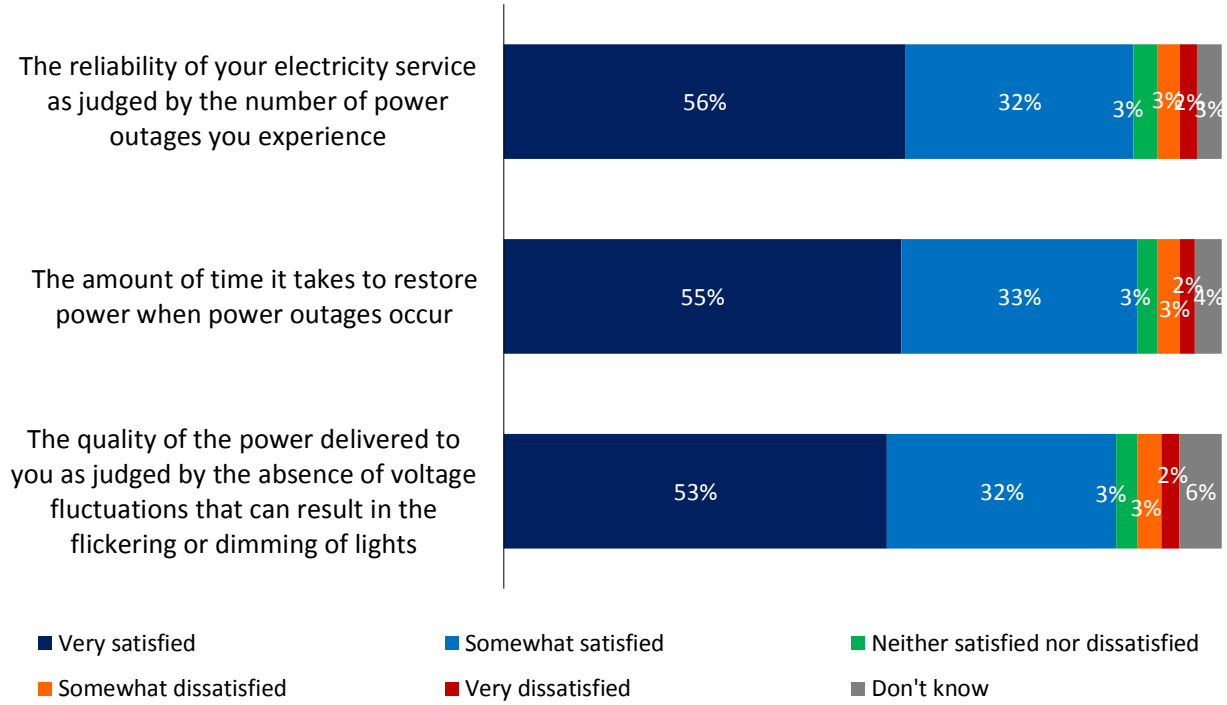
Nearly 9-in-10 (87%) said they were satisfied with EnWin's reliability considering the number of power outages they've experienced. More than half (56%) felt very satisfied and 1-in-3 (32%) felt somewhat satisfied. Just 5% responded that they were dissatisfied with the reliability as judged by the number of power outages.

Roughly the same number said that they were satisfied with the amount of time it takes to restore power during outages (satisfied: 88%, including 55% "very satisfied" and 33% "somewhat satisfied") and the quality of power as judged by the "absence of voltage fluctuations" (satisfied: 85%, includes 53% "very satisfied" and 32% "somewhat satisfied").

- High consumption residents were the least satisfied with reliability as measured by the number of power outages (82% satisfied), the time it takes to restore power (85%), and the quality of power (80%).

Figure 9R: System Reliability Satisfaction

Q For each of the following statements, please tell me if you are *very satisfied*, *somewhat satisfied*, *neither satisfied nor dissatisfied*, *somewhat dissatisfied*, *very dissatisfied*, or would you say you *don't know*?
[asked of all respondents; n=560]



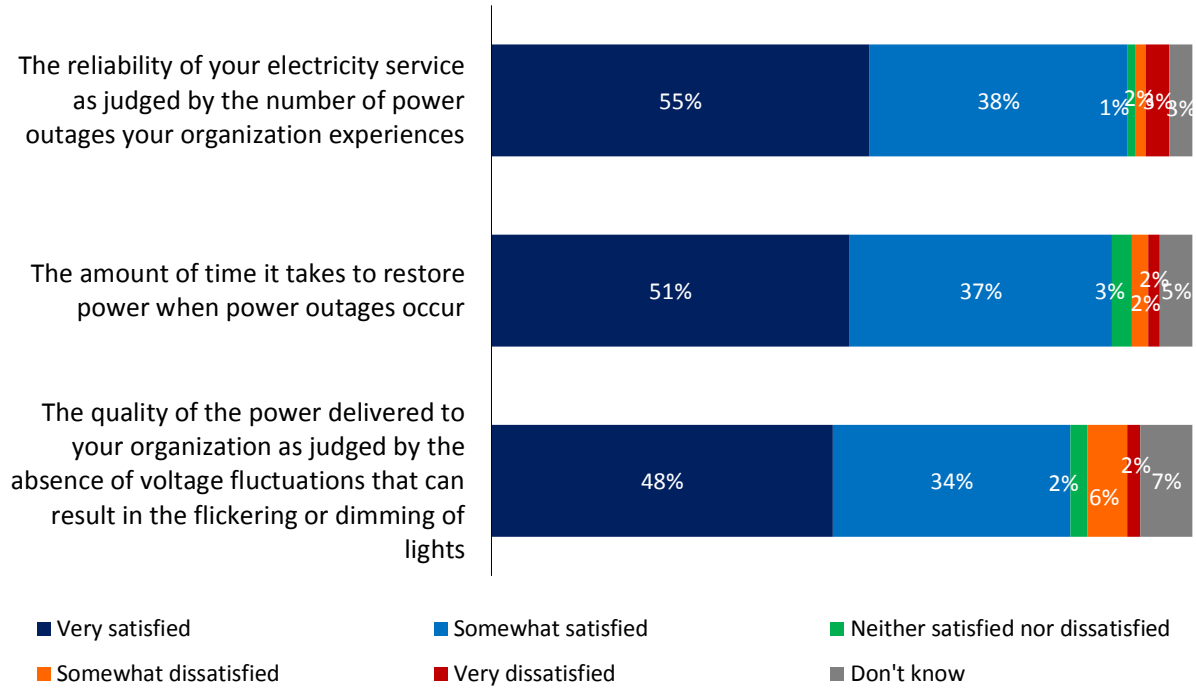
Almost all small business customers were satisfied on all three measures of system reliability:

- The system reliability judged by number of outages ("very satisfied": 55%; "somewhat satisfied": 38%);
- The amount of time to restore outages ("very satisfied": 51%; "somewhat satisfied": 37%); and
- The quality of power judged by absence of power fluctuations ("very satisfied": 48%; "somewhat satisfied": 34%).

Less than 10% of customers on all three reliability measures felt dissatisfied.

Figure 9GS: System Reliability Satisfaction

Q For each of the following statements, please tell me if you are *very satisfied*, *somewhat satisfied*, *neither satisfied nor dissatisfied*, *somewhat dissatisfied*, *very dissatisfied*, or would you say you *don't know*?
[asked of all respondents; n=200]

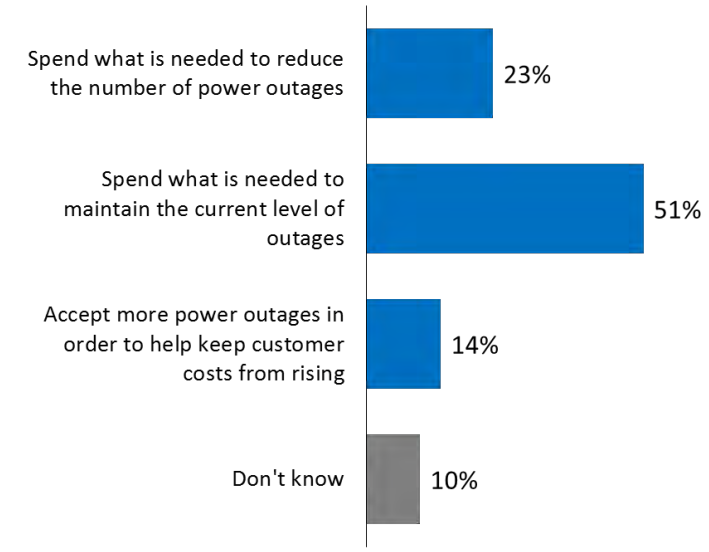


When asked about how they would address the number of customer outages, a majority (51%) of residential customers felt EnWin should "spend what is needed to maintain the current level of outages". About 1-in-4 (23%) thought EnWin should "spend what is needed to reduce the number of outages" and only 14% felt EnWin should "accept more power outages to help keep customer costs from rising". 1-in-10 (10%) didn't know how to respond.

- High consumption (26%) residential customers were a bit more likely than low consumption (20%) ones to feel EnWin should spend what is needed to reduce outages.
- Those who do not feel well served (27%) are slightly more likely to say spend what is need than those who feel well served (23%).

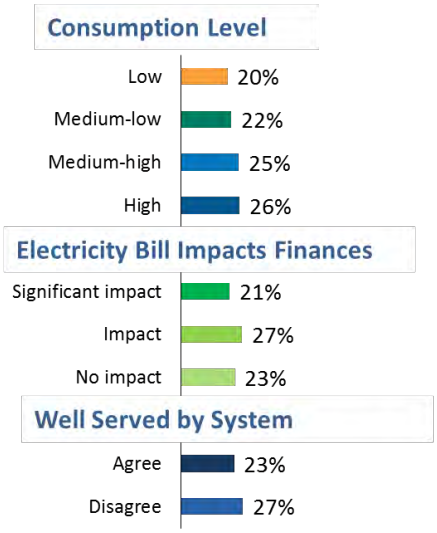
Figure 10R: Spending to Address Number of Outages

Q In your view, how do you think **EnWin** should address the **number** of customer power outages?
[asked of all respondents; n=560]



Note: 'Refused' (2%) not shown

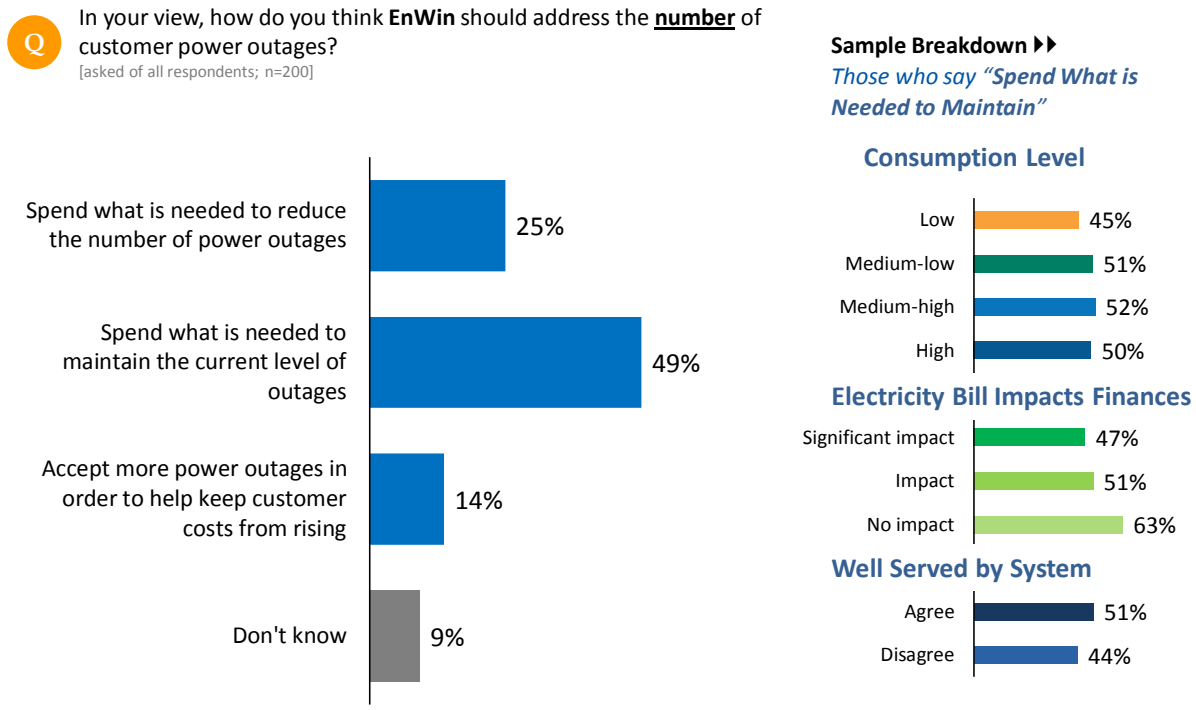
Sample Breakdown ▸▸
*Those who say "**Spend what is needed to reduce number of outages**"*



About half (49%) of small business customers felt that EnWin should spend what is needed to maintain the current level of outages and 1-in-4 (25%) thought it should spend to reduce the number of outages. Just 14% felt that EnWin should accept more outages to prevent rising costs and 1-in-10 (9%) didn't know how they felt.

- Small business customers "significantly" impacted by their electricity bill are much less likely than unimpacted customers (63%) to agree EnWin should spend what is needed to maintain the number of outages.

Figure 10GS: Spending to Address Number of Outages

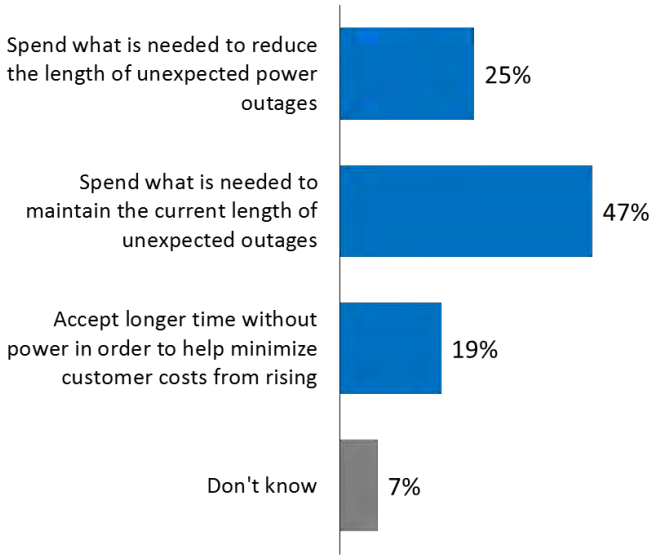


For residential customers when it comes to "length of outages", there was a near-identical breakdown on attitudes. Nearly half (47%) felt EnWin should spend what it takes to maintain the current length of outages, 1-in-4 (25%) said that EnWin should spend what is needed to reduce the length, and nearly 2-in-10 (19%) thought EnWin should "accept longer time without power to help stop customer costs from rising".

- Low consumption (31%) residential customers were a bit more likely to say, "spend what is needed to reduce the length of outages".

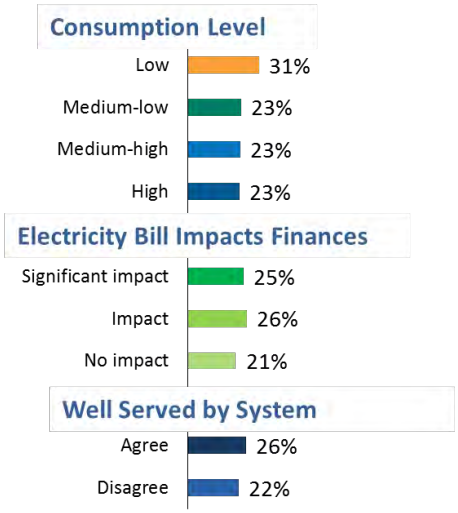
Figure 11R: Spending to Address Length of Outages

Q Overall, the average **EnWin** customer is without power for about **one hour** per year. In your view, how do you think **EnWin** should address the **length of time** customers are without power? Would you say …
[asked of all respondents; n=560]



Note: 'Refused' (2%) not shown

Sample Breakdown ▸▸
*Those who say "**Spend what is needed to reduce length of outages**"*

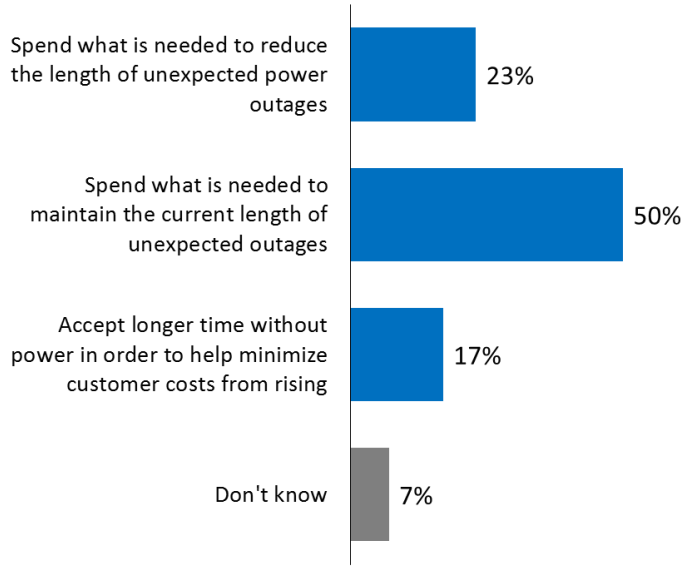


Half (50%) of small business customers felt EnWin should spend what is needed to maintain the length of outages and 1-in-4 (23%) thought it should spend what is needed to reduce the length of them. 15% would accept longer times without power to help minimize rising costs and 7% didn't know how to respond.

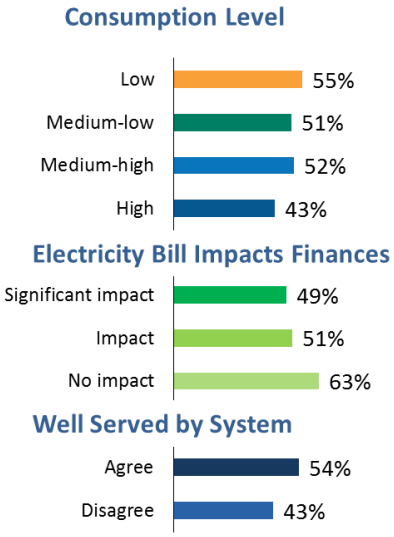
- Low-consumption (55%) small business customers and unimpacted customers (63%) were the most likely groups to feel EnWin should spend what is needed to maintain the current length of outages.

Figure 11GS: Spending to Address Length of Outages

Q Overall, the average **EnWin** customer is without power for about **one hour** per year. In your view, how do you think **EnWin** should address the **length of time** customers are without power? Would you say…
[asked of all respondents; n=200]



Sample Breakdown ▸▸
Those who say "Spend What is Needed to Maintain"



Note: 'Refused' (3%) not shown

Reaction to Customer Input and Capital Plan Priorities

The next section examines respondent attitudes on paying for electricity and capital investments such as those in aging infrastructure; building, equipment and IT; and the importance of investing now in modernizing the grid.

Summary: Reaction to Customer Input and Capital Plan Priorities

On the key attitudes statements, most customers…

- Worried about the impact of outages on vulnerable customers (residential, agree: 79%; small business: 74%);
- Agreed that reliable electricity is an economic advantage to retaining existing jobs and attracting new ones (residential: 77%%; small business: 81%);
- Felt EnWin should pay its employees a competitively (residential: 73%; small business: 75%);
- Felt there is an obligation to maintain the system for future generations (residential: 75%; small business: 75%);
- Acknowledge the need to modernize the system so consumers can better control their electricity consumption (residential: 67%; small business: 69%); and
- Support investing in the system now while the economic conditions are right (residential: 66%; small business: 69%).

However, when faced with paying more for reliability, customers seemed less interested. Just 1-in-3 (34%) residential customers and 27% of small business customers felt willing to pay more for electricity if it meant better reliability.

Residential customers were divided on paying more to invest in aging infrastructure (residential, "invest what it takes": 45% vs. "lower its investment": 44%) while small business customers were a bit more willing to invest (small business: 49% vs. 37%). Still, a majority felt that EnWin should spend what is needed on equipment and tools for its staff (residential: 58%; small business: 50%) and roughly 7-in-10 (residential: 69%; small business: 73%) thought it important that EnWin modernize the grid now.

- Residential customers who struggle to pay their electricity bill were less likely to say that EnWin should invest what it takes in infrastructure (31%) or to make sure the staff has the equipment and staff it needs (53%).

Respondents were read a series of seven statements and asked whether they agree or disagree with the content; statements focused on major issues brought out in the previous discussions:

- **Reliability and protecting the vulnerable**: *"A few power outages are fine for me personally, but I worry about the impact this has on more vulnerable people, such as the elderly."*
- **Competitive advantage**: *"A reliable local electricity system is a competitive advantage for the City of Windsor and can help retain existing jobs and attract new ones."*
- **Labour costs:** *"Skilled hydro workers are sought out across both North America and Ontario. EnWin should pay the people who maintain the local distribution system a competitive salary, or they risk losing the most qualified and experienced hydro workers to other utilities."*
- **Legacy:** *"Nobody likes to pay more for electricity, but I think we have an obligation to maintain the reliability of our local electrical system for future generations."*
- **Modernizing the grid:** *"We need to modernize the local electricity system so consumers can have greater control over their electricity usage."*
- **Pay now or pay later:** *"We should invest in our electricity system now, while the local economy is relatively strong and unemployment is relatively low."*
- **Willingness to pay:** *"I'm willing to pay a bit more for my electricity if it means better system reliability."*

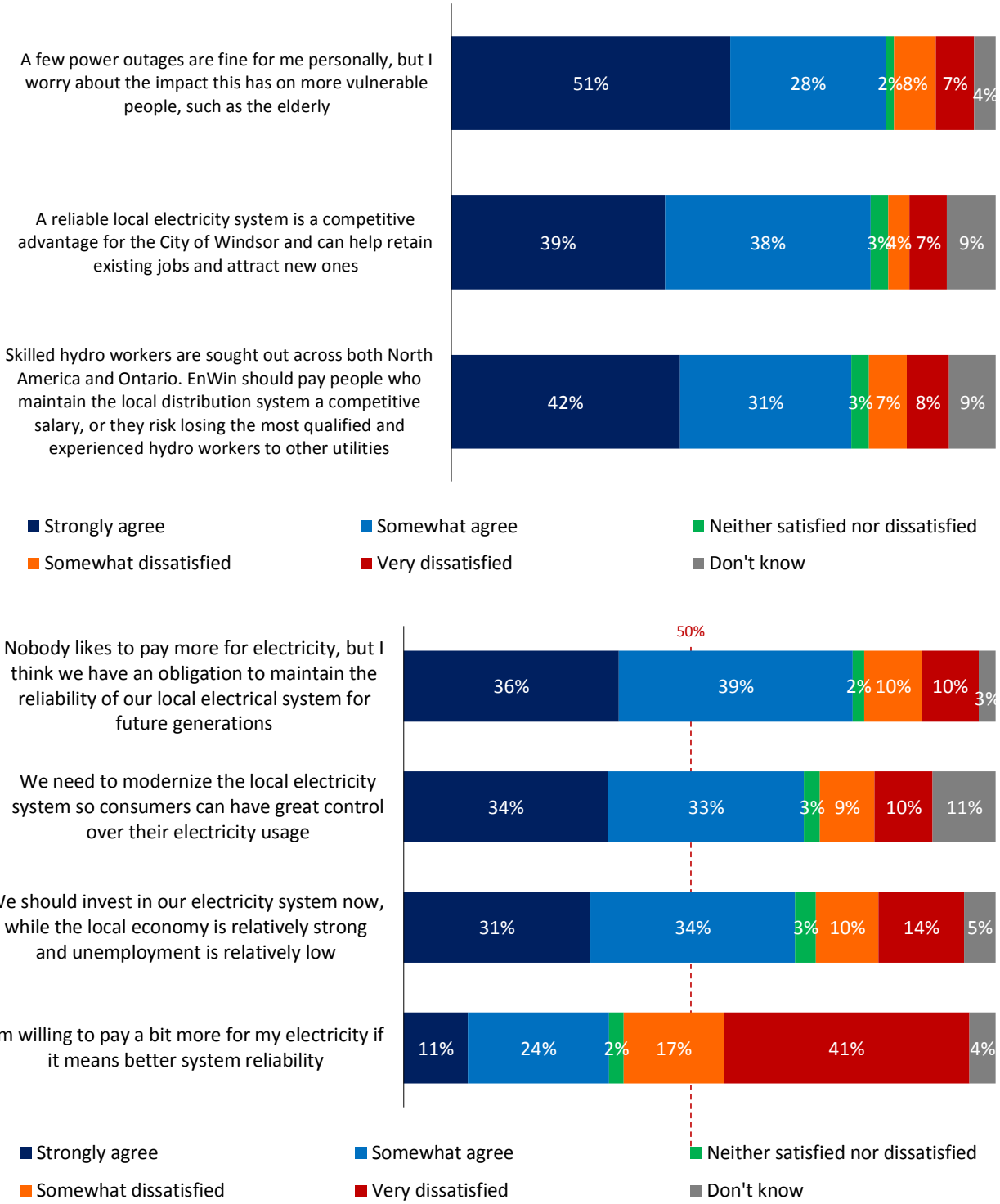
A strong majority of residential customers worried about the impact of outages on vulnerable populations, such as the elderly (79% agree; 15% disagree); agreed that reliable electricity is a competitive advantage to keep and attract jobs (77% agree; 11% disagree), and that EnWin should pay its employees a competitive salary (73% agree; 15% disagree); felt that we have an obligation to future generations to maintain the system (75% agree; 19% disagree); that we need to modernize the system (67% agree: 19% disagree); and that "we should invest now" while the economic conditions are good (66% agree; 25% disagree).

The outlier was, again, personal cost. Just 1-in-3 (34%) residential customers agreed with the statement, "I'm willing to pay a bit more for my electricity if it means better system reliability". Nearly 6-in-10 (58%) were not willing to make the trade-offs required for a more reliable system.

- However, a plurality of those less impacted by their bills ("some impact": 48%/46%; "No impact": 48%/43%) agreed to pay a bit more for reliability. In striking contrast, just 1-in-4 (25%) of those majorly impacted by their electricity bills agreed to pay more.
- The impacted were also much less likely to agree that "we should invest in our electricity system now, while the local economy is strong" ("major impact": 59%/33%; "some impact": 75%/16%; "no impact": 75%/15%) and they were a bit less likely to agree with the "legacy" argument of maintaining for future generations ("major impact": 69%/25%; "some impact": 81%/14%; "no impact": 83%/13%).

Figure 12R: Attitudes Towards System

Q For each of the following statements, please tell me if you are *strongly agree*, *somewhat agree*, *neither agree nor disagree*, *somewhat disagree*, *strongly disagree*, or would you say you *don't know*?
[asked of all respondents; n=560]



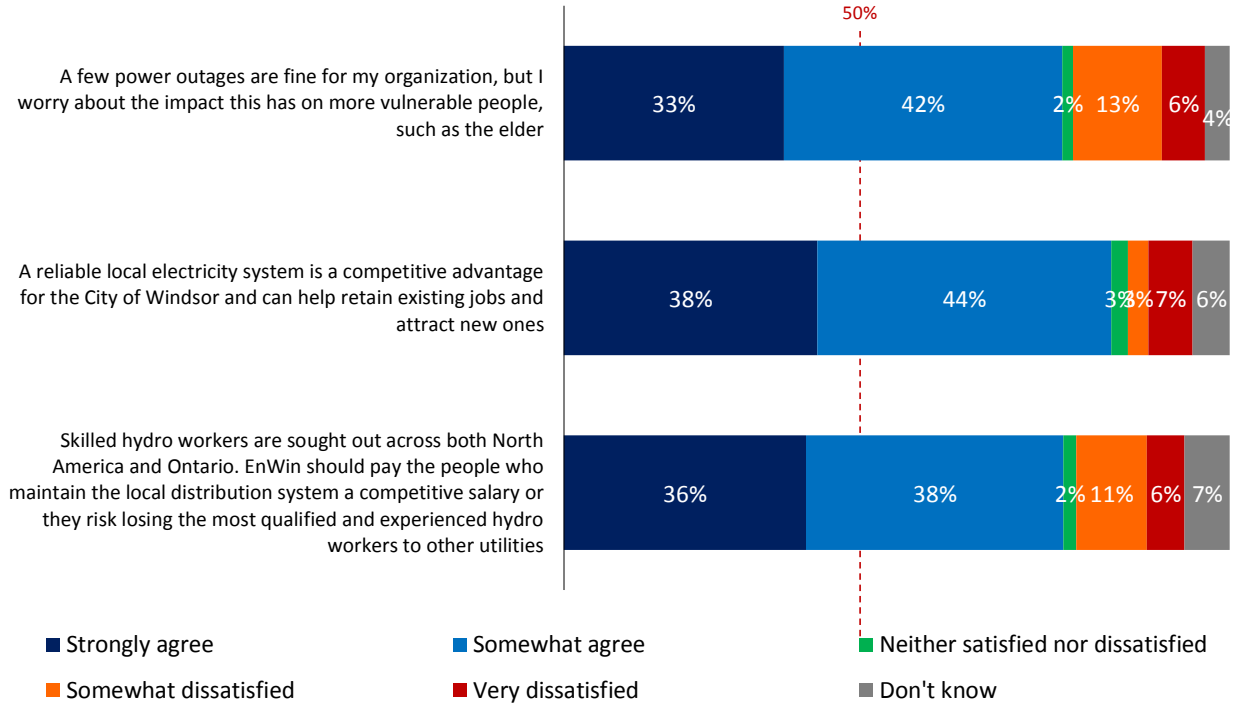
A strong majority of small business customers felt:

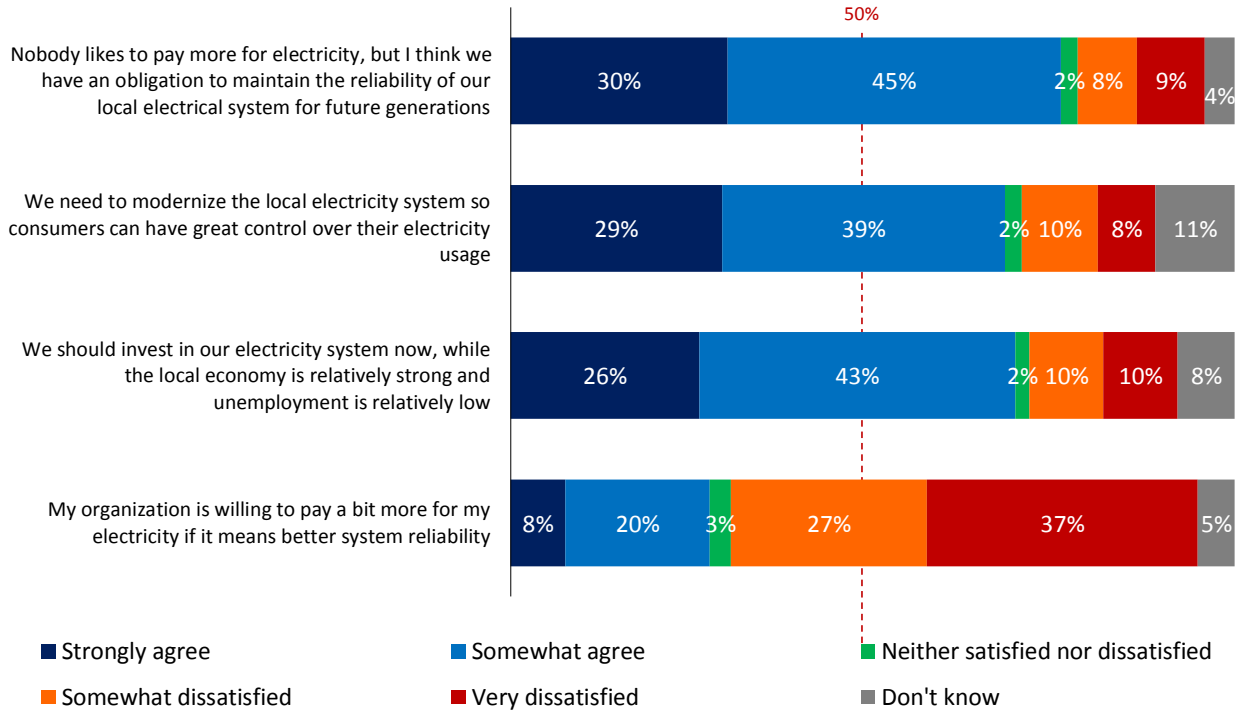
- Worried about the impact of outages on "vulnerable people" ("agree": 74%);
- That system reliability is a competitive advantage for Windsor (81%);
- That EnWin should pay competitive salaries for skilled hydro workers (75%);
- Obliged to maintain reliability for future generations (75%);
- That the system needs to be modernized so consumers can better control their usage (67%); and
- That investment now is needed while the local economy is strong (69%).

Less than 3-in-10 (27%) small business customers agreed to pay a bit more for better reliability.

Figure 12GS: Attitudes Towards System

Q For each of the following statements, please tell me if you are *strongly agree*, *somewhat agree*, *neither agree nor disagree*, *somewhat disagree*, *strongly disagree*, or would you say you *don't know*?
[asked of all respondents; n=200]




50%
Nobody likes to pay more for electricity, but I think we have an obligation to maintain the reliability of our local electrical system for future generations
30%
45%
2%
8%
9%
4%
We need to modernize the local electricity system so consumers can have great control over their electricity usage
29%
39%
2%
10%
8%
11%
We should invest in our electricity system now, while the local economy is relatively strong and unemployment is relatively low
26%
43%
2%
10%
10%
8%
My organization is willing to pay a bit more for my electricity if it means better system reliability
8%
20%
3%
27%
37%
5%
Strongly agree
Somewhat agree
Neither satisfied nor dissatisfied
Somewhat dissatisfied
Very dissatisfied
Don't know

The next question focused on the trade-off between reliability of aging infrastructure and cost to customers, prefaced with the following information:

*"While **EnWin** believes it has done its best to prolong the life of the assets that make up the distribution system, many of these assets are approaching the end of their useful life.*

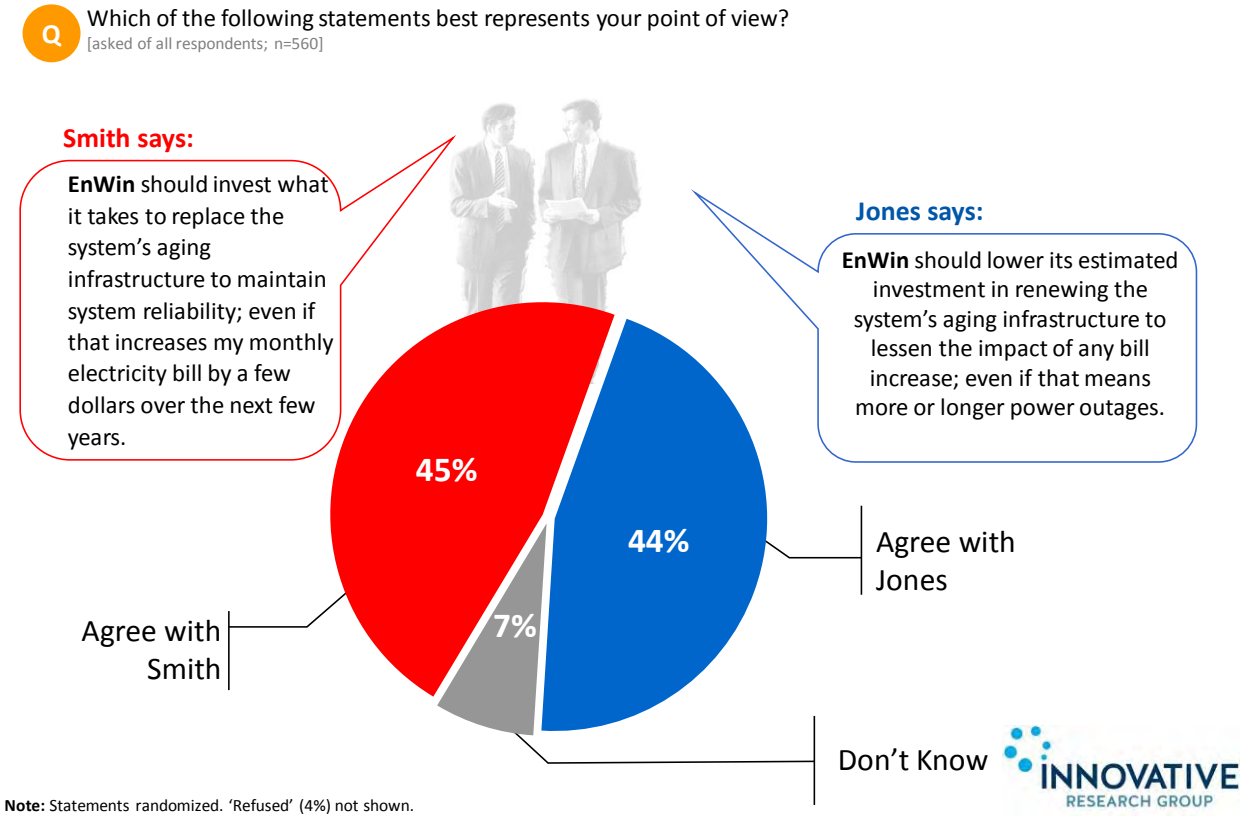
*As part of its investment plan, **EnWin** is proposing a significant infrastructure replacement or renewal program. The estimated cost of this system renewal program is **$30.4 million** between 2017 and 2021.*

*Although this plan will allow **EnWin** to make the necessary investments to maintain system reliability, **it will have an impact on customer bills."***

Residential customers were divided on whether to invest in aging infrastructure at a personal cost. Nearly half (45%) felt that EnWin "should invest what it takes to replace the system's aging infrastructure to maintain system reliability", even at the cost of a few dollars more a month over the next few years. Roughly the same number (44%) chose the opposing statement, that EnWin should "lower its estimated investment" to "lessen the impact of a bill increase", even if that means longer outages. Around 1-in-10 (11%) didn't know how to respond or refused to answer.

- Residential customers severely impacted by their bill were much more likely to think EnWin should lower its investment ("major impact": 56%; "some impact": 40%; "no impact": 23%).

Figure 13R: System Renewal- Investment in Aging Infrastructure

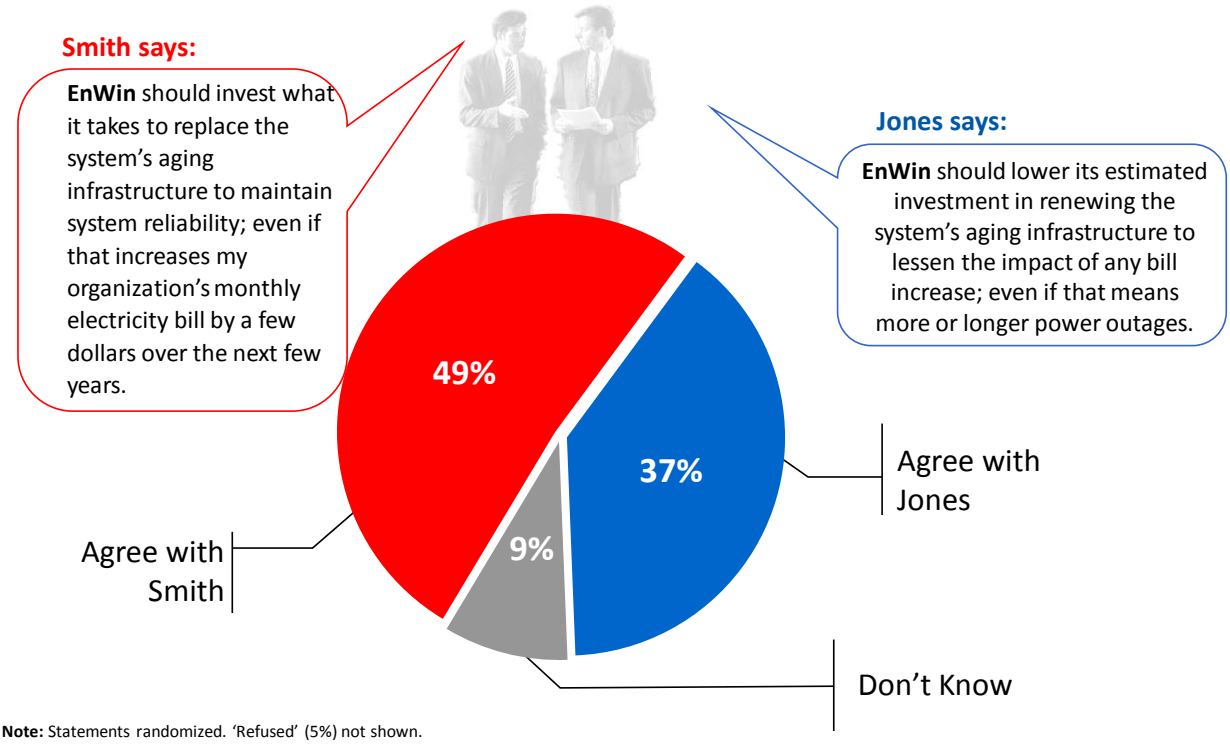


Note: Statements randomized. 'Refused' (4%) not shown.

A strong plurality (49%) of small business customers felt that EnWin should "invest what it takes" to replace the system's infrastructure, even if it means higher monthly bills. Less than 4-in-10 (37%) said that EnWin should lower its investment to lessen bill impact, even if it means worse reliability. 1-in-10 (9%) didn't know how to respond.

Figure 13GS: System Renewal- Investment in Aging Infrastructure

Q Which of the following statements best represents your point of view?
[asked of all respondents; n=200]



Note: Statements randomized. 'Refused' (5%) not shown.

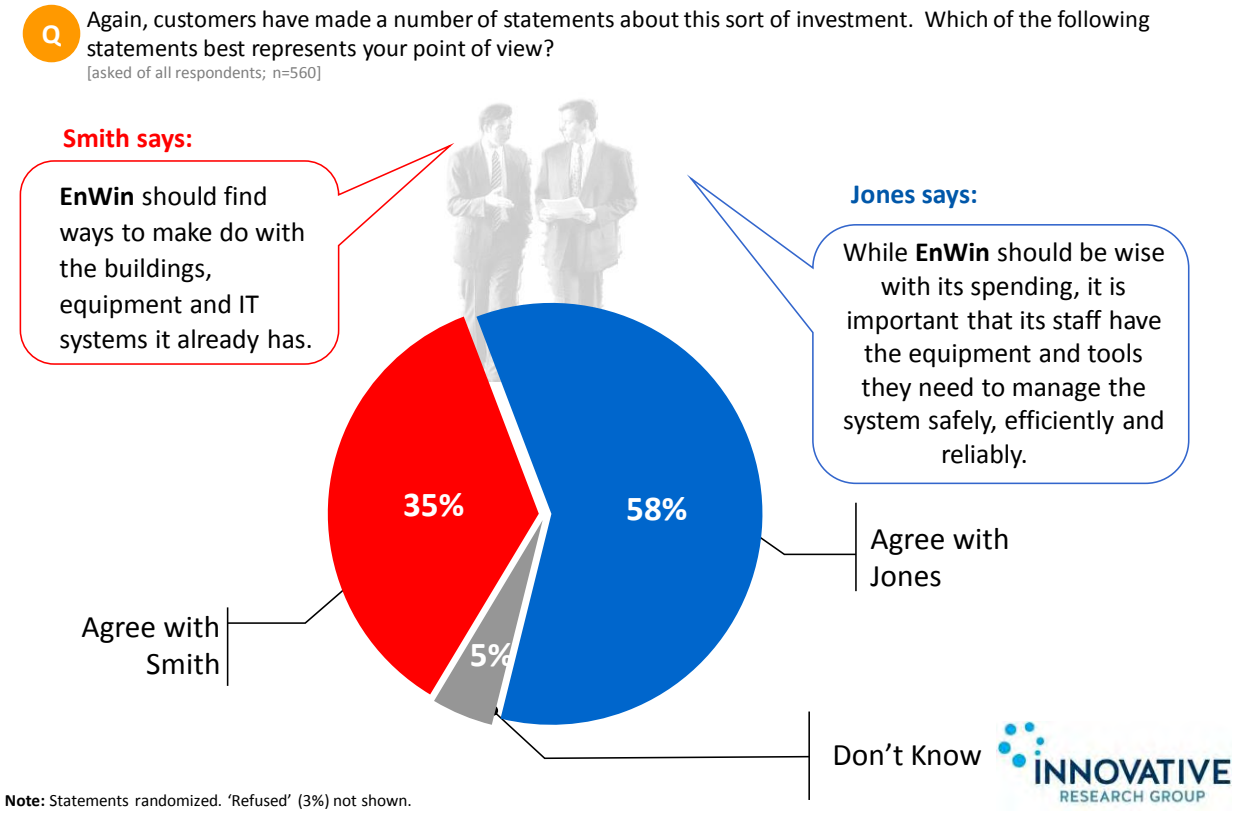
A similar question examined the trade-off between building, equipment or IT versus cost to customers, and included this introduction:

*"**EnWin** is not just the local electricity distribution system itself, but a company that operates the system. As a company, **EnWin** needs buildings to house its staff, vehicles and tools to service the power lines, and IT systems to manage the electrical system and customer information."*

For residential customers, there was a clear answer to this trade-off: nearly 6-in-10 (58%) felt that "while EnWin should be wise with its spending", it's important that the company has "the equipment and tools" needed to manage the system. Just over 1-in-3 (35%) said that EnWin should "find ways to make do with the buildings, equipment and IT systems it already has". Less than 1-in-10 (8%) refused to answer or didn't know how to respond.

- Residential customers severely affected by their electricity bill were the most likely to say that EnWin should make do with what it currently has ("major impact": 43%; "some impact": 27%; "no impact": 25%).

Figure 14R: System Renewal- Investment in Building, Equipment and IT

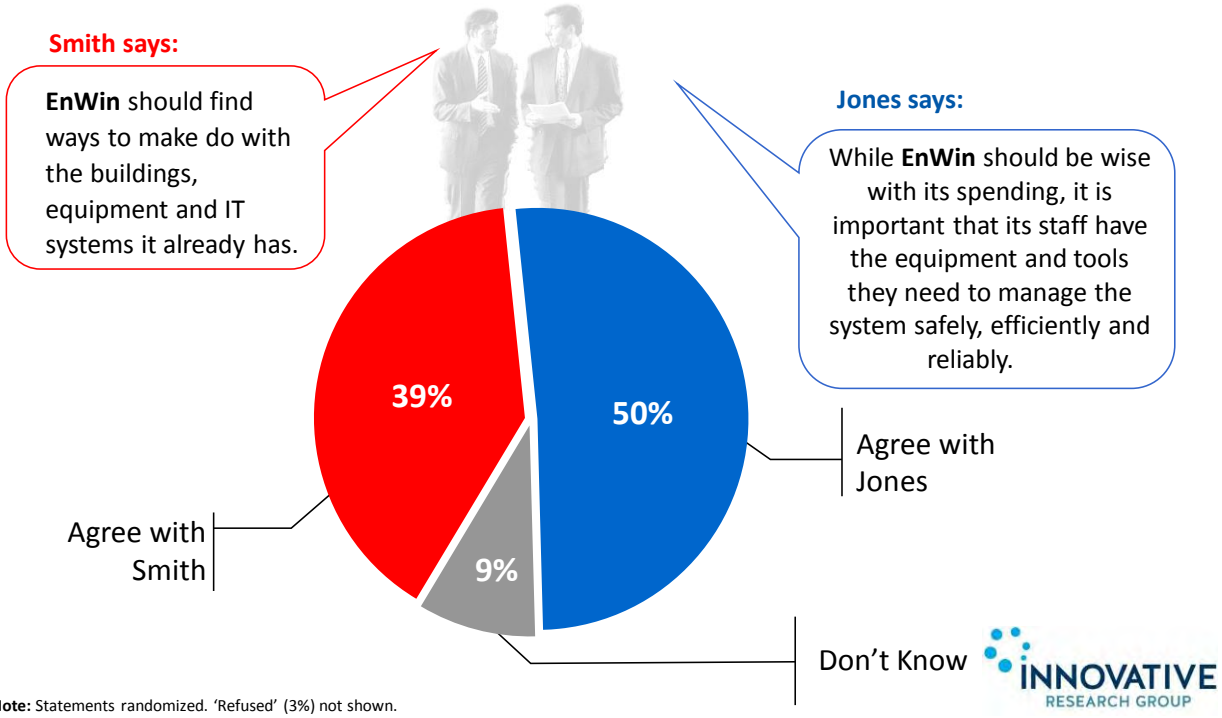


Note: Statements randomized. 'Refused' (3%) not shown.

A slim majority (50%) of Small business Customers felt that EnWin should spend what is needed on equipment and tools to manage the system. Less than 4-in-10 (39%) said that EnWin should "make do with the buildings, equipment and IT systems" it already has and 9% didn't know how to respond.

Figure 14GS: System Renewal- Investment in Building, Equipment and IT

Q Again, customers have made a number of statements about this sort of investment. Which of the following statements best represents your point of view?
[asked of all respondents; n=200]



Note: Statements randomized. 'Refused' (3%) not shown.

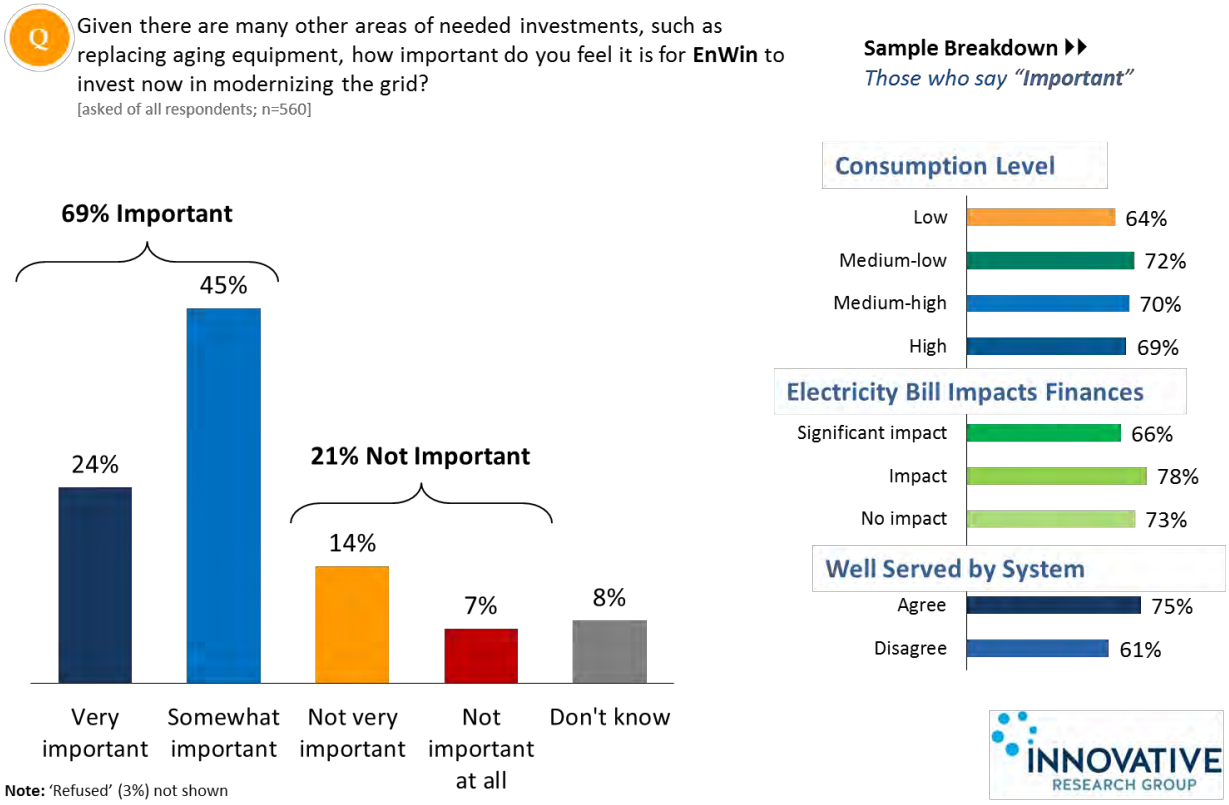
The final question in this section asked about the importance of modernizing the grid, prefaced by this brief statement:

*"Modernizing the grid can allow **EnWin** to improve reliability. Investments such as automated switches may allow **EnWin** to quickly identify the location of outages to minimize the number of people impacted by outages and to restore electricity to customers more quickly than was previously possible."*

A strong majority (69%) of residential customers felt it was important to invest now in modernizing the grid. Nearly 1-in-4 (24%) considered it "very important" and nearly half (45%) felt it was "somewhat important". Just 2-in-10 (21%) thought it was "not very important" (14%) or "not at all important" (7%). 1-in-10 (11%) either refused (3%) or didn't know how to respond (8%).

- Significantly impacted (66%) bill-payers were a bit less likely to feel modernizing the grid is important than less impacted ones ("some impact": 78%; "no impact": 73%).
- Those who feel well served (75%) more likely than those who do no (61%) to say modernizing the grid is important.

Figure 15R: System Renewal- Modernizing the Grid

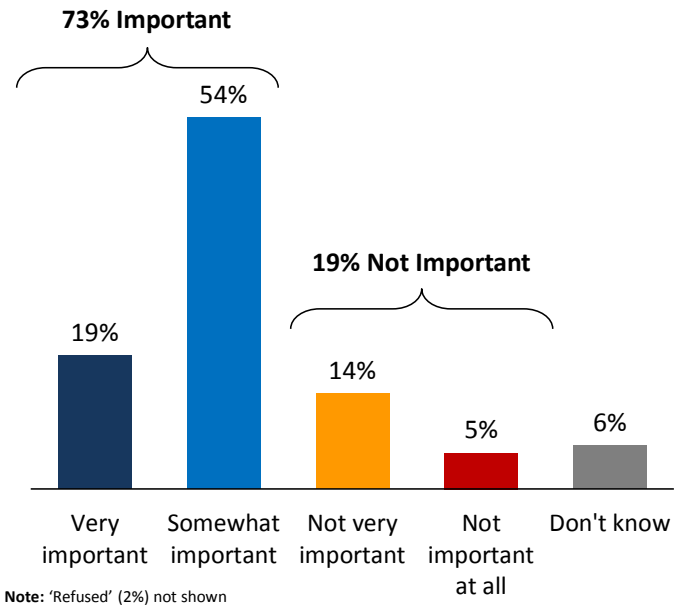


Nearly 3-in-4 (73%) Small business customers felt it was either "very important" (19%) or "somewhat important" (54%) for EnWin to invest now, modernizing the grid. About 2-in-10 (19%) felt it was "not important" and 6% didn't know how to respond.

- Those who felt well-served by the system (82%) were much more likely to feel it important to invest now.

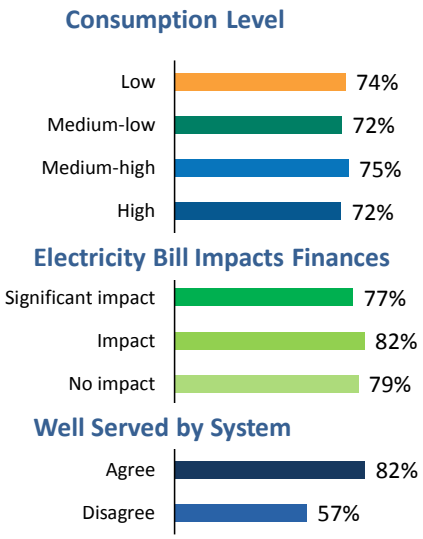
Figure 15GS: System Renewal- Modernizing the Grid

Q Given there are many other areas of needed investments, such as replacing aging equipment, how important do you feel it is for **EnWin** to invest now in modernizing the grid?
[asked of all respondents; n=200]



Note: 'Refused' (2%) not shown

Sample Breakdown ▸▸
*Those who say "**Important**"*



Information Tools, e-Billing and Cost Demand Management

This section of the respondent feedback examines customer satisfaction with EnWin service and its communication campaign, attitudes towards e-billing and perceptions of EnWin's Cost Demand Management conservation programs.

Summary: Information Tools, e-Billing and Cost Demand Management

Most customers felt satisfied with the service provided (residential: 60%; small business: 70%) or the communications received (residential; 69%; small business; 75%) from EnWin.

- Residential customers struggling to pay their electricity bill were less satisfied on both measures.

A majority of residential (59%) and a strong plurality of small business customers (46%) felt that, instead of charging or incentivizing people to move to e-billing, EnWin should leave it up to the customers to decide.

- Again, residential customers who struggle to pay their electricity bills (64%) were the most likely to say, "leave it to customers".

More than half (residential: 57%; small business: 59%) of customers have not participated in EnWin's CDM Programs.

- Less than 4-in-10 residential (37%) and only 3-in-10 (30%) small business customers reported they have participated in EnWin's conservation program.

About 2-in-3 (residential; 66%; small business: 63%) felt that EnWin does a "good job" of providing information about the programs to manage electricity consumption.

When asked what EnWin could do to better provide conservation information, residential customers cited mailings (21%), emails (9%), and ads (7%) among other suggestions to improve communication.

Six-in-10 (60%) residential customers felt satisfied with the customer service provided by EnWin with nearly 4-in-10 (37%) who feel "very satisfied". Just 8% felt dissatisfied by their contact with EnWin staff and 5% felt neither satisfied nor dissatisfied with their customer service experience. (Nearly 1-in-4 (22%) hadn't been in contact with EnWin staff.)

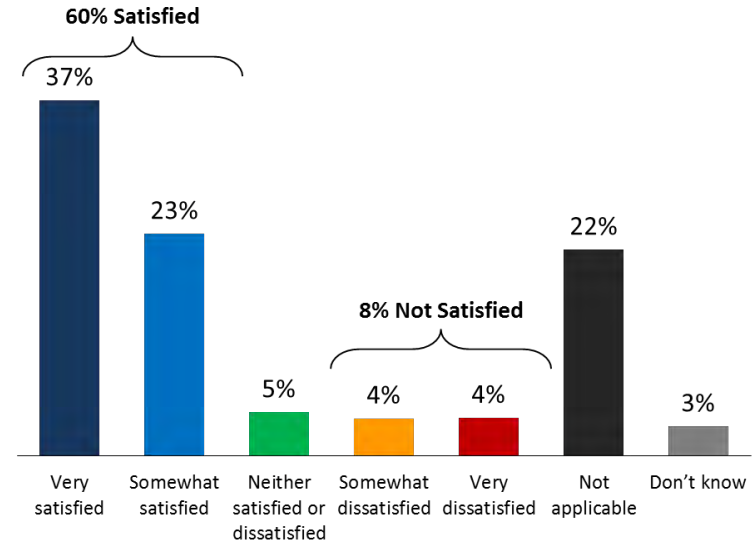
- Those most significantly impacted by their bills (60%) and those with the lowest consumption levels (57%) felt the least satisfied.

Figure 16R: Customer Service Satisfaction, General

Q Overall, how satisfied or dissatisfied are you with the customer service provided by **EnWin**?

Would you say you are *very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied*, or would you say you *don't know*. If you have not been in contact with **EnWin** staff, just let me know.

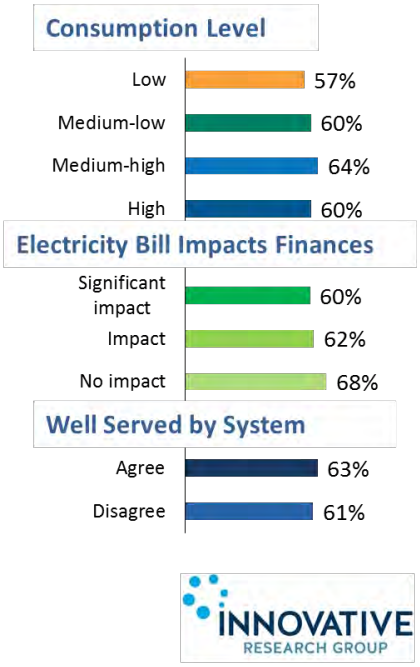
[asked of all respondents; n=560]



Note: 'Refused' (3%) not shown

Sample Breakdown ▸▸

*Those who say "**Satisfied**"*



A strong majority (70%) of small business customers felt satisfied with EnWin's customer service, including 4-in-10 (40%) "very satisfied" customers. Only 4% said they were dissatisfied with their customer service. The remaining customers felt either ambivalent (7%), didn't know how to respond (6%) or hadn't been in contact with EnWin staff (13%).

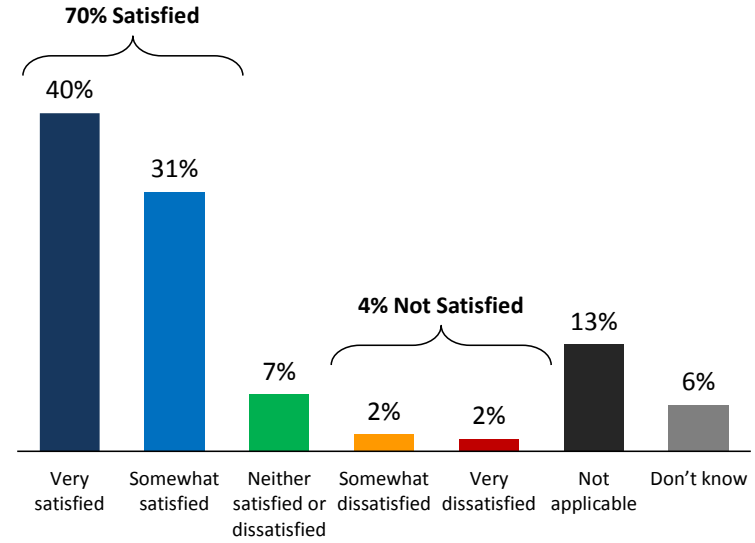
- "Significantly impacted" small business customers (77%) were a bit more likely to feel satisfied with EnWin's customer service ("no impact": 70%).

Figure 16GS: Customer Service Satisfaction, General

Q Overall, how satisfied or dissatisfied are you with the customer service provided by **EnWin**?

Would you say you are *very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied*, or would you say you *don't know*. If you have not been in contact with **EnWin** staff, just let me know.

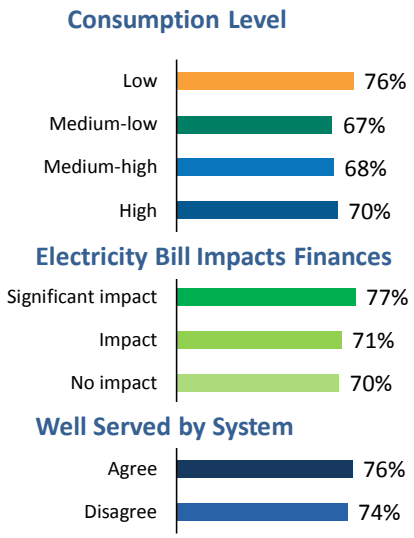
[asked of all respondents; n=200]



Note: 'Refused' (2%) not shown

Sample Breakdown ▸▸

*Those who say "**Satisfied**"*



Nearly 7-in-10 (69%) residential customers felt satisfied with the communications they received from EnWin regarding their electrical service. More than 3-in-10 (31%) felt "very satisfied" and less than 4-in-10 (38%) were "somewhat satisfied". Just 10% said they were either "somewhat dissatisfied" (5%) or "very dissatisfied" (5%). About 2-in-10 (19%) either didn't feel strongly either way (10%) or didn't know how to respond (9%).

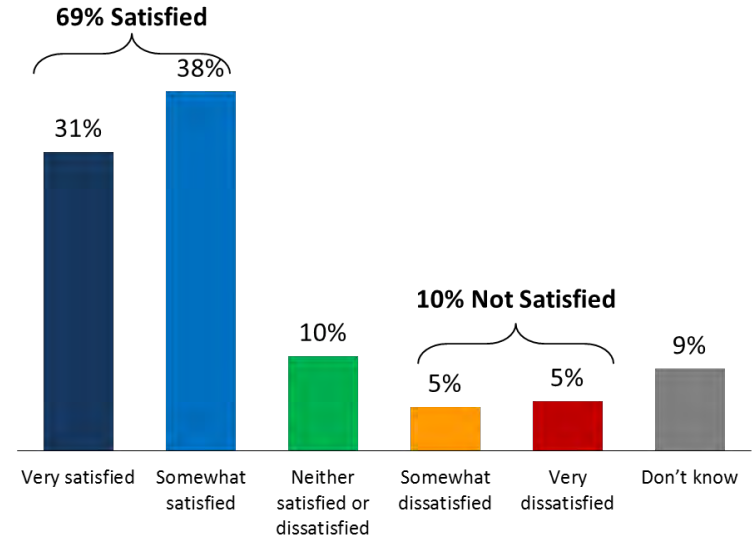
- Residential customers severely impacted by their electricity bill (67%) and those who feel least well served (64%) felt the least satisfied with EnWin communications.

Figure 17R: Customer Satisfaction, Communications about Service

Q Overall, how satisfied or dissatisfied are you with the communications that you receive from **EnWin** related specifically to your electrical service?

Would you say you are *very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied* or would you say you *don't know*?

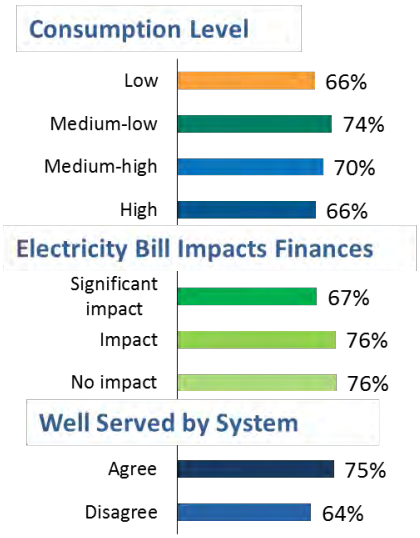
[asked of all respondents; n=560]



Note: 'Refused' (3%) not shown

Sample Breakdown

*Those who say "**Satisfied**"*



3-in-4 (75%) small business customers felt satisfied with the service communications they receive from EnWin. Just 3% of customers reported they were dissatisfied. About 1-in-10 felt ambivalent (9%) or didn't know how to respond (12%).

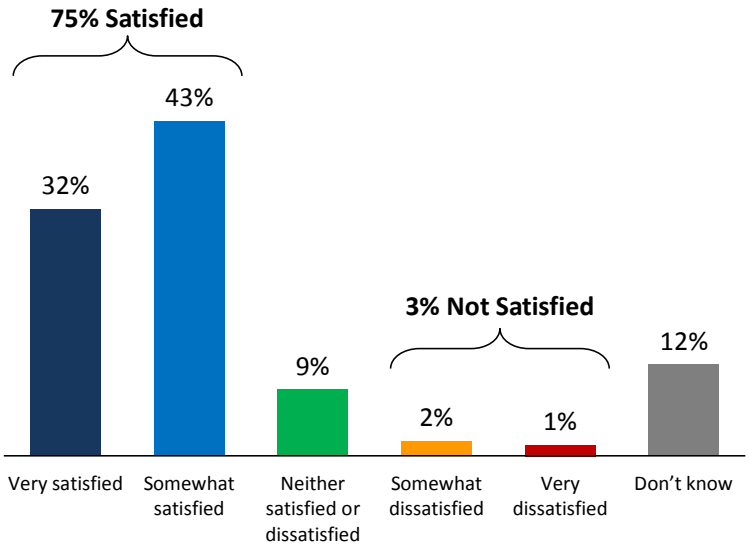
- Those significantly impacted by their electricity bill (81%) were a bit more likely to feel satisfied with EnWin's service communications than those with no impact (76%).

Figure 17GS: Customer Satisfaction, Communications about Service

Q Overall, how satisfied or dissatisfied are you with the communications that you receive from **EnWin** related specifically to your electrical service?

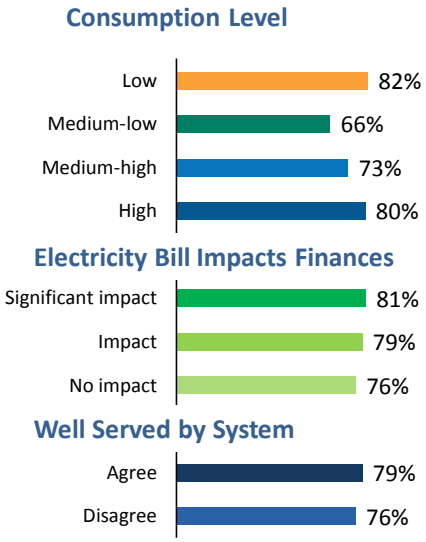
Would you say you are *very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied* or would you say you *don't know*?

[asked of all respondents; n=200]



Sample Breakdown ▸▸

*Those who say "**Satisfied**"*



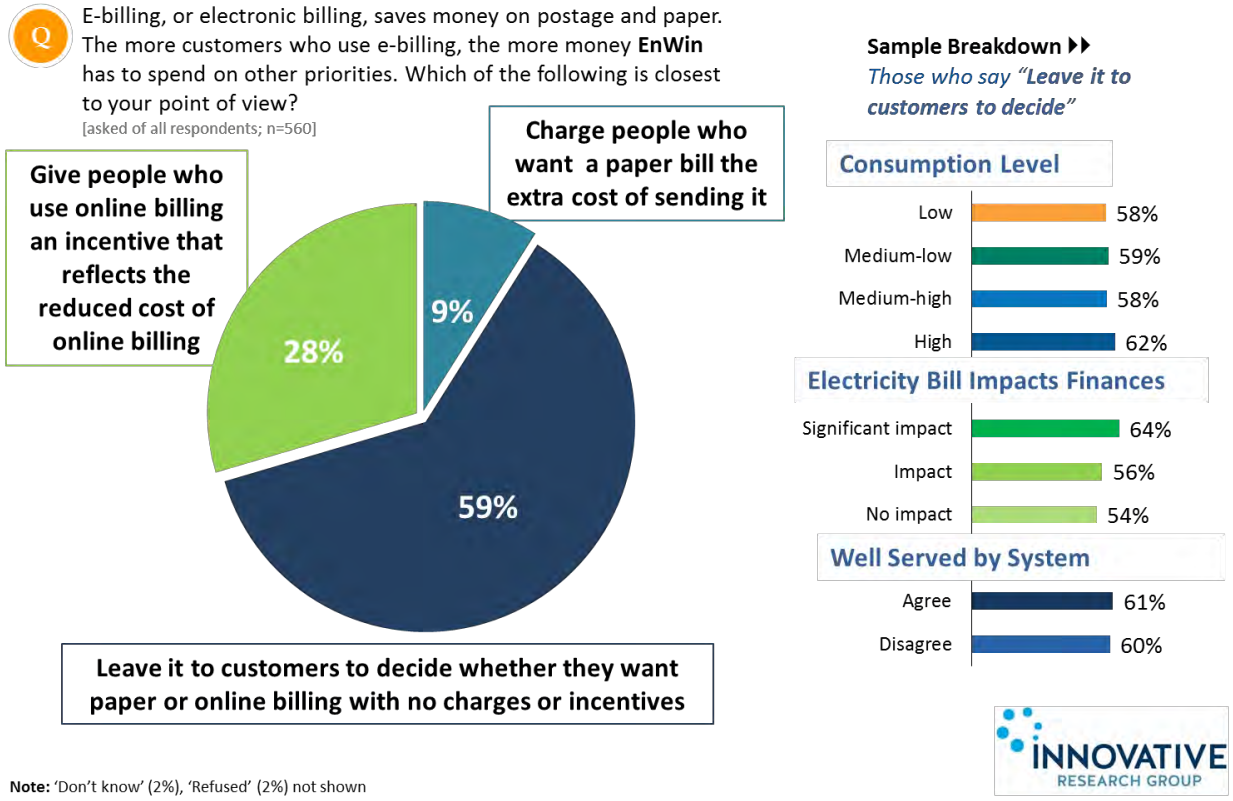
The next question on e-billing was prefaced by the statement:

"E-billing, or electronic billing, saves money on postage and paper. The more customers who use e-billing, the more money EnWin has to spend on other priorities."

When asked to choose between giving incentives to use e-billing, charging people extra for paper billing, or leaving it to customers to choose between e-billing and paper billing with no charges or incentives, residential customers picked the last option. Nearly 6-in-10 (59%) felt that EnWin should leave it to customers to decide while more than a quarter (28%) felt that EnWin should give people who use online billing an incentive. Just 9% of residential customers felt that EnWin should charge people who want a paper bill the additional cost.

- Severely impacted bill-payers (64%) were the most likely to want to leave it to customers to decide without additional charges or incentives.

Figure 18R: e-Billing Charges

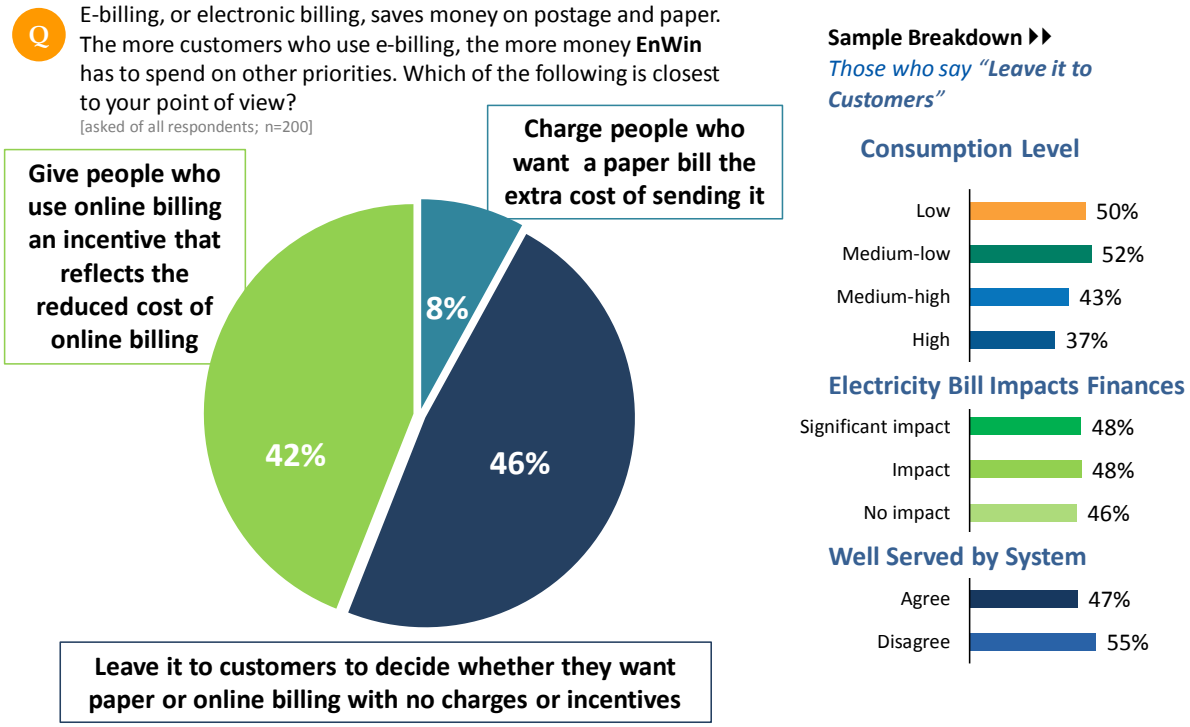


Note: 'Don't know' (2%), 'Refused' (2%) not shown

Nearly half (46%) of small business customers felt that, when it comes to e-billing, EnWin should leave it to the customers to decide with no charges or incentives. More than 4-in-10 (42%) thought that EnWin should give people incentives for using online billing and just 8% said that EnWin should charge people for the extra cost of paper bills.

- Low-consumption small business customers were the most likely group to say "leave it to the customers" ("low": 50%; "high": 37%).

Figure 18GS: e-Billing Charges



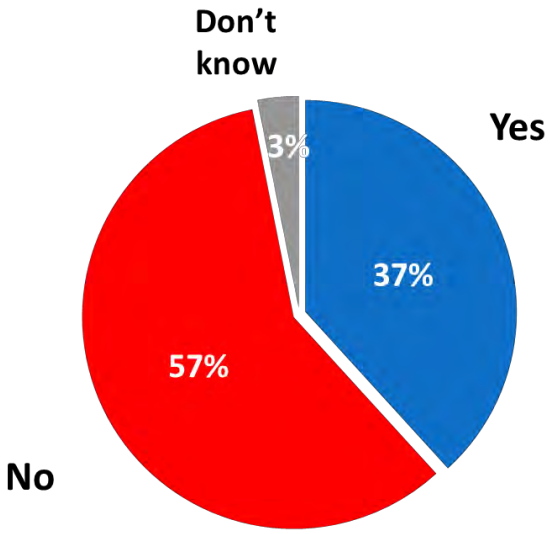
Note: 'Don't know' (4%), 'Refused' (1%) not shown

Most (57%) residential customers have not participated in EnWin's conservation programs. Less than 4-in-10 (37%) confirmed they have participated and 3% didn't know how to respond.

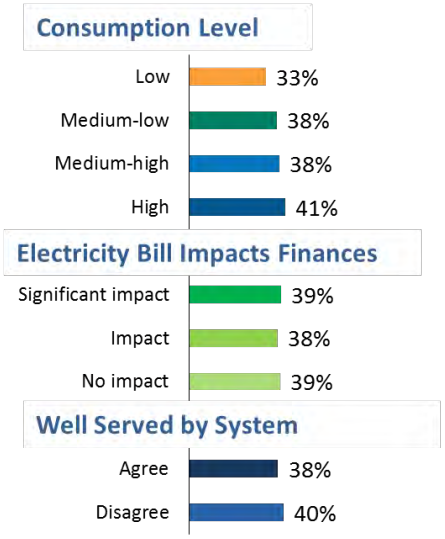
- High consumption (41%) customers were a bit more likely to have participated in the CDM programs than lower ones (33-38%).

Figure 19R: CDM Program Participation

Q Have you ever participated in a **EnWin** conservation program?
[asked of all respondents; n=560]



Sample Breakdown ▸▸
Those who say "Yes"

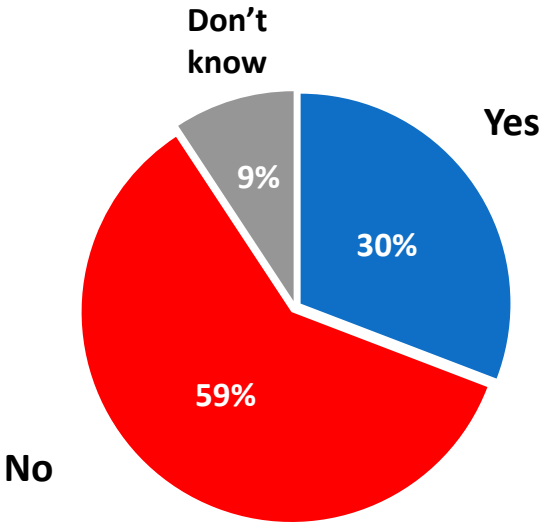


6-in-10 (59%) small business customers said, "no", they haven't participated in EnWin's conservation programs. Only 3-in-10 (30%) recall participating in the programs and 1-in-10 (9%) didn't know how to respond.

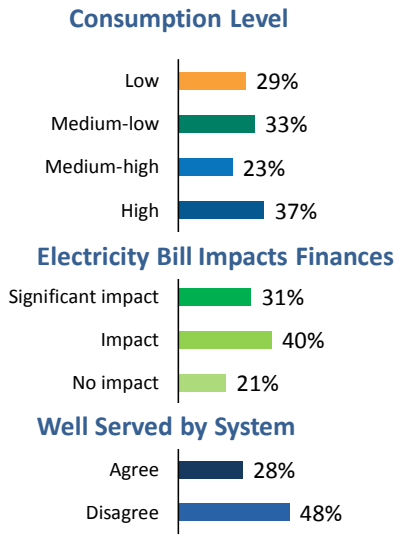
- Small business customers impacted by their electricity bills("significant impact": 31%; "impact": 40%; "no impact": 21%) and those who felt the system didn't serve them well ("disagree": 48%; "agree": 28%) are the most likely groups to have participated in a conservation program.

Figure 19GS: CDM Program Participation

Q Has your organization ever participated in a **EnWin** conservation program?
[asked of all respondents; n=200]



Sample Breakdown ▸▸
Those who say "Yes"

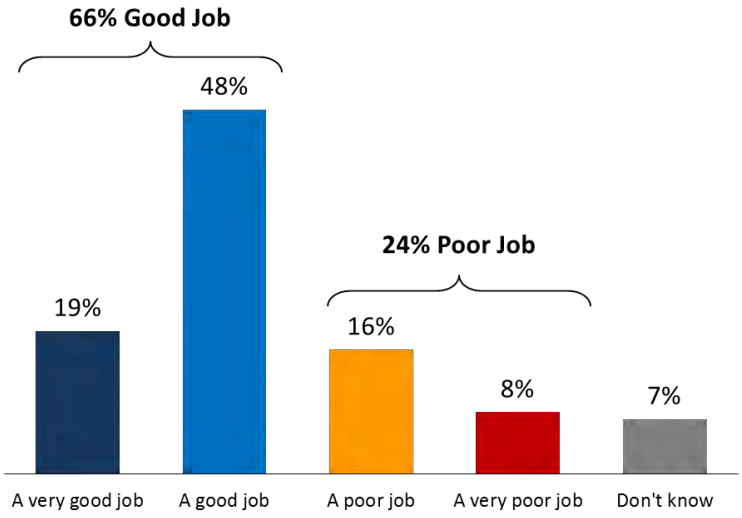


2-in-3 (66%) residential customers felt that EnWin does a "good job" at providing information on available tools and programs to manage household electricity consumption. Just 1-in-4 (24%) thought that EnWin does a poor job of providing CDM information.

- Those who feel well served (73%) are most likely to say "good job" while those who do not (55%) are least likely.

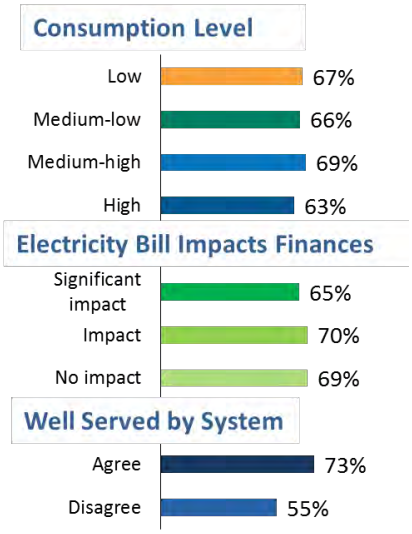
Figure 20R: Job Satisfaction with CDM Information

Q How *good* or *poor* a job does **EnWin** do at providing you with information on available tools and programs that can help you manage your household electricity consumption?
[asked of all respondents; n=560]



Note: 'Refused' (2%) not shown

Sample Breakdown ▸▸
*Those who say "**Good job**"*

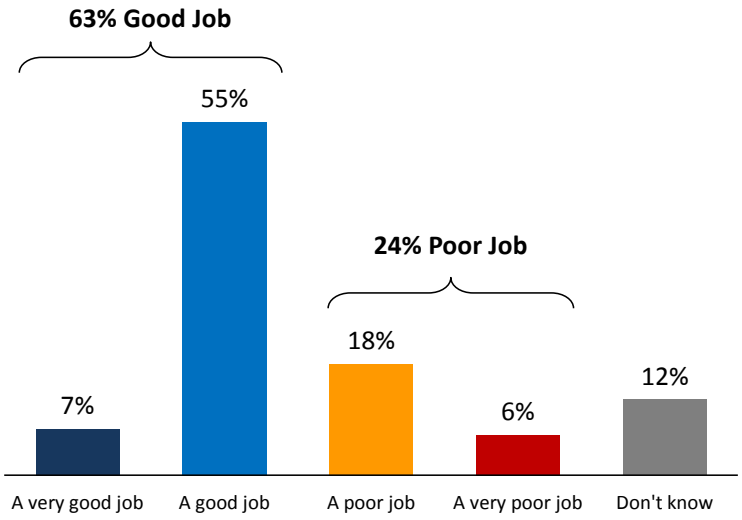


Nearly 2-in-3 (63%) small business customers said EnWin does a "very good" (7%) or "good" job (55%) providing their organization with the necessary information to manage consumption. Only 1-in-4 (24%) felt that EnWin does a poor job and 12% didn't know how to respond.

- Those least impacted by their bills (82%) are most likely to say that EnWin does a good job at providing information on electricity consumption tools.

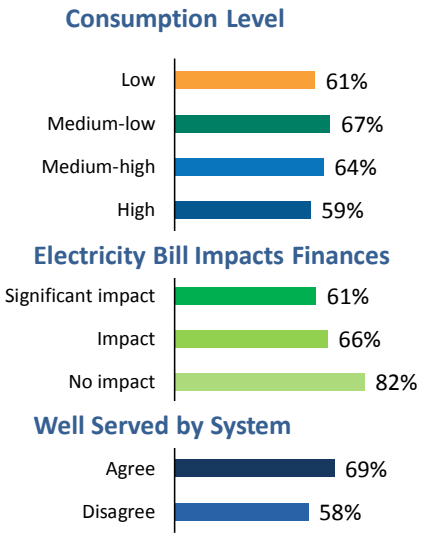
Figure 20GS: Job Satisfaction with CDM Information

Q How *good* or *poor* a job does **EnWin** do at providing your organization with information on available tools and programs that can help you manage or conserve your electricity consumption?
[asked of all respondents; n=200]



Note: 'Refused' (2%) not shown

Sample Breakdown
*Those who say "**Good Job**"*

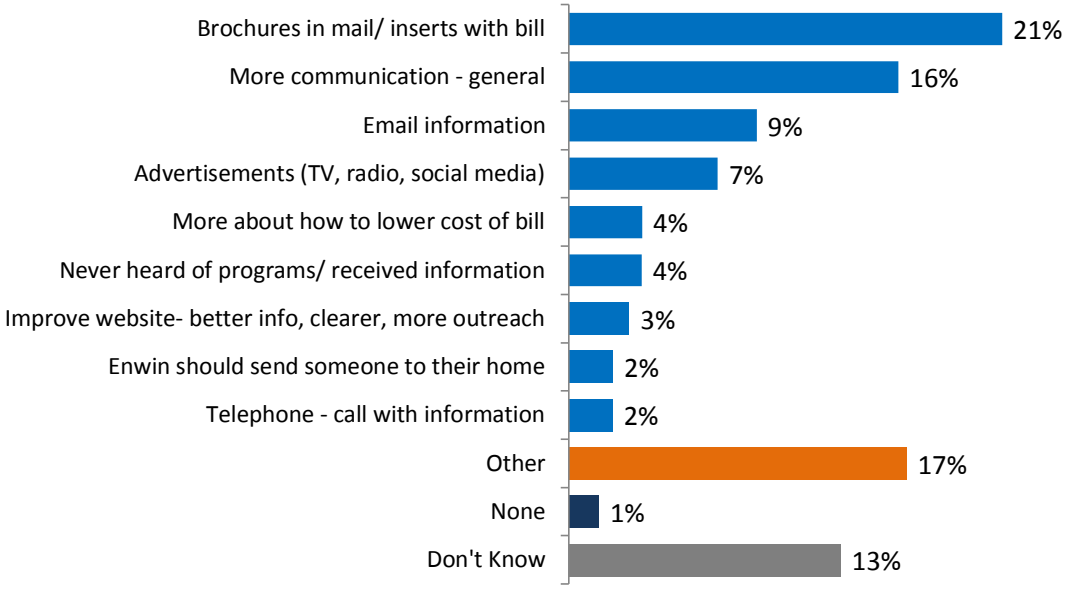


When asked how EnWin could better provide information on electricity conservation, more than 2-in-10 (21%) residential customers suggested brochures in the mail or inserts with the bill, while an additional 16% suggested more communication in general. Other specific suggestions included "emailed information" (9%), "advertisements (TV, radio, social media)" (7%), "more about how to lower the cost of bills" (4%), "improved website" (3%), "sending someone to their home" (2%) and "calling with additional information" (2%). More than 1-in-10 (13%) didn't know how to respond.

Figure 21R: Suggestions to Provide Better Information [OPEN]

Q And how can EnWin do a better job of providing you with information on available tools and programs to help you conserve electricity?

[asked of all those who said EnWin does a poor job providing information; n=137]



Note: Only three small business customers offered a response to this question, each one in favour of a different means of communication. Their verbatim responses are as follows:

- "Have [multiple] bills to be in one, and give more information on electricity consumption."
- "Face to face consultations in person."
- "Through newsletters and emails."

Assessment of Proposed Plan

The final section of respondent feedback focuses on the assessment of the plan: did EnWin customers support the plan, and why or why not?

Summary: Assessment of Plan

More than half of customers (residential: 54%; small business: 59%) give permission for the proposed range of rate increases.

- There is a striking gap on permission between residential customers who struggle to pay their electricity bills (40%) and the rest ("somewhat impact": 68%; "no impact: 79%).
- The same is true of small business customers on permission between whose electricity bills have a significant impact on their bottom line (51% permission) and the rest ("some impact": 80%; "no impact: 87%).

The primary reason residential customers oppose the increase is that their current bill costs too much. Some also feel that "EnWin should have planned better or make do with what it currently has" (11%) or that they don't trust EnWin to spend the money properly (11%).

Reasons for support mostly focus on the reasonableness of the amount, that it's necessary and that it's to be expected ("reasonable, support it"; 52%; "don't like it, but necessary"; 46%) as well as the importance of upgrading and maintain the system for the future ("support": 31%; "necessary": 15%).

When asked to choose between four outcomes for reliability and service performance – pay $5.25 ($12.00 GS) to **improve**; pay $4.35 ($10.00 GS) to **maintain**; pay $3.45 ($7.90 GS) to **decline**; and pay nothing for **significant decline** to reliability and service:

- 1-in-4 (24%) residential customers would accept $4.35 to **maintain** and 17% would accept the highest rate increase ($5.25) to **improve**. Less than 1-in-10 (9%) accept an additional $3.45 for potentially **declining** reliability and service.
- Half (53%) of those residential customers significantly impacted by their bills refuse to pay additional charges. Conversely, just 23% of those not impacted by their bills feel the same.
- Similarly for small business customers, 11% would accept the highest rate increase ($12 a month) to **improve** performance; 1-in-4 (25%) would accept the "maintain" **increase** ($10) and 17% would accept a $7.90 increase understanding that reliability and service could **decline**.

The final permission questions began with the following statement describing the range of the rate increase:

"Over the years, EnWin has worked hard to keep its equipment working up to, and well beyond, its expected useful life, providing maximum value for money. However, at present, the systems key investment requirements come from the need to replace aging distribution assets.

The investments required to address these key areas, maintain reliability and safety and invest in other infrastructure priorities between 2019 and 2023 is estimated to be $93.4 million.

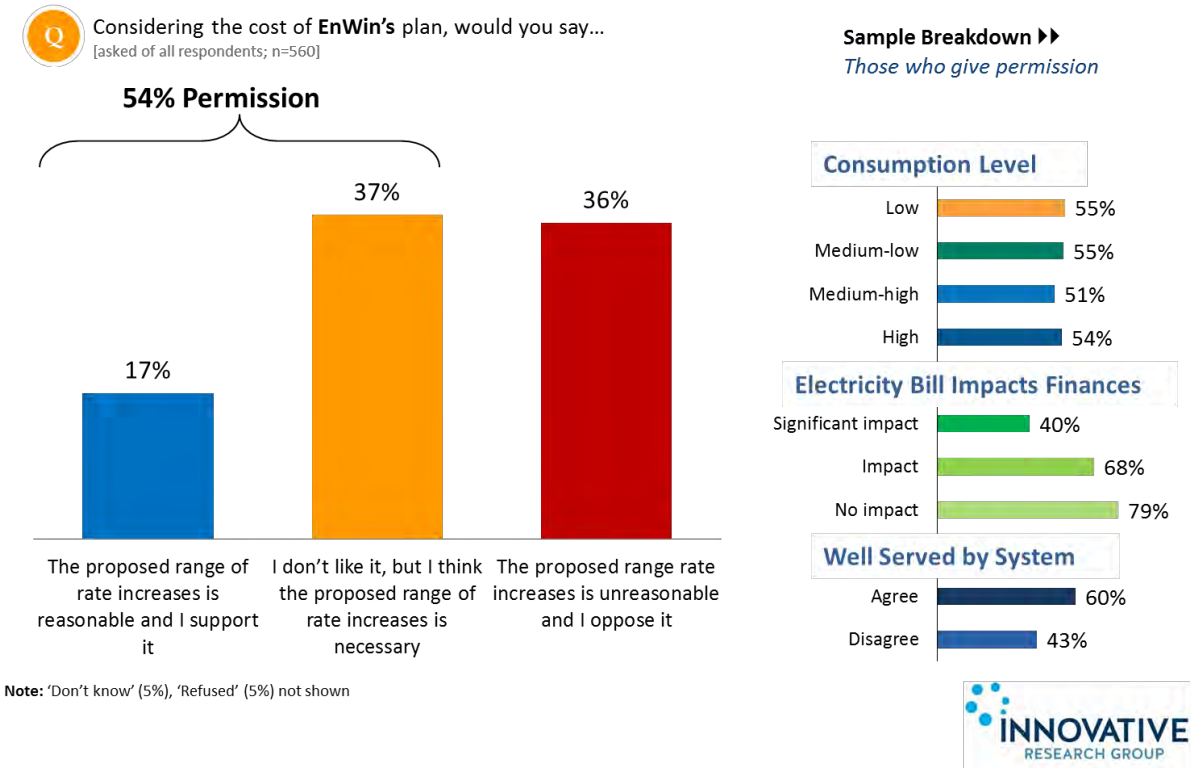
*To fund this plan, EnWin is has estimated that the average residential/small business customer could experience a monthly increase of between **$1.70** and **$3.40** (small business: **$3.83** and **$7.70**) on the EnWin portion of the bill between now and 2019.*

*By 2023, it is estimated that the seven-year total EnWin increase for the average household/small business could be between **$3.45** and **$5.25** (small business: **$7.90** and **$12.00**) per month."*

A majority (54%) of residential customers gave permission for EnWin's planned rate increase. Just 17% thought the rate increase is reasonable and support it and less than 4-in-10 (37%) didn't like it, but felt the increase was necessary. About the same number (37%) thought the rate increase was unreasonable and didn't support it.

- Those struggling to pay their electricity bill were much less permissive: just 40% of those significantly impacted gave their permission. Twice as many, nearly 8-in-10 (79%) of those not impacted supported it or thought it was necessary.
- Those who feel well served (60%) are much more likely to give permission than those who do not (43%).

Figure 22R: Permission for Rate Increase



Customers were then asked a follow-up question asking them to explain their permission decision. The responses were divided into three categories in the chart below: those who thought it was reasonable, those who didn't like it but felt it was necessary and those who opposed it.

Of the 88 residential customers who supported the rate increase, more than half (52%) found it to be a reasonable increase, a necessary one or meeting their expectation. About 3-in-10 (31%) cited how important it was to upgrade and maintain the system for the future. And an additional 7% thought it would cost more to wait.

Among the 191 residential customers who didn't like it, but thought it was necessary, less than half thought the increase was "reasonable, necessary and to be expected", another 15% mentioned how important it was to upgrade and maintain the system for the future" and 2% cited that waiting will cost more in the end. Some negative reasons included "the electricity bill is already too high" (7%) and they didn't like any increase (5%).

Nearly half of the 196 residential customers who opposed it felt that their "bill was already too high" (46%). Other reasons included "EnWin should make do/have planned better" (11%), "don't trust EnWin to spend properly, won't see the benefit" (11%), "don't like any increase" (8%), "management salaries are too high" (5%), "increase amount is too much, already increased it recently" (3%) and "high cost of living hurting low-income Ontarians" (1%).

Figure 23R: Reasons for Permission/Opposition [OPEN]

Q And why do you say that?
[asked of all respondents with response; n=475]

Permission: Reasonable, and support	
Increase reasonable, necessary and to be expected	52%
Upgrading/maintaining system important (for future)	31%
Waiting will cost more	7%
Other	7%
Sample size	**n=88**

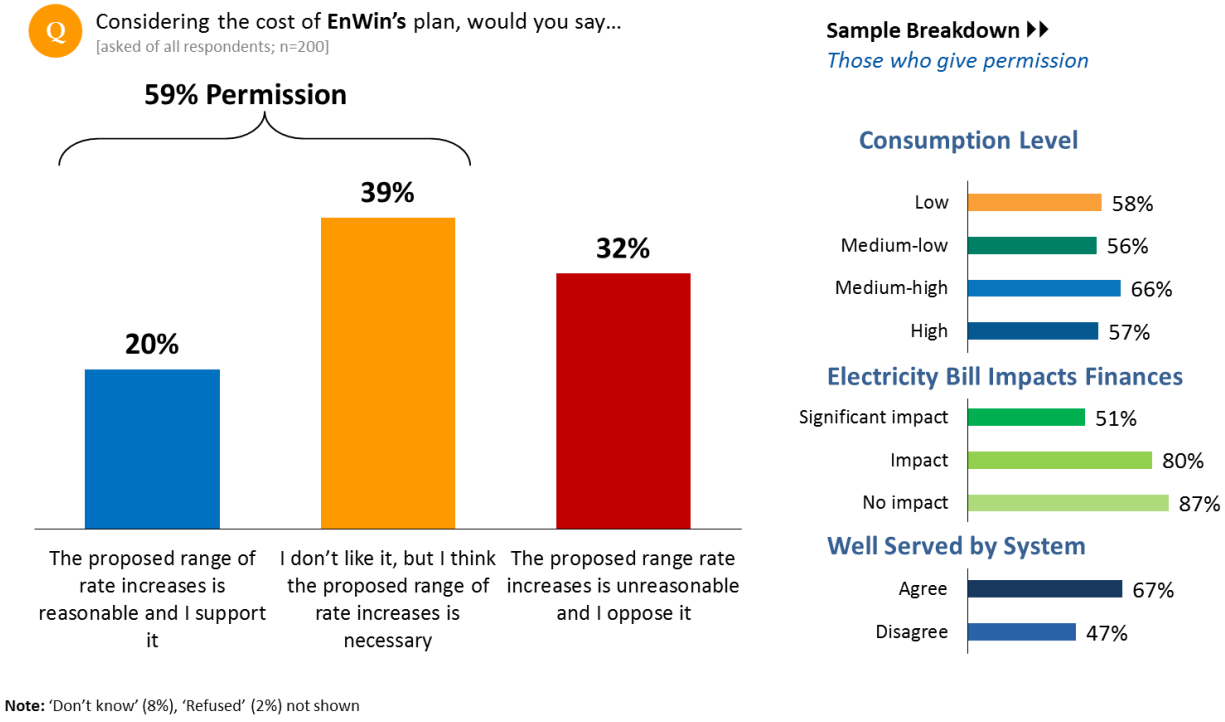
Oppose it	
Bill is already too high	46%
Other	13%
EnWin should make do/have planned better	11%
Don't trust EnWin to spend properly/won't see benefit	11%
Don't like any increase	8%
CEO/management salaries too high	5%
Increase amount is too much, already increased it recently	3%
No reason	2%
High cost of living, hurting low-income Ontarians	1%
Don't Know	1%
Sample size	**n=196**

Permission: Don't like, but necessary	
Increase reasonable, necessary and to be expected	46%
Other	20%
Upgrading/maintaining system important (for future)	15%
Bill is already too high	7%
Don't like any increase	5%
No reason	3%
Don't Know	2%
Waiting will cost more	2%
Sample size	**n=191**

Nearly six-in-ten (59%) small business customers felt that either the proposed range of rate increases sounded reasonable and supported it (20%) or they didn't like it, but felt it was necessary (39%). 1-in-3 (32%) thought the proposed rate increase was unreasonable and opposed it.

- Those who did not feel impacted by their electricity bill ("no impact": 87% permission; "significant impact": 51%) and those who felt well-served by the system (agree: 67%; disagree: 47%) were much more likely to give permission.

Figure 22GS: Permission for Rate Increase



Note: 'Don't know' (8%), 'Refused' (2%) not shown

Reasons why small business customer feel the way they feel towards the proposed range of rate increases include:

Figure 23GS: Reasons for Permission/Opposition [OPEN]

Q And why do you say that?
[asked of all respondents with response; n=162]

Permission: Reasonable, and support	%
It is a small increase over time	51%
They have to improve things	29%
Price of everything goes up	6%
No one wants a rate increase	3%
They should find other ways to finance it	3%
Other	9%
Sample size	**n=35**

Permission: Don't like, but necessary	%
They have to improve things	21%
No one wants a rate increase	21%
Already paying too much	11%
They should find other ways to finance it	9%
No choice/someone has to pay for it	8%
Other	6%
Price of everything goes up	5%
It is a small increase over time	3%
Don't trust EnWin	3%
Increase is too high/can't afford any more	2%
Refused	12%
Sample size	**n=66**

Oppose Proposed Range	%
Already paying too much	28%
Increase is too high/can't afford any more	21%
They should find other ways to finance it	14%
Don't trust EnWin	7%
No one wants a rate increase	5%
Everything is being increased, the system should be better	4%
Other	12%
Don't Know	2%
Refused	7%
Sample size	**n=57**

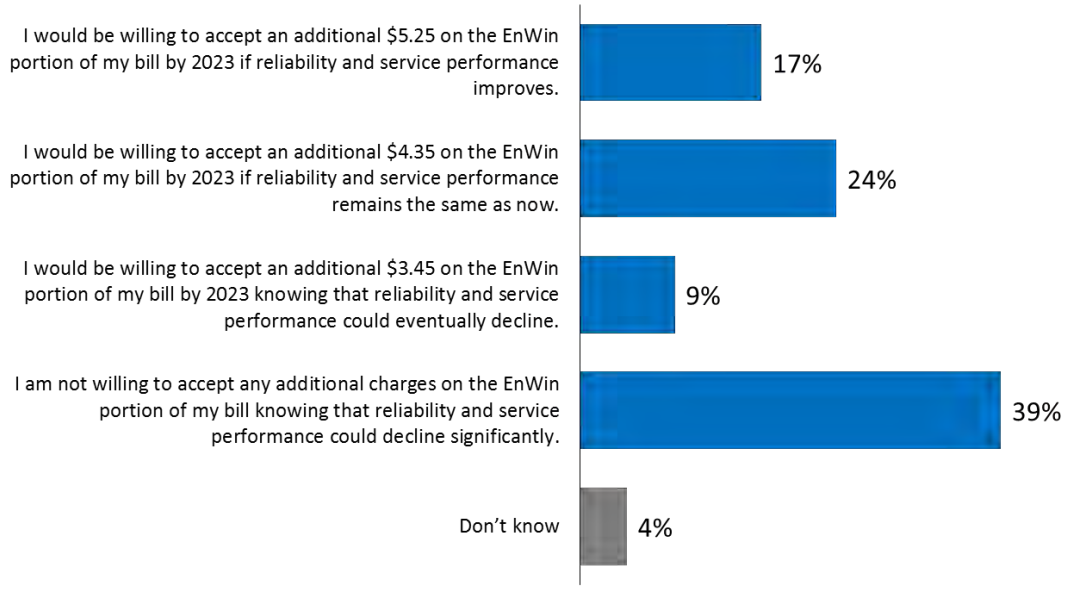
The last core question of the survey posited four alternative scenarios: a $5.25 increase to see reliability and service improve; a $4.35 increase to see reliability and service remain the same; a $3.45 increase with the understanding that reliability and service might decline; and no additional charges which may result in significantly reduced reliability and service.

A plurality (39%) would not accept any additional charges, even with the understanding their "service and reliability could **decrease significantly**". Of the three remaining outcomes, the "**maintain**" solution wins out with 24% who would pay an additional $4.35. Less than 2-in-10 (17%) would accept an additional $5.2.5 to **improve** reliability and service. Just 9% would be willing to accept an additional $3.45 for a **decline** in reliability and service.

- A majority (53%) of those significantly impacted by their electricity bills refused to pay any additional charges, compared to just 23% of those who were not impacted by their bills.
- Similarly, just 10% of significantly impacted residential customers would accept a $5.25 increase for improved reliability and service. Nearly a third (32%) of financially secure residential customers feel the same.

Figure 24R: Alternative Rate Increase Scenarios

Q Knowing this, which of the following statements is closest to your view?
[asked of all respondents; n=560]

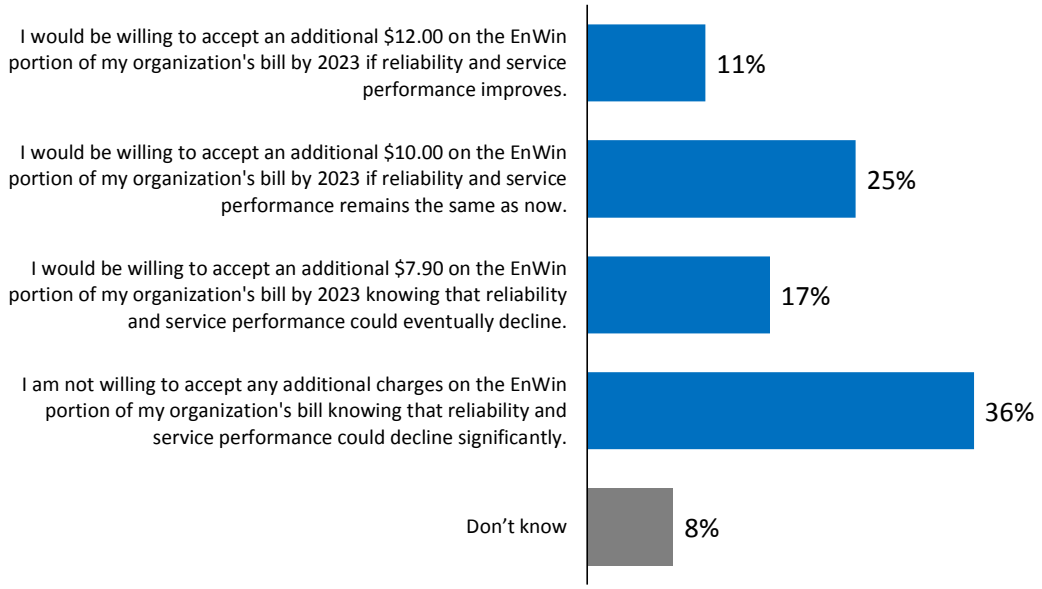


Small business customers were asked the same question with estimates scaled to their rate class: a $12 increase for improved reliability and service; a $10 increase for maintained reliability and service; a $7.90 increase for declining service; and no increase with significantly decreased system reliability.

A plurality (36%) felt unwilling to accept any additional charges on their organization's bill. Less than 2-in-10 (17%) would accept a $7.90 increase for declining service and 1-in-4 (25%) felt willing to accept an additional $10 a month to maintain their current levels of service and reliability. Just 11% of small business customers would accept an additional $12 to improve service and reliability.

Figure 24GS: Alternative Rate Increase Scenarios

Q Knowing this, which of the following statements is closest to your view?
[asked of all respondents; n=200]



Survey Instruments

Residential Survey Instrument

A. Screening and Qualifications

Introduction

Hello, my name is _____ and I'm calling from **Innovative Research Group** on behalf of **EnWin Utilities**, your electricity distributor.

Innovative Research Group is a national public opinion research firm. We have been commissioned by **EnWin** Utilities to help them better understand the needs and preferences of customers who are responsible for paying their household's electricity bill.

EnWin Utilities – which distributes electricity to homes and businesses in your community – is preparing to submit its investment plan to the Ontario Energy Board for regulatory review. Since this plan will impact your bill, **EnWin Utilities** wants to hear from you, so your views can help shape its plan.

A.1 Would you mind if I had **10 minutes** of your time to ask you some questions? All your responses will be kept strictly confidential.

1	Yes	[**continue**]
2	No – NOT PRIMARY BILL PAYER	[**go to TRANSFER-1**]
3	No – BAD TIME	**ARRANGE CALLBACK**
4	No – HARD REFUSAL	[**Terminate**]

MONIT

This call may be monitored or audio taped for quality control and evaluation purposes.

1	PRESS TO CONTINUE	

A2. Have I reached you at your home phone number?

1	Yes – SPEAKING, CONTINUE	[**continue to A3**]
2	No – AT OFFICE or WORKPLACE	[**continue to A3**]
3	No – on cellular or mobile phone	[skip to CELL]
99	Refused – LOG (THANK AND TERMINATE)	[**Terminate**]

CELL. Are you currently operating a car, truck or other motor vehicle?

1	YES	ARRANGE CALLBACK
2	NO	[continue to A3]
98	Refused – LOG (THANK AND TERMINATE)	[**Terminate**]

A.3 Are you the person primarily responsible for paying the electricity bill in your household?

1	Yes – I pay the bill	[continue to A4]
2	Yes – shared responsibility	[continue to A4]
3	No	[go to TRANSFER-1]
98	Don't know (**DNR**)	[**Terminate**]

TRANSFER-1

Can I speak with the person in your household who usually pays the electricity bill?

1	Yes	[**BACK TO** *INTRO*]
2	No – NOT AVAILABLE/BAD TIME	[ARRANGE CALLBACK]
3	No – HARD REFUSAL	[**Terminate**]
98	Don't know (**DNR**)	[**Terminate**]

A4. And can you confirm that your household receives an electricity bill from **EnWin Utilities**?

1	Yes	[**continue**]
2	No	[**Terminate**]
98	Don't know (**DNR**)	[**Terminate**]

GENDER	**Note gender by observation:**
1	Male
2	Female

B. General Satisfaction

We need to prime respondents to start thinking about electricity and the part of the system that EnWin operates.

[PREAMBLE]

To begin, I'd like to ask you some questions about your electricity service.

Today we want to talk about **EnWin Utilities** and the local electricity system in your community. This is the system that takes the electricity from provincial transmission towers and brings it to your home through a network of wires, poles and other equipment that is owned and operated by **EnWin.**

B5. How familiar are you with **EnWin**, which operates the electricity distribution system in your community? Would you say you are very familiar, somewhat familiar, not familiar or would you say you don't know?

01	Very familiar
02	Somewhat familiar
03	Not familiar
98	Don't know (DNR)
99	Refused (DNR)

B6. In general, how satisfied or dissatisfied are you with the services you receive from **EnWin**?

Would you say you are very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied or would you say you don't know enough to say?

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
98	Don't know (DNR)
99	Refused (DNR)

B7. Is there anything in particular **EnWin** can do to improve its service to you? [OPEN]

98	Don't know (DNR)
99	Refused (DNR)

C. Bill Knowledge & Impact

I'd now like to talk with you about your electricity bill …

C8. While **EnWin** is responsible for collecting payment for the entire electricity bill, they retain only about **20%** of the average residential customer's bill. This is about **$27** on an average **$135** monthly electricity bill. The rest of the bill goes to power generation companies, transmission companies, the provincial government and regulatory agencies.
Before this survey, how familiar were you with the percentage of your electricity bill that went to **EnWin**? Would you say you were very familiar, somewhat familiar, not familiar or would you say you don't know?

01	Very familiar
02	Somewhat familiar
03	Not familiar
98	Don't know (DNR)
99	Refused (DNR)

C9. Do you feel that the **20%** of your total electricity bill that you pay to **EnWin** for the services they provide is very reasonable, somewhat reasonable, somewhat unreasonable, very unreasonable or would you say you don't know?

01	Very reasonable
02	Somewhat reasonable
03	Somewhat unreasonable
04	Very unreasonable
98	Don't know (DNR)
99	Refused (DNR)

D. Customer Priorities

EnWin regularly holds discussions with its customers to better understand how it should set spending priorities with ratepayer dollars.

In recent conversions with customers, a number of company goals were identified as priorities for **EnWin**.

D10. Among the following priorities, please tell me which one is most important to you as an EnWin customer.

[READ LIST; RANDOMIZE LIST]

01	Delivering electricity at a reasonable price.
02	Ensuring reliable electrical service.
03	Ensuring the safety of electrical infrastructure.
04	Providing enhanced customer service.
05	Helping customers with electricity conservation and efficient usage.
06	Enhancing the electrical system to help customers reduce greenhouse gases.
98	Don't know (DNR)
99	Refused (DNR)

D11. What is the next most important priority?
[Remove answer from D10 if asked to read again]

D.12 And what do you consider the third most important priority?
[Remove answer from D10 and D11 if asked to read again]

D.13 Are there any other important priorities that **EnWin** should be focusing on that weren't included in the previous list I read? [OPEN]

E. System Reliability

These questions are about priming the respondent to think about their experience with system reliability and separate adverse weather from failing equipment.

PREAMABLE-2:
I'd now like to read you a few statements about the electrical service that you receive from **EnWin**.

Despite best efforts, no electrical distribution system can deliver perfectly reliable electricity. As a general rule, the more reliable the system, the more expensive the system is to build and maintain.

With that said, the average **EnWin** customer experiences **two** unexpected power outages per year.

ASK ALL
For each of the following statements, please tell me if you are very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied, or would you say you don't know?

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
98	Don't know (DNR)
99	Refused (DNR)

E14. The reliability of your electricity service as judged by the number of power outages you experience.
E15. The amount of time it takes to restore power when power outages occur.
E16. The quality of the power delivered to you as judged by the absence of voltage fluctuations that can result in the flickering or dimming of lights.
[END BATTERY]

E17. In your view, how do you think EnWin should address the **number** of customer power outages? Would you say … [READ LIST]
[Rotate response codes 1 and 3]

01	Spend what is needed to **reduce** the number of unexpected power outages
02	Spend what is needed to **maintain** the current level of unexpected power outages
03	**Accept more** power outages in order to help keep customer costs from rising
98	Don't know (DNR)
99	Refused (DNR)

E18. Overall, the average **EnWin** customer is without power for about **one hour per year**.

In your view, how do you think EnWin should address the **length of time** customers are without power? Would you say … [READ LIST]
[Rotate response codes 1 and 3]

01	Spend what is needed to **reduce** the length of unexpected power outages
02	Spend what is needed to **maintain** the current length of unexpected outages
03	**Accept longer** time without power in order to help minimize customer costs from rising
98	Don't know (DNR)
99	Refused (DNR)

F. Reaction to Customer Input

Below are the common themes that have arisen in qualitative customer consultations.

The following statements have been made by customers throughout EnWin's on-going customer engagement.
For each statement, please tell me if you strongly agree, somewhat agree, somewhat disagree or strongly disagree.

01	Strongly agree
02	Somewhat agree
03	Neither agree nor disagree (DNR)
04	Somewhat disagree
05	Strongly disagree
98	Don't know
99	Refused [DNR]

RANDOMIZE QUESTIONS

Willingness / Ability to Pay

F19. I'm willing to pay a bit more for my electricity if it means better system reliability.

Pay Now or Later

F20. We should invest in our electricity system now, while the local economy is relatively strong and unemployment is relatively low.

Legacy

F21. Nobody likes to pay more for electricity, but I think we have an obligation to maintain the reliability of our local electrical system for future generations.

Modernizing the Grid

F22. We need to modernize the local electricity system so consumers can have greater control over their electricity usage.

System Reliability

F23. A few power outages are fine for me personally, but I worry about the impact this has on more vulnerable people, such as the elderly.

Labour Costs

F24. Skilled hydro workers are sought out across both North America and Ontario. EnWin should pay the people who maintain the local distribution system a competitive salary, or they risk losing the most qualified and experienced hydro workers to other utilities.

Competitive Advantage

F25. A reliable local electricity system is a competitive advantage for the City of Windsor and can help retain existing jobs and attract new ones.

G. Capital Plan Priorities

System Renewal Question

[PREAMBLE] While **EnWin** believes it has done its best to prolong the life of the assets that make up the distribution system, many of these assets are approaching the end of their useful life.

As part of its investment plan, **EnWin** is proposing a sizeable infrastructure replacement or renewal program. The estimated cost of this proposed program is **$30.4 million** between 2019 and 2023.

Although this plan will allow **EnWin** to make the necessary investments to maintain system reliability, **it will have an impact on customer bills.**

G26. Which of the following statements best represents your point of view?

[Read and Rotate statements 1 and 2]
Some customers have said …

01	**EnWin** should invest what it takes to replace the system's aging infrastructure to maintain system reliability; even if that increases my monthly electricity bill by a few dollars over the next few years.

Others have said …

02	**EnWin** should lower its estimated investment in renewing the system's aging infrastructure to lessen the impact of any bill increase; even if that means more or longer power outages.

98	Don't know (DNR)
99	Refused (DNR)

General Plant

G27. **EnWin** is not just the local electricity distribution system itself, but a company that operates the system. As a company, **EnWin** needs buildings to house its staff, vehicles and tools to service the power lines, and IT systems to manage the electrical system and customer information.

Again, customers have made a number of statements about this sort of investment. Which of the following statements best represents your point of view?
[Read and Rotate statements 1 and 2]

Some customers have said …

01	EnWin should find ways to make do with the buildings, equipment, vehicles and IT systems it already has.

Others have said …

02	While EnWin should be wise with its spending, it is important that its staff have the equipment and tools they need to manage the system safely, efficiently and reliably.

98	Don't know (DNR)
99	Refused (DNR)

System Service Questions

[PREAMBLE] Modernizing the grid can allow **EnWin** to improve reliability. Investments such as automated switches may allow **EnWin** to quickly identify the location of outages in order to minimize the number of people impacted by outages and to restore electricity to customers more quickly than was previously possible.

G28. Given there are many other areas of needed investments, such as replacing aging equipment, how important do you feel it is for **EnWin** to invest now in modernizing the grid? Would you say … [READ LIST]

01	Very important
02	Somewhat important
03	Not very important
04	Not important at all
98	Don't know
99	Refused [DNR]

H. Information Tools & E-Billing

H29. Now I'd like to ask you about the customer service you have received when dealing with employees of **EnWin** - whether on the telephone, via email, in person or through online conversations including social media.

Overall, how satisfied or dissatisfied are you with the customer service provided by **EnWin**?

Would you say you are very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied, or would you say you don't know. If you have not been in contact with **EnWin** staff, just let me know.

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
97	Not applicable – Have never been in contact with **EnWin** staff
98	Don't know
99	Refused [DNR]

H30. I would now like you to think about the communications that you may receive from **EnWin** without talking directly to an employee. This may include information found on their website, bill inserts, advertising, notices, emails, or social media sites.

Overall, how satisfied or dissatisfied are you with the communications that you receive from EnWin related specifically to your electrical service?

Would you say you are very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied or would you say you don't know?

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
98	Don't know
99	Refused [DNR]

E-Billing Question

H31. E-billing, or electronic billing, saves money on postage and paper. The more customers who use e-billing, the more money **EnWin** has to spend on other priorities. Which of the following is closest to your point of view?

01	Charge people who want a paper bill the extra cost of sending it.
02	Leave it to customers to decide whether they want paper or online billing with no charges or incentives.
03	Give people who use online billing an incentive that reflects the reduced cost of online billing.
98	Don't know [DNR]
99	Refused [DNR]

CDM Questions

H32. One of the most cost effective ways for **EnWin** to reduce its required investments in the distribution system is through customer uptake of conservation programs.

When customers consume less electricity at peak demand times, less strain is put on the distribution system and as a result, customers save money in two ways: 1) a lower level of investment is required by **EnWin** to expand and maintain the distribution system's capacity to deliver electricity; and 2) customers pay less when they reduce their electricity consumption.

Have you ever participated in an **EnWin** conservation program?

01	Yes
02	No
98	Don't know [DNR]
99	Refused [DNR]

H33. How good or poor a job does **EnWin** do at providing you with information on available tools and programs that can help you manage or conserve your household electricity consumption? Would you say … [READ LIST]

01	A very good job
02	A good job
03	A poor job
04	A very poor job
98	Don't know [DNR]
99	Refused [DNR]

ASK IF H34= 3 OR 4

H34. And how can **EnWin** do a better job of providing you with information on available tools and programs to help you conserve electricity? [OPEN]

I. Assessment of Plan

PREAMBLE

Over the years, **EnWin** has worked hard to keep its equipment working up to, and well beyond, its expected useful life, providing maximum value for money. However, at present, the systems key investment requirements come from the need to replace aging distribution assets.
The investments required to address these key areas, maintain reliability and safety and invest in other infrastructure priorities between 2019 and 2023 is estimated to be $93.4 million.
To fund this plan, **EnWin** is has estimated that the average residential customer could experience a monthly increase of between **$1.70** and **$3.40** on the **EnWin** portion of the bill between now and 2019.
By 2023, it is estimated that the seven-year total **EnWin** increase for the average household could be between **$3.45** and **$5.25** per month.

I35. Considering the cost of EnWin's plan, would you say [READ LIST] …
Rotate response codes "1 "and "3"

01	The proposed range of rate increases is reasonable and I support it
02	I don't like it, but I think the proposed range of rate increases is necessary
03	The proposed range rate increases is unreasonable and I oppose it
98	Don't know [DNR]
99	Refused [DNR]

Ask only if I36 = 1, 2 or 3
I36. And why do you say that? [OPEN]

98	Don't know [DNR]
99	Refused [DNR]

PREAMBLE While **EnWin** has presented a preliminary plan that maintains the current level of reliability and system performance, they have also explored two alternative scenarios.
One where reliability and service levels eventually **decline**;
And one where they **improve**.
Each scenario impacts customer rates differently.

I37. Knowing this, which of the following statements is closest to your point of view?

01	I would be willing to accept an additional **$5.25** on the **EnWin** portion of my bill by 2023 if reliability and service performance improves.
02	I would be willing to accept an additional **$4.35** on the **EnWin** portion of my bill by 2023 if reliability and service performance remains the same as now.
03	I would be willing to accept an additional **$3.45** on the **EnWin** portion of my bill by 2023 knowing that reliability and service performance could eventually decline.
04	I am not willing to accept any additional charges on the **EnWin** portion of my bill knowing that reliability and service performance could decline significantly.
98	Don't know [DNR]
99	Refused [DNR]

J. Segmentation & Demographics

Lastly, I'd like to ask you some general questions about the electricity system in Ontario.
For each statement please tell me if you would strongly agree, somewhat agree, somewhat disagree or strongly disagree. If you don't know enough to say or don't have an opinion just let me know.

01	Strongly agree
02	Somewhat agree
03	Somewhat disagree
04	Strongly disagree
98	Don't know/ No opinion
99	Refused [DNR]

[ROTATE]
J38. The cost of my electricity bill has a major impact on my finances and requires I do without some other important priorities.

J39. Customers are well served by the electricity system in Ontario.
[END BATTERY]

These last few questions are for statistical purposes only and we remind you again that all of your responses are completely confidential.

J40. Counting yourself, how many people live in your household? [DO NOT READ LIST]

1	1 person
2-7	Enter number of people
8	8 or more
99	Refused (DNR)

THANK and END SURVEY

Thank you very much for taking the time to complete this survey.

Small business (GS < 50 kW) Survey Instrument

A. Screening and Qualifications

Introduction

Hello, my name is _____ and I'm calling from **Innovative Research Group** on behalf of **EnWin Utilities**, your electricity distributor.

Innovative Research Group is a national public opinion research firm. We have been commissioned by **EnWin Utilities** to help them better understand the needs and preferences of its customers.

Can I please speak to the person who is in-charge of managing the electricity bill at your organization?

1) Yes, speaking <**contact on the line**> **[skip to A1]**

2) Yes <**transferred to contact**> **[skip to A1]**

3) No <**not the right contact person**> **[GO to "NEW"]**

4) No <**busy**> "When is a good time to callback?" **[record callback time]**

5) Maybe <**may I ask who is calling?**> **[skip to GATE]**

NEW. And … can I have their …
First Name _____
Last Name _____
Title/Position _____
Phone Number _____

ASK to be transferred …

- **if transferred → go to A1**
- **if not transferred → Thank & Add to Callback List**

GATE. My name is _____ and I'm calling on behalf of your local electricity distributor, **EnWin Utilities.**

INTERVIEWER NOTE: If gatekeeper asks the purpose of call → I'd like to ask the person in-charge of managing the electricity bill at your organization a few questions concerning a **EnWn Utilities** customer consultation.

1) Yes <**transferred to contact**> **[skip to A1]**

2) No <**not available**> "When is a good time to callback? **[record callback time and GO to "NEW"]**

3) No <**not interested in talking**> **[Thank & Terminate]**

A1. **EnWin Utilities** – which distributes electricity to homes and businesses in your community – is preparing to submit its investment plan to the Ontario Energy Board for regulatory review. Since this plan will impact your bill, **EnWin Utilities** wants to hear from you, so your views can help shape its plan.
Would you mind if I had 10 minutes of your time to ask you some questions? All your responses will be kept strictly confidential.

1	Yes	[continue]
2	No – Not primary bill payer	[go to TRANSFER-1]
3	No – BAD TIME	ARRANGE CALLBACK
4	No – HARD REFUSAL	[Terminate]

MONIT
This call may be monitored or audio taped for quality control and evaluation purposes.
1 PRESS TO CONTINUE

A2. Just to confirm, does your organization receive an electricity bill from EnWin Utilities?

1	Yes	[continue]
2	No	[Terminate]
98	Don't know (DO NOT READ)	[Terminate]

A3. As part of your job, are you in-charge of managing or overseeing your organization's electricity bill?

1	Yes	[Continue to A4]
2	No	CAN I SPEAK TO THE PERSON WHO MANAGES YOUR ORGANIZATION'S ELECTRICITY BILL?[Return to NEW]
98	DK	CAN I SPEAK TO THE PERSON WHO MANAGES YOUR ORGANIZATION'S ELECTRICITY BILL? [Return to NEW]

A4. READ STATEMENT TO RESPONDENT: While you may be an **EnWin Utilities** residential customer, for the following questions I'd like you to answer from the perspective of the business or organization that you represent.

B. General Satisfaction

We need to prime respondents to start thinking about electricity and the part of the system that EnWin operates.

[PREAMBLE]

To begin, I'd like to ask you some questions about your electricity service.

Today we want to talk about **EnWin Utilities** and the local electricity system in your community. This is the system that takes the electricity from provincial transmission towers and brings it to your home through a network of wires, poles and other equipment that is owned and operated by **EnWin.**

B5. How familiar are you with **EnWin**, which operates the electricity distribution system in your community? Would you say you are very familiar, somewhat familiar, not familiar or would you say you don't know?

01	Very familiar
02	Somewhat familiar
03	Not familiar
98	Don't know (DNR)
99	Refused (DNR)

B6. In general, how satisfied or dissatisfied are you with the services that your organization receives from **EnWin**?

Would you say you are very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied or would you say you don't know enough to say?

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
98	Don't know (DNR)
99	Refused (DNR)

B7. Is there anything in particular EnWin can do to improve its service to you? [OPEN]

98	Don't know (DNR)
99	Refused (DNR)

C. Bill Knowledge & Impact

I'd now like to talk with you about your electricity bill …

C8. While **EnWin** is responsible for collecting payment for the entire electricity bill, they retain only about 17% of the average small business customer's bill. This is about **$62** on an average **$362** monthly electricity bill. The rest of the bill goes to power generation companies, transmission companies, the provincial government and regulatory agencies.

Before this survey, how familiar were you with the percentage of your organization's electricity bill that went to **EnWin**? Would you say you were very familiar, somewhat familiar, not familiar or would you say you don't know?

01	Very familiar
02	Somewhat familiar
03	Not familiar
98	Don't know (DNR)
99	Refused (DNR)

C9. Do you feel that the **17%** of your total electricity bill that you pay to EnWin for the services they provide is very reasonable, somewhat reasonable, somewhat unreasonable, very unreasonable or would you say you don't know?

01	Very reasonable
02	Somewhat reasonable
03	Somewhat unreasonable
04	Very unreasonable
98	Don't know (DNR)
99	Refused (DNR)

D. Customer Priorities

READ PREAMBLE:

EnWin regularly holds discussions with its customers to better understand how it should set spending priorities with ratepayer dollars.
In recent conversions with customers, a number of company goals were identified as priorities for **EnWin**.

D10. Among the following priorities, please tell me which one is most important to your organization as an **EnWin** customer.
[READ LIST; RANDOMIZE LIST]

01	Delivering electricity at a reasonable price.
02	Ensuring reliable electrical service.
03	Ensuring the safety of electrical infrastructure.
04	Providing enhanced customer service.
05	Helping customers with electricity conservation and efficient usage.
06	Enhancing the electrical system to help customers reduce greenhouse gases.
98	Don't know (DNR)
99	Refused (DNR)

D11. What is the next most important priority?
[Remove answer from D10 if asked to read again]

D12. And what do you consider the third most important priority?
[Remove answer from D10 and D11 if asked to read again]

D13. Are there any other important priorities that **EnWin** should be focusing on that weren't included in the previous list I read? [OPEN]

E. System Reliability

These questions are about priming the respondent to think about their experience with system reliability and separate adverse weather from failing equipment.

PREAMABLE-2:

I'd now like to read you a few statements about the electrical service that you receive from **EnWin**.

Despite best efforts, no electrical distribution system can deliver perfectly reliable electricity. As a general rule, the more reliable the system, the more expensive the system is to build and maintain.

With that said, the average **EnWin** customer experiences **two** unexpected power outages per year.

ASK ALL
For each of the following statements, please tell me if you are very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied, or would you say you don't know?

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
98	Don't know (DNR)
99	Refused (DNR)

E14. The reliability of your electricity service as judged by the number of power outages your organization experiences.

E15. The amount of time it takes to restore power when power outages occur.

E16. The quality of the power delivered to your organization as judged by the absence of voltage fluctuations that can result in the flickering or dimming of lights.
[END BATTERY]

E17. In your view, how do you think EnWin should address the **number** of customer power outages? Would you say … [READ LIST]
[Rotate response codes 1 and 3]

01	Spend what is needed to **reduce** the number of unexpected power outages
02	Spend what is needed to **maintain** the current level of unexpected power outages
03	**Accept more** power outages in order to help keep customer costs from rising
98	Don't know (DNR)
99	Refused (DNR)

E17. Overall, the average **EnWin** customer is without power for about **one hour per year.**

In your view, how do you think **EnWin** should address the length of time customers are without power? Would you say … [READ LIST]
[Rotate response codes 1 and 3]

01	Spend what is needed to **reduce** the length of unexpected power outages
02	Spend what is needed to **maintain** the current length of unexpected outages
03	**Accept longer** time without power in order to help minimize customer costs from rising
98	Don't know (DNR)
99	Refused (DNR)

F. Reaction to Customer Input

Below are the common themes that have arisen in qualitative customer consultations.

The following statements have been made by customers throughout **EnWin's** on-going customer engagement.

For each statement, please tell me if you strongly agree, somewhat agree, somewhat disagree or strongly disagree.

01	Strongly agree
02	Somewhat agree
03	Neither agree nor disagree (**DNR**)
04	Somewhat disagree
05	Strongly disagree
98	Don't know
99	Refused [**DNR**]

RANDOMIZE QUESTIONS

Willingness / Ability to Pay

F18. My organization is willing to pay a bit more for electricity if it means better system reliability.

Pay Now or Later

F19. We should invest in our electricity system now, while the local economy is relatively strong and unemployment is relatively low.

Legacy

F20. Nobody likes to pay more for electricity, but I think we have an obligation to maintain the reliability of our local electrical system for future generations.

Modernizing the Grid

F21. We need to modernize the local electricity system so consumers can have greater control over their electricity usage.

System Reliability

F22. A few power outages are fine for my organization, but I worry about the impact this has on more vulnerable people, such as the elderly.

Labour Costs

F23. Skilled hydro workers are sought out across both North America and Ontario. EnWin should pay the people who maintain the local distribution system a competitive salary, or they risk losing the most qualified and experienced hydro workers to other utilities.

Competitive Advantage

F24. A reliable local electricity system is a competitive advantage for the City of Windsor and can help retain existing jobs and attract new ones.

G. Capital Plan Priorities

System Renewal Question

G25. [PREAMBLE] While **EnWin** believes it has done its best to prolong the life of the assets that make up the distribution system, many of these assets are approaching the end of their useful life.

As part of its investment plan, EnWin is proposing a sizeable infrastructure replacement or renewal program. The estimated cost of this proposed program is **$30.4 million** between 2019 and 2023.

Although this plan will allow **EnWin** to make the necessary investments to maintain system reliability, **it will have an impact on customer bills.**

G26. Which of the following statements best represents your point of view?
[Read and Rotate statements 1 and 2]
Some customers have said …

01	**EnWin** should invest what it takes to replace the system's aging infrastructure to maintain system reliability; even if that increases my organization's electricity bill by a few dollars over the next few years.

Others have said …

02	**EnWin** should lower its estimated investment in renewing the system's aging infrastructure to lessen the impact of any bill increase; even if that means more or longer power outages.

98	Don't know (DNR)
99	Refused (DNR)

General Plant

G27. **EnWin** is not just the local electricity distribution system itself, but a company that operates the system. As a company, **EnWin** needs buildings to house its staff, vehicles and tools to service the power lines, and IT systems to manage the electrical system and customer information.

Again, customers have made a number of statements about this sort of investment. Which of the following statements best represents your point of view?
[Read and Rotate statements 1 and 2]

Some customers have said …

01	**EnWin** should find ways to make do with the buildings, equipment, vehicles and IT systems it already has.

Others have said …

02	While **EnWin** should be wise with its spending, it is important that its staff have the equipment and tools they need to manage the system safely, efficiently and reliably.

98	Don't know (DNR)
99	Refused (DNR)

System Service Questions

[PREAMBLE] Modernizing the grid can allow **EnWin** to improve reliability. Investments such as automated switches may allow **EnWin** to quickly identify the location of outages in order to minimize the number of people impacted by outages and to restore electricity to customers more quickly than was previously possible.

G28. Given there are many other areas of needed investments, such as replacing aging equipment, how important do you feel it is for **EnWin** to invest now in modernizing the grid? Would you say … [READ LIST]

01	Very important
02	Somewhat important
03	Not very important
04	Not important at all
98	Don't know
99	Refused [**DNR**]

H. Information Tools & E-Billing

H29. Now I'd like to ask you about the customer service your organization has received when dealing with employees of **EnWin** - whether on the telephone, via email, in person or through online conversations including social media.

Overall, how satisfied or dissatisfied are you with the customer service provided by **EnWin**?

Would you say you are very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied, or would you say you don't know. If you have not been in contact with **EnWin** staff, just let me know.

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
97	Not applicable – Have never been in contact with EnWin staff
98	Don't know
99	Refused [DNR]

H30. I would now like you to think about the communications that your organization may receive from **EnWin** without talking directly to an employee. This may include information found on their website, bill inserts, advertising, notices, emails, or social media sites.

Overall, how satisfied or dissatisfied are you with the communications that you receive from **EnWin** related specifically to your electrical service?

Would you say you are very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied or would you say you don't know?

01	Very satisfied
02	Somewhat satisfied
03	Neither satisfied or dissatisfied
04	Somewhat dissatisfied
05	Very dissatisfied
98	Don't know
99	Refused [DNR]

E-Billing Question

H31. E-billing, or electronic billing, saves money on postage and paper. The more customers who use e-billing, the more money **EnWin** has to spend on other priorities. Which of the following is closest to your point of view?

01	Charge people who want a paper bill the extra cost of sending it.
02	Leave it to customers to decide whether they want paper or online billing with no charges or incentives.
03	Give people who use online billing an incentive that reflects the reduced cost of online billing.
98	Don't know [DNR]
99	Refused [DNR]

CDM Questions

H32. One of the most cost effective ways for **EnWin** to reduce its required investments in the distribution system is through customer uptake of conservation programs.

When customers consume less electricity at peak demand times, less strain is put on the distribution system and as a result, customers save money in two ways: 1) a lower level of investment is required by **EnWin** to expand and maintain the distribution system's capacity to deliver electricity; and 2) customers pay less when they reduce their electricity consumption.

Has your organization ever participated in an **EnWin** conservation program?

01	Yes
02	No
98	Don't know [DNR]
99	Refused [DNR]

How good or poor a job does **EnWin** do at providing your organization with information on available tools and programs that can help you manage or conserve electricity consumption? Would you say … [READ LIST]

01	A very good job
02	A good job
03	A poor job
04	A very poor job
98	Don't know [DNR]
99	Refused [DNR]

ASK IF H33= 3 OR 4

And how can **EnWin** do a better job of providing your organization with information on available tools and programs to help you conserve electricity? [OPEN]

I. Assessment of Plan

PREAMBLE

Over the years, **EnWin** has worked hard to keep its equipment working up to, and well beyond, its expected useful life, providing maximum value for money. However, at present, the systems key investment requirements come from the need to replace aging distribution assets.

The investments required to address these key areas, maintain reliability and safety and invest in other infrastructure priorities between 2019 and 2023 is estimated to be $93.4 million.

To fund this plan, **EnWin** is has estimated that the average small business customer could experience a monthly increase of between **$3.83** and **$7.70** on the **EnWin** portion of the bill between now and 2019.
By 2023, it is estimated that the seven-year total **EnWin** increase for the average small business could be between **$7.90** and **$12.00** per month.

I35. Considering the cost of **EnWin's** plan, would you say [READ LIST] …
Rotate response codes "1 "and "3"

01	The proposed range of rate increases is reasonable and I support it
02	I don't like it, but I think the proposed range of rate increases is necessary
03	The proposed range rate increases is unreasonable and I oppose it
98	Don't know [DNR]
99	Refused [DNR]

Ask only if I35 = 1, 2 or 3
I36. And why do you say that? [OPEN]

98	Don't know [DNR]
99	Refused [DNR]

PREAMBLE While **EnWin** has presented a preliminary plan that maintains the current level of reliability and system performance, they have also explored two alternative scenarios.
One where reliability and service levels eventually **decline**;
And one where they **improve**.
Each scenario impacts customer rates differently.

Knowing this, which of the following statements is closest to your point of view?

01	I would be willing to accept an additional **$12.00** on the **EnWin** portion of my organization's bill by 2023 if reliability and service performance improves.
02	I would be willing to accept an additional **$10.00** on the **EnWin** portion of my organization's bill by 2023 if reliability and service performance remains the same as now.
03	I would be willing to accept an additional **$7.90** on the **EnWin** portion of my organization's bill by 2023 knowing that reliability and service performance could eventually decline.
04	I am not willing to accept any additional charges on the **EnWin** portion of my organization's bill knowing that reliability and service performance could decline significantly.
98	Don't know [DNR]
99	Refused [DNR]

J. Segmentation & Demographics

Lastly, I'd like to ask you some general questions about the electricity system in Ontario.
For each statement please tell me if you would strongly agree, somewhat agree, somewhat disagree or strongly disagree. If you don't know enough to say or don't have an opinion just let me know.

01	Strongly agree
02	Somewhat agree
03	Somewhat disagree
04	Strongly disagree
98	Don't know/ No opinion
99	Refused [**DNR**]

[ROTATE]
J38. The cost of my electricity bill has a major impact on the bottom line of my organization and results in some important spending priorities and investments being put off.
J39. Customers are well served by the electricity system in Ontario.
[END BATTERY]

These last few questions are for statistical purposes only and we remind you again that all of your responses are completely confidential.

J40. While of the following best describes the sector in which your organization operates [READ LIST]

01	Restaurant
02	Retail
03	Commercial
04	Multi-residential
05	Hospitality (i.e. catering, hotel operations)
06	Manufacturing
07	Other [Please specify:_____]
98	Don't know [DNR]
99	Refused [DNR]

THANK and END SURVEY

Thank you very much for taking the time to complete this survey.

Appendix:

Customer Engagement Workbook (Residential Version)

Customer Engagement

Have Your Say: *Assessing Windsor Customers' Priorities, Needs and Preferences*

Residential Workbook

ENWIN

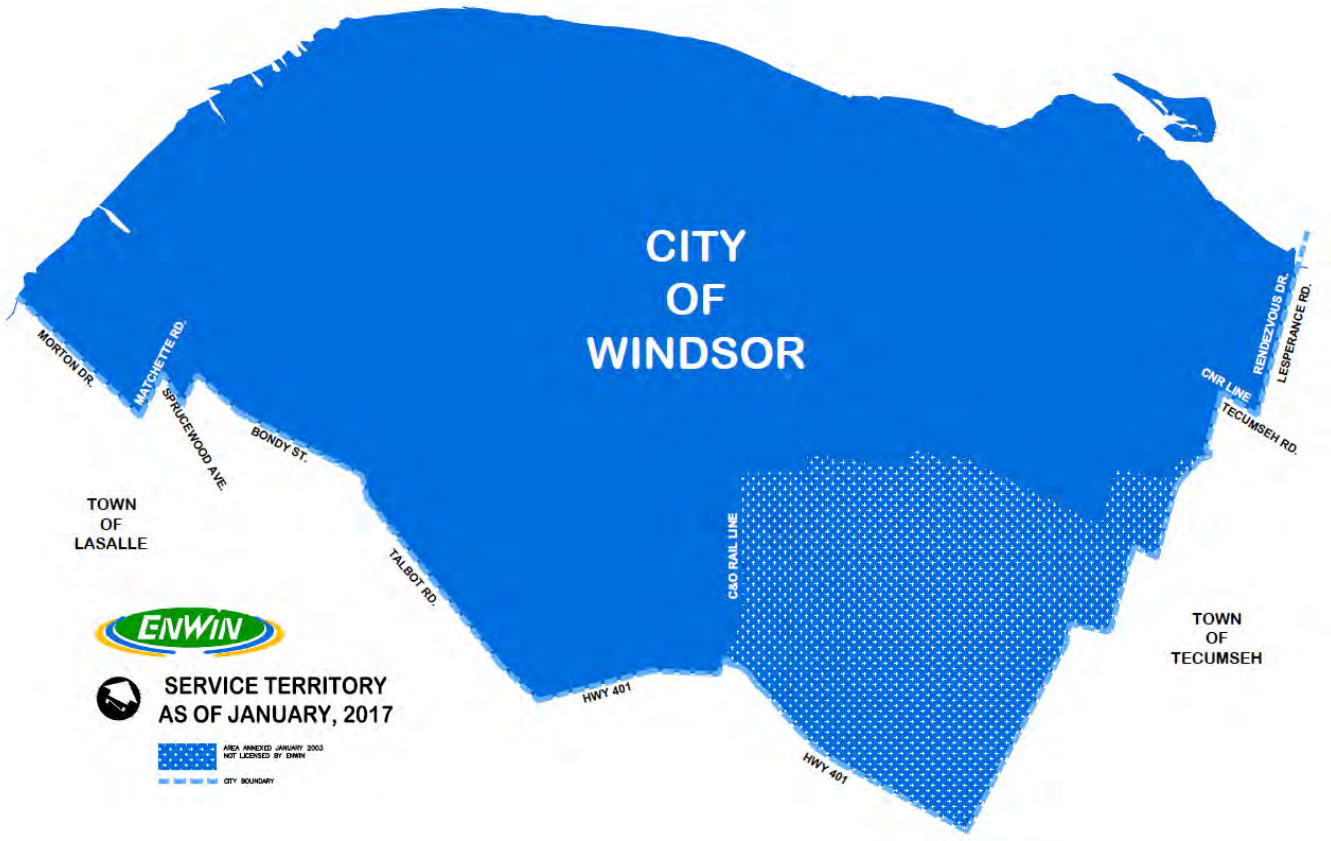
March 2017

ENWIN Utilities Ltd. (*ENWIN*) is Windsor's Local Distribution Company (LDC), responsible for the distribution of electricity and the servicing and maintenance of Windsor's power line infrastructure. *ENWIN* also serves as the community's water system operator under contract with the owner of the local water production and distribution infrastructure, Windsor Utilities Commission (WUC).

ENWIN serves just under 90,000 electricity customers, representing a population of just over 215,000 in the City of Windsor.

ENWIN is a subsidiary of Windsor Canada Utilities Ltd., which was founded in 1999 and is 100 percent owned by The Corporation of the City of Windsor.

ENWIN's Service Territory



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What's this consultation about?

The purpose of this customer consultation is to solicit your input on priorities, needs and preferences, and to collect your feedback on *ENWIN's* electrical distribution system investment and spending plan for 2019 to 2023.

This consultation deals only with *ENWIN's* portion of the Delivery charge on your bill, which represents about 20% of your total electricity charges. All other provincial charges, including the transmission portion of the Delivery charge, electricity commodity charges and regulatory charges, are not within *ENWIN's* discretion, and are therefore outside the scope of this consultation.

Your comments will be shared with *ENWIN's* Board of Directors, to inform their decision-making regarding the timing and the amount requested in the company's rate application.

ENWIN's goal is to deliver safe and reliable electricity to homes and local businesses as efficiently as possible and at an affordable cost. However, there is a balancing act that all utilities must consider when planning for the future: system reliability and service versus the cost to consumers. No distribution system delivers perfectly reliable electricity. Generally, the more reliable the system, the more expensive the system is to build and maintain.

This customer consultation is designed to collect your feedback on the reliability of the electricity distribution system and the spending decisions *ENWIN* will need to make between 2019 and 2023. Ultimately, this consultation will help *ENWIN* ensure alignment between its operational and capital investment plans, while addressing customers' **priorities**, **needs** and **preferences**.

As an *ENWIN* customer, this is an opportunity for you to tell your local distribution company where it should prioritize services, what you think about its preliminary planning and the cost implications this plan will have on you.

This is also an opportunity for *ENWIN* to explain to its customers the challenges it faces in operating and maintaining the local electricity distribution system. More importantly, it will help the utility better understand how customers want *ENWIN* to meet those challenges.

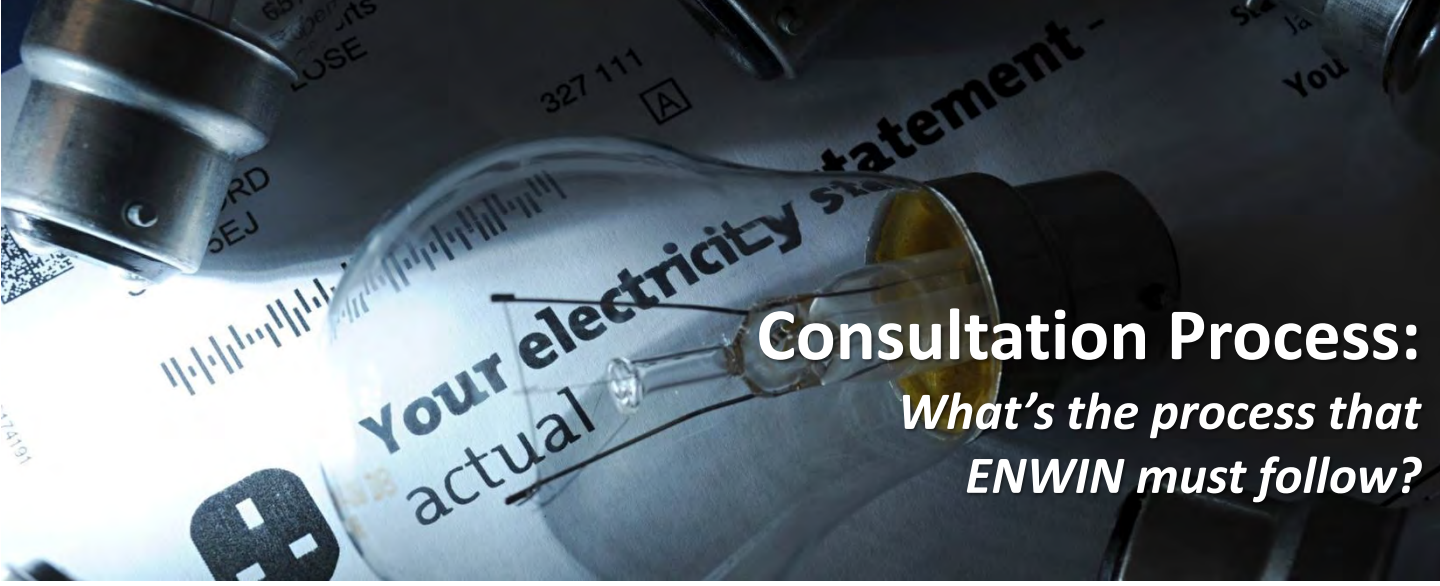
To participate in this review, you do <u>not</u> need to be an expert on electrical distribution systems. This workbook explains key parts of the electrical distribution system, the challenges facing the system, *ENWIN*'s recent work to maintain the system, and the company's budgetary plan for 2019 to 2023.

ENWIN does not expect you to make electrical engineering decisions. *ENWIN* wants to hear about the electricity issues that matter most to you, and whether or not you feel the utility's spending and investing priorities seem reasonable.

This workbook is designed to give you enough background about these issues for you to develop an informed opinion.

Innovative Research Group Inc. has been engaged by *ENWIN* to collect participant feedback as an impartial third-party. Innovative Research Group will deliver the collected customer feedback to *ENWIN* to assist them in shaping their rate application and distribution system plan.

INNOVATIVE RESEARCH GROUP



Consultation Process:
What's the process that ENWIN must follow?

How are electricity rates determined in Ontario?

The electricity industry in Ontario is regulated by the Ontario Energy Board (OEB), which recently developed a new regulatory framework that requires electricity distributors, such as *ENWIN*, to identify customer priorities, needs and preferences, to inform its business planning and distribution system design.

ENWIN is funded by the distribution rates paid by its customers. Periodically, *ENWIN* is required to file a rate application with the OEB to determine the funding needed to operate and maintain the distribution system. *ENWIN* must submit evidence to justify the amount of funding it needs to safely and reliably distribute electricity to its customers.

As a customer, how are my interests protected?

ENWIN's rationale for a customer rate adjustment is assessed in an open and transparent public process known as a rate hearing. Any individual or group may intervene during *ENWIN*'s application to ask questions or challenge *ENWIN*'s plans and assumptions. At the end of the process, the OEB weighs the evidence and decides on the rates *ENWIN* can charge its customers.

Why is my feedback important?

Your feedback will inform the amount and timing of *ENWIN*'s future rate application(s). Customer feedback will be presented to the *ENWIN* Board of Directors, the OEB and public intervenors (who represent various ratepayer groups) when *ENWIN* files its rate application. As part of any rate hearing process, the OEB will review how *ENWIN* acquired and responded to customer feedback in its planning process. Any future rate application will be effective no earlier than 2019.

Rate Application Process

ENWIN assesses distribution system needs

↓

Identify customer priorities, needs and preferences

↓

Refine business plan to respond to customer priorities, needs and preferences

↓

ENWIN's Board of Directors review customer and staff input and approve rate application

↓

File rate application with Ontario Energy Board

↓

Interrogatories, technical conference and rate hearing

↓

Ontario Energy Board sets *ENWIN*'s distribution rates

Consumer feedback on Ontario's electricity system

While there are a number of ways for customers in Ontario to voice their opinions about provincial, regional and local electricity issues, this consultation is only about your local distribution system and your preferences about how *ENWIN* should use your money.

If you are interested in broader medium-term and long-term electricity issues, such as Ontario's Long-Term Energy Plan, regional planning, conservation planning and general energy policy in the province, there are other opportunities to provide your feedback.

Ontario's Long Term Energy Plan: The Ontario Government's plan details how electricity will be generated and the longer-term conservation strategy for the province.

Regional Planning: The Independent Electricity System Operator (IESO) looks ahead to the future electricity needs of your region and how those needs can be addressed through energy conservation programs, local generation and sourcing electricity from outside the region.

Distribution Planning: This consultation concentrates on the short-term plan for *ENWIN*'s distribution system.

The graphic below shows the various planning initiatives ongoing across Ontario's electricity system. In addition to the short-term distribution plan being discussed in this workbook, there are other planning initiatives undertaken to ensure that Ontario's system maintains reliability and works efficiently for the benefit of customers.

Electricity System Planning in Ontario

Provincial System Planning

This involves more long-term planning about how Ontario's electricity system is designed and operated. This includes planning for:

- Provincial electricity supply mix (e.g. what mix of nuclear, hydro-electric, natural gas-fired and renewable power generation Ontario should maintain)
- System supply and demand forecasting
- Interconnections and grid design

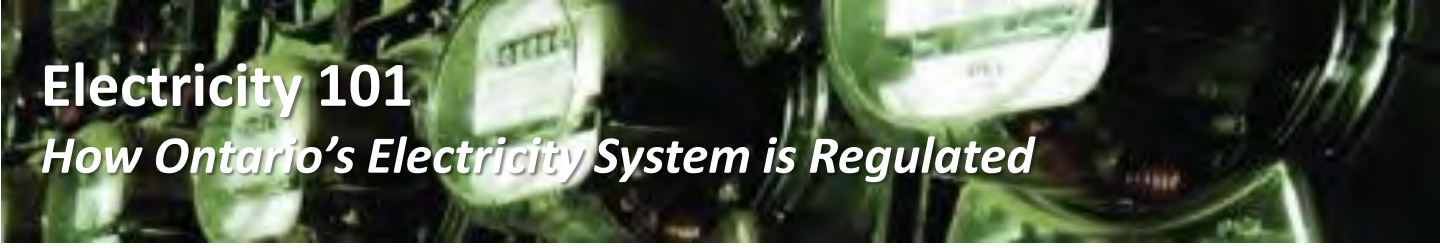
Regional Planning

This involves near-term and medium-term planning to meet the needs of a specific region of the province, and ensure all key players (i.e. transmission and distribution operators) are coordinated.

This planning process is focused on examining whether conservation and local generation options have been considered, in addition to core infrastructure (wires) solutions.

Distribution System Planning

This involves both near-term and longer-term planning to ensure the local distribution systems have adequate infrastructure to meet required reliability and safety standards, as well as the needs of customers.



Electricity 101

How Ontario's Electricity System is Regulated

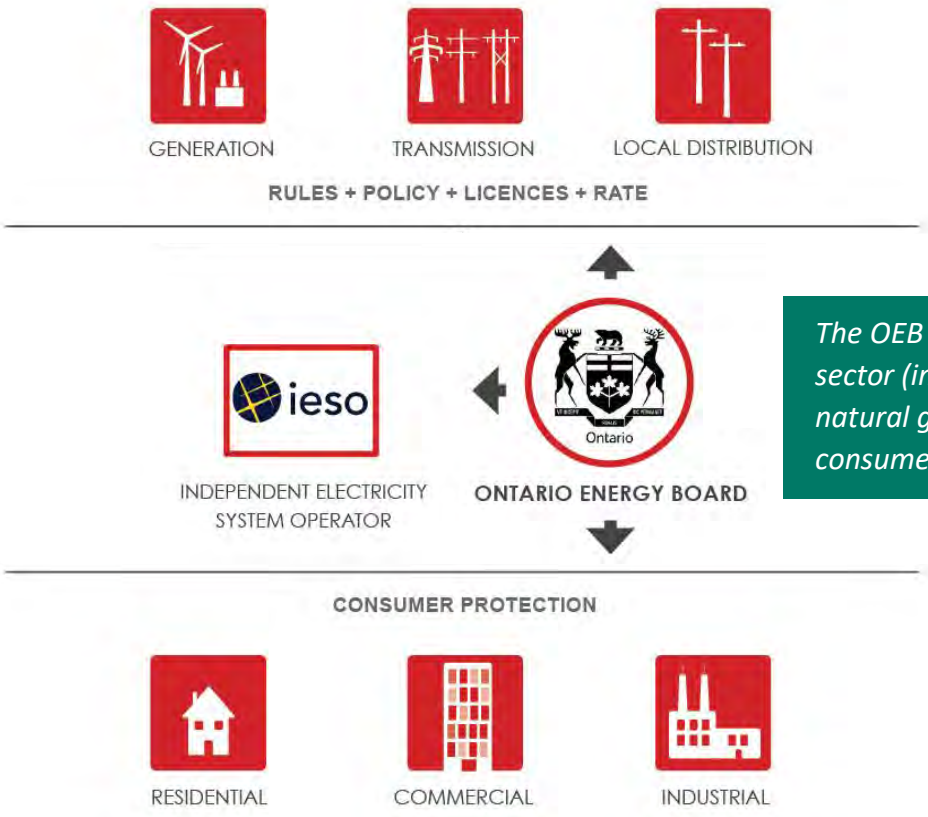
The electricity system in Ontario is regulated by the following bodies:

Ontario Ministry of Energy: The Ontario Ministry of Energy defines energy policy, sets the rules, establishes key planning priorities and mandates the role of regulatory agencies through legislation.

Ontario Energy Board: The mission of the Ontario Energy Board (OEB) is to promote a viable, sustainable and efficient energy sector that serves the public interest and assists consumers in obtaining reliable energy services at a reasonable cost.

The OEB is an independent body established by legislation that sets the rules and regulations for the provincial electricity sector. One of the OEB's roles is to review the distribution plans of all electricity distributors and set the rates that they can charge customers.

Independent Electricity System Operator: The Independent Electricity System Operator (IESO) is responsible for short, medium and long-term electricity planning. It ensures that an adequate supply of electricity is available for Ontario residents and businesses. It operates the grid in real time, to ensure that Ontario has the electricity it needs, when and where it's needed. The IESO receives directives from the Ministry of Energy (e.g. energy supply mix, Green Energy Act), but otherwise works at arm's-length from the government.



The OEB regulates Ontario's energy sector (including both electricity and natural gas) and is responsible for consumer protection.

Electricity 101

Understanding ENWIN's Role in Ontario's Electricity System

Ontario's electricity system is owned and operated by public, private and municipal corporations across the Province. It is made up of three components: **generation**, **transmission** and **distribution**.

GENERATION

Power generation stations convert various forms of energy into electric power.

EXAMPLES

Ontario Power Generation
TransCanada Energy Ltd.
Bruce Power
Samsung Renewable

TRANSMISSION

Transmission lines (high voltage lines) connect the power produced by the power generators to transformer stations across the province.

EXAMPLE

Hydro One

DISTRIBUTION

The distribution system connects to the transmission stations and carries lower voltage electricity to local homes and businesses.

EXAMPLES

- Essex Powerlines Corporation
- E.L.K. Energy Inc.
- Entegrus Powerlines Inc.

CUSTOMERS

Electricity is consumed by local customers, including homes and businesses. Customers of electricity distribution companies are often referred to as ratepayers.

Where does electricity come from?

In Ontario, approximately 70% of your electricity is generated by **Ontario Power Generation** (OPG). This provincially-owned crown corporation has **generation stations** across the province that produce electricity from hydroelectric dams, nuclear reactors and natural gas burning power plants.

Once electricity is generated, it must be delivered to the communities across Ontario in need of power. High voltage **transmission stations** and interconnected lines serve as highways for electricity. The Province has more than 30,000 kilometres of transmission lines*, owned mostly by **Hydro One**.

ENWIN's Role in Ontario's Electricity System

ENWIN is responsible for the last step of the journey: distributing electricity to customers in the City of Windsor through its **distribution system**.

*Source: IESO. The Power System, www.ieso.ca

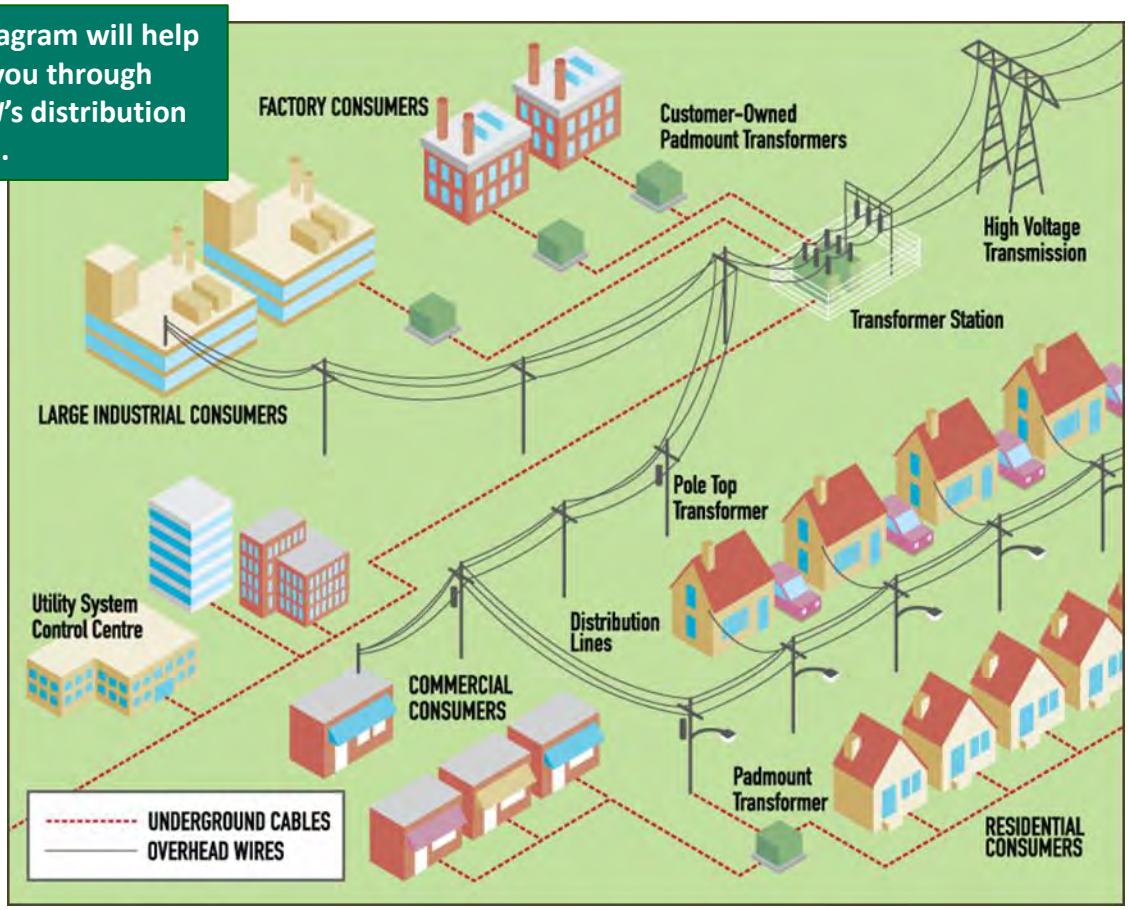
ENWIN's Distribution System Today

Every distribution system is unique, with its own history and challenges. In order to better understand *ENWIN*'s distribution system, we first have to understand all the different components and how they impact the way in which you receive electricity when you need it.

ENWIN manages approximately 690 km of overhead distribution lines, 460 km of underground distribution lines and 6,700 transformers.

The local distribution system receives high voltage electricity from six transformer stations that are owned by **Hydro One**, and one transformer station that is owned by ***ENWIN***. The high voltage electricity is reduced and connected through 27.6 kV feeder circuits. The feeder circuits distribute power directly to customers. Additional transformers, which are located near customers, transform the voltage one final time to levels safe to distribute to local homes and businesses.

This diagram will help guide you through *ENWIN*'s distribution system.



High Voltage Transmission: Hydro One's high voltage transmission lines connect *ENWIN*'s distribution system to electricity generating stations across the province.

Transformer Stations: Reduce high voltage electricity from transmission lines to medium voltage electricity, which is fed into *ENWIN*'s distribution feeder system.

Overhead System: The overhead system includes the wires, poles and pole top transformers that are commonly seen across *ENWIN*'s service territory.

Underground System: The underground system includes underground cables, padmount transformers and switches.

Note: *An advantage of underground systems is that they are affected to a lesser extent by extreme weather. The disadvantage is that they are more expensive to install and maintain, and when there is a power outage, it often takes longer to locate and repair a problem compared to overhead wires.*

ENWIN's Distribution System Today

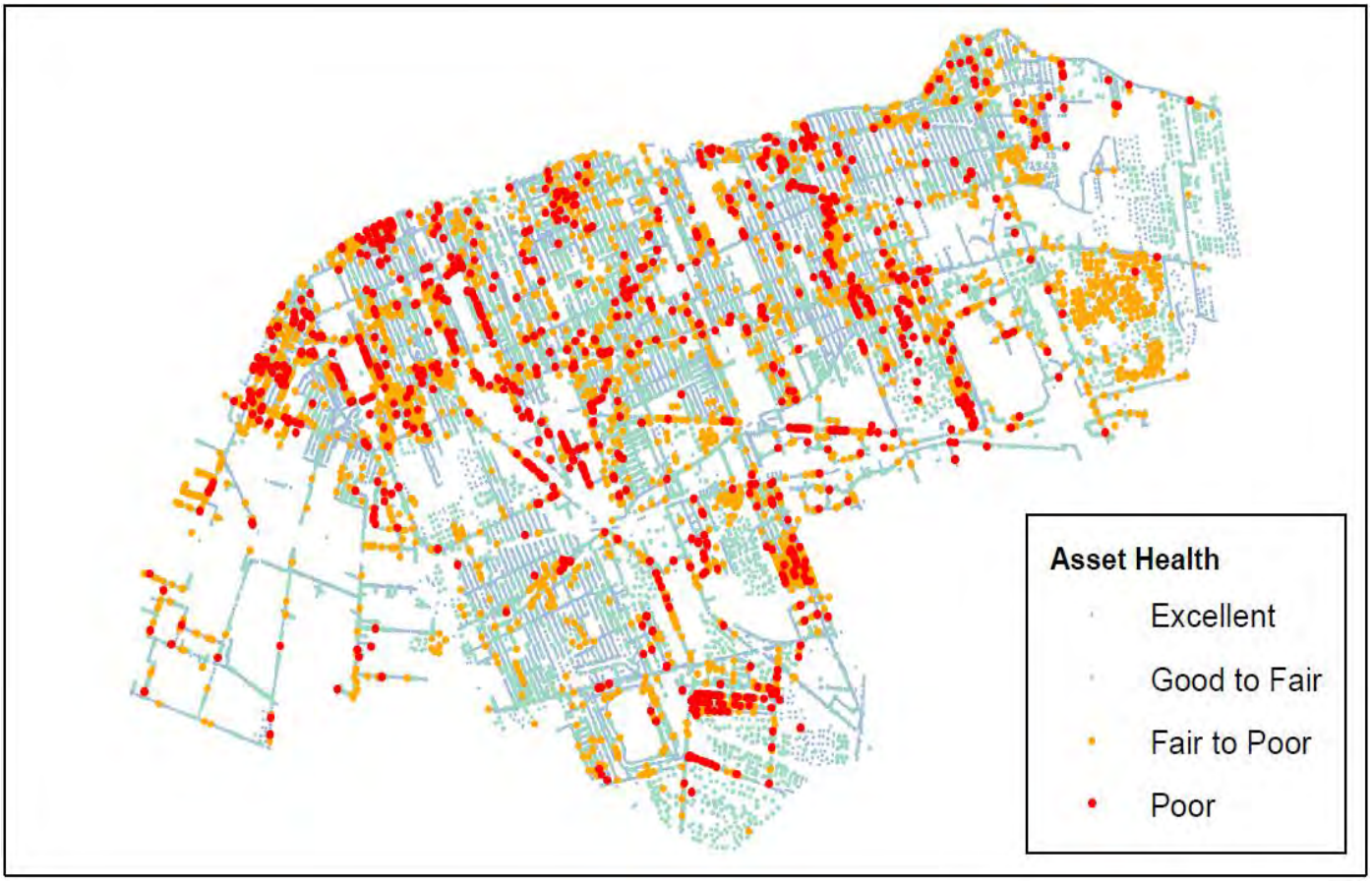
Asset Management

Managing the Distribution System

ENWIN adheres to the Ontario Energy Board's Distribution System Code that sets out good utility practices, minimum performance standards and minimum inspection requirements for distribution equipment.

ENWIN maintains and regularly updates an Asset Management Plan, which is an evolving blueprint for maintaining the utility's infrastructure and other assets, to deliver an agreed upon standard of service. The Asset Management Plan prescribes the process for collecting and inspecting data on the health of thousands of individual assets (pieces of infrastructure and equipment) that must work seamlessly together to deliver reliable electricity to customers.

ENWIN maintains and upgrades infrastructure and equipment approaching end-of-life, in order to offer its customers reliable electrical service. *ENWIN* tries to pace the expenditures so that reliability is maintained without sharp increases or decreases in expenditures. This results in more predictable rates for customers. Assets have been added to the distribution system as the City of Windsor has grown. These assets will reach end-of-life at different times. A depiction of electrical distribution assets at or nearing end-of-life is shown below.



* Asset inventory and health assessments based on estimates as of December 31, 2015.

Electricity Bills:
Understanding where your money goes

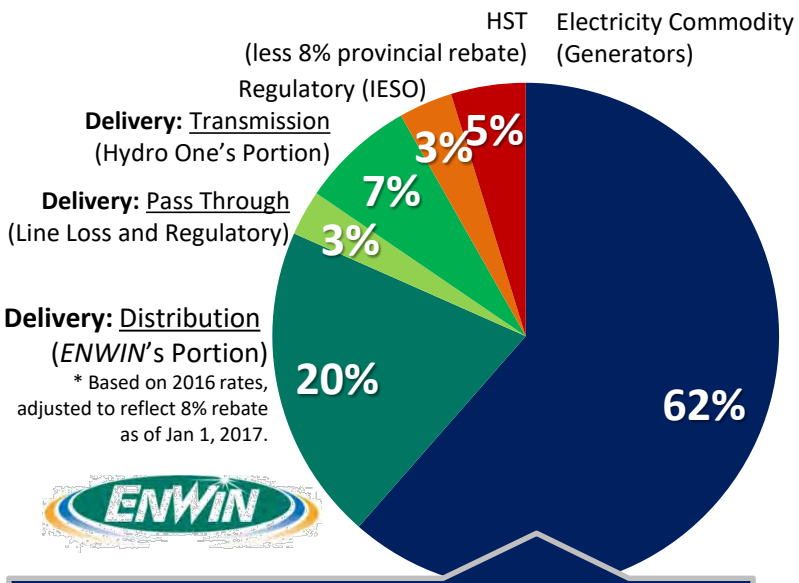
Your Electricity Bill: Every item and charge on your bill is mandated by the provincial government or regulated by the OEB. There are two distinct cost areas that make up the ***delivery*** charge on your bill: ***distribution*** and ***transmission***.

While *ENWIN* collects both of these charges, the transmission charge is passed on to Hydro One. *ENWIN* keeps only a part of the delivery charges on your bill, but some other pass-through charges are remitted to the IESO. The delivery charges that stay with *ENWIN* make up about 20% of the typical bill for a residential customer who uses 750 kWh of electricity per month.

Consequently, as an example, a 10% increase or decrease in ENWIN rates will only result in a 2% increase or decrease in your total electricity bill.

ENWIN's distribution rates are subject to the review and approval of the OEB. The distribution fees collected from customers cover *ENWIN*'s capital investments and operating expenses.

About 20% of the average residential electricity bill goes to *ENWIN*. The rest of the bill goes to power generation companies, transmission companies, the government and regulatory agencies.



Over the past 10 years, rising electricity bills have largely been driven by increases in the commodity price of electricity.

SAMPLE RESIDENTIAL MONTHLY BILL

ENWIN Utilities Ltd.

Account Number:
000 000 000 000 0000

Meter Number:
00000000

Your Electricity Charges

Electricity	
Off-Peak @ 8.700 ¢/kWh	42.41
Mid-Peak @ 13.200 ¢/kWh	16.83
On-Peak @ 18.000 ¢/kWh	24.30
Delivery (*ENWIN*'s portion: $27.44)	41.26
Regulatory Charges	4.67
Debt Retirement Charge	0.00
Debt Retirement Charge exemption saved you $X.XX	
Total Electricity Charges	**$129.47**
HST	$16.83
8% Provincial Rebate*	**(-$10.36)**
*The Ontario government is providing a rebate on your electricity costs equal to the provincial portion of the HST	
Total Amount	**$135.95**

Current monthly distribution charges are about **$27.44 per month or 20% of the total monthly bill** for the average *ENWIN* residential customer who consumes 750 kWh of electricity per month.

By 2023, it is estimated that the average residential bill could increase to between **$30.90 and $32.70** per **month** so that *ENWIN* can operate, maintain and modernize the local electricity distribution system.

The majority of this impact may take place by 2019, with customers experiencing a monthly increase of between **$1.70 and $3.40** during this period. Following an approved Cost of Service rate application, distribution rates will increase only marginally, to account for inflation.

By 2023, it is possible that the seven-year total increase for the average residential household could be between **$3.45 and $5.25** per month.

Customer Feedback:
Satisfaction & Areas for Improvement

1. Before this consultation, how familiar were you with the various parts of the electricity system, how they work together and for which services *ENWIN* is responsible?
   - ❑ Very familiar and could explain the details of Ontario's electricity system to others
   - ❑ Somewhat familiar, but could not explain all the details of Ontario's electricity system to others
   - ❑ Have heard of some of the terms and organizations mentioned in this workbook, but knew very little about Ontario's electricity system
   - ❑ Aside from receiving a bill from *ENWIN*, I knew nothing about Ontario's electricity system

2. As you may know, *ENWIN* operates and maintains the local electricity distribution system, reads meters, calculates your charges, answers your calls, responds during outages and clears trees and brush from power lines. *ENWIN* does not generate electricity or set electricity prices.

   Generally, how satisfied are you with the service you receive from *ENWIN*?
   - ❑ Very satisfied
   - ❑ Somewhat satisfied
   - ❑ Neither satisfied nor dissatisfied
   - ❑ Somewhat dissatisfied
   - ❑ Very dissatisfied
   - ❑ Don't know

3. Is there anything in particular that *ENWIN* can do to improve its services to you?

Customer Feedback:
Electricity Prices & Bill Impact

4. While *ENWIN* is responsible for collecting payment for the entire electricity bill, it retains only about 20% of the average residential customer's bill. The rest of the bill goes to power generation companies, transmission companies, the provincial government and regulatory agencies.

   Before this survey, how familiar were you with the percentage of your electricity bill that went to *ENWIN*?

   - ❑ Very familiar
   - ❑ Somewhat familiar
   - ❑ Not familiar

5. How reasonable do you feel that the 20% of your total electricity bill that you pay to *ENWIN* is for the services they provide?

   - ❑ Very reasonable
   - ❑ Somewhat reasonable
   - ❑ Somewhat unreasonable
   - ❑ Very unreasonable
   - ❑ Don't know

6. Please indicate the extent to which you agree or disagree with the following statement:

   The cost of my electricity bill has a major impact on my finances and requires I do without some other important priorities.

   - ❑ Strongly agree
   - ❑ Somewhat agree
   - ❑ Neither agree nor disagree
   - ❑ Somewhat disagree
   - ❑ Strongly disagree
   - ❑ Don't know

ENWIN's Distribution System Today

System Reliability

No distribution system can deliver 100% reliable electrical service. From time to time, customers will experience an electrical service interruption. Generally, the more reliable the system, the more expensive it is to build, operate, and maintain.

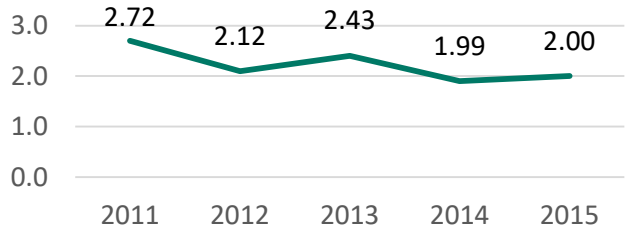
Electrical distribution systems are outdoors and subject to sun, wind, rain, lightning, ice, falling tree branches, vehicle accidents, animal contact, excavations (on underground lines) and natural aging. Generally, the more difficult the environment, the more difficult it is to maintain reliable electrical service. The Windsor region has the highest frequency and intensity of thunderstorms in all of Canada. As well, climate change has resulted in more frequent and more severe storms, as evidenced in the last few years by three tornados in Windsor and Essex County.

A higher degree of reliability in any electrical distribution system results in higher costs. *ENWIN,* like all electricity distributors, faces a balancing act between keeping costs as low as possible and keeping reliability at acceptable levels.

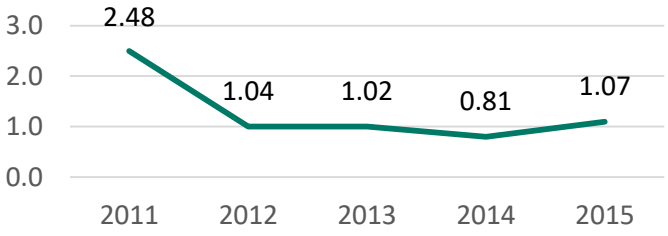
For most customers, the key test of system reliability is "**Do the lights stay on?**" *ENWIN* tries to minimize both the number of outages that customers experience and the length of time the power is out.

Outage statistics (shown below) – consisting of outages lasting a minute or more – are compiled by *ENWIN* to help identify and focus on specific issues that may affect reliability.

Average # Outages per Customer per Year



Length of Outages (hours) per Customer per Year



As illustrated in the table below, *ENWIN*'s reliability statistics compare well with neighbouring utilities:

2015 Reliability Indicator	*ENWIN*	Entegrus Powerlines Inc.	Essex Powerlines	E.L.K. Energy Inc.
Average # Outages per Customer	2.00	1.68	1.84	0.57
Length of Outages (hours)	1.07	1.99	2.23	5.36

Source: 2015 OEB Yearbook; Comparative Reliability Statistics

ENWIN's Distribution System Today

System Reliability

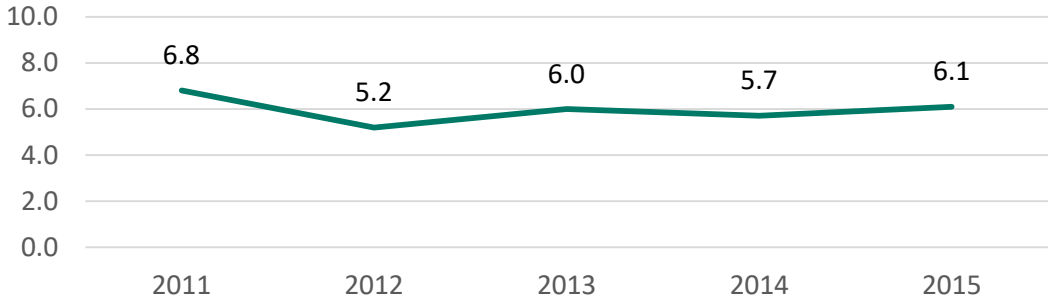
Momentary Outages

Measuring the number and length of outages that last over a minute is a standard regulatory reporting requirement. *ENWIN* also measures the number of momentary outages (under 1 minute and often under 1 second) customers experience over the course of the year. A momentary outage is often experienced as just a flickering of lights that may require you to reset your clocks.

These momentary interruptions indicate that *ENWIN* has successfully avoided longer power interruptions.

ENWIN's outage analysis and system performance measures provide an overview of local distribution system performance during the year. They are based on the raw data for incidents and outages, accumulated by the control room staff. The data enhances *ENWIN*'s Asset Management Plan by identifying the future maintenance and capital budget priorities needed to improve the reliability and performance of the distribution system.

Average # of Momentary Outages per Customer per Year



Addressing System Reliability

Two of the most frequent causes of power outages are storms (lightning, tree contact, adverse weather) and equipment failure (defective equipment).

- *ENWIN* undertakes proactive measures, such as trimming trees away from overhead lines, to both promote safety and reduce the outages caused by tree branches contacting lines during storms.
- *ENWIN* is also installing remotely operable switches and cross connections on its lines. This will enable the utility to quickly isolate damaged sections of lines and restore power first to customers who are not directly affected by the damaged lines or equipment.
- *ENWIN* regularly inspects its lines to check their condition and to identify assets that are not able to continue to reliably fulfil their function. *ENWIN* then performs maintenance or replacement in order to provide reliable electricity distribution to its customers.

Without work and investment, the reliability of the distribution system would deteriorate each year. *ENWIN* has invested on average just over $17 million a year for the last 3 years. During this time, its reliability performance has remained relatively constant. This level of investment is required in order to maintain the current level of reliability of service to customers.

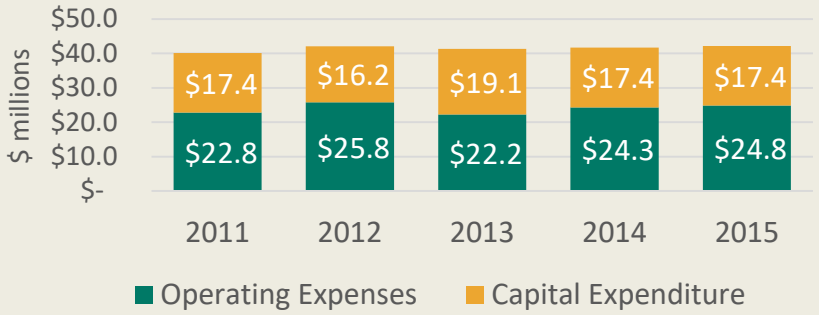
ENWIN's Distribution System Today

What does it cost to run ENWIN's distribution system?

Like most businesses, *ENWIN* manages its spending in two budgets – an *operating budget* and a *capital budget*.

ENWIN's **operating budget** covers recurring expenses, such as the payroll for employees and the maintenance of tools, equipment and assets. Its **capital budget** covers items that, once purchased, have lasting benefits over many years. This includes much of the equipment that is part of the distribution system, such as poles, wires, cables, transformers, major computer systems, vehicles and facilities.

Historic Operating Expenses and Capital Expenditures



Managing the distribution system requires millions of dollars in maintenance, system renewal and day-to-day operations. In its last fiscal year (2015,) *ENWIN*'s operating expenses and capital expenditures **totalled $42.2 million**.

How does *ENWIN* set its budgets?

Utilities are monopolies, and do not operate in competitive markets like most private businesses. Customers cannot choose who delivers power to their homes and businesses. Like it or not, *ENWIN* is the only electricity distribution choice in Windsor. Due to their monopoly market structure, utilities are highly regulated to ensure that they are offering their customers reliable services at a reasonable cost.

For most businesses, net income is determined by revenue minus expenses. To increase net income, businesses need to either increase revenues or decrease expenses. Unlike private businesses, regulated utilities take a bottom-up approach. They start with a return on capital, plus expenses, which equals their revenue requirement.

Does *ENWIN* make a profit? Yes, a profit is built into its rate design. By law, like other regulated utilities in Ontario, *ENWIN* can generate a profit based on a target set by the OEB. A portion of this profit is reinvested in the business. The remainder is paid out in the form of an annual dividend to its shareholder. The dividend may be transferred to the City of Windsor to fund services such as road maintenance, public transit, parks and other municipal programs.

Top-Down Approach

Private Business
Revenue
- Cost of Goods Sold
- Operating Expenses
- Depreciation
- Interest
- Taxes
= Net Income

Bottom-Up Approach

Regulated Ontario Utility
= Revenue Requirement
+ Taxes
+ Interest
+ Depreciation
- Other Revenue
+ Operating Expenses
Return on Capital

Unlike typical private businesses, regulated utilities, such as *ENWIN*, set their budgets based on forecasts of the revenue requirements needed to operate and maintain the distribution system. The cost of providing utility services is reviewed by, and must be approved by, the OEB.

Customer Feedback:
System Reliability

7. The average *ENWIN* customer experiences roughly **two** unexpected power outages per year.

   Have you experienced any power outages **in 2016** which *lasted longer than one minute*? If so, approximately how many of these power outages did you experience?

   - ❑ None
   - ❑ One
   - ❑ Two
   - ❑ Three
   - ❑ Four
   - ❑ More than four
   - ❑ Don't know

Answer only if you experienced one or more power outages in 2016.

8. Approximately how many minutes did the most recent power outage in 2016 last at your household?

   - ❑ Less than 15 minutes
   - ❑ 15 to less than 30 minutes
   - ❑ 30 minutes to less than 1 hour
   - ❑ 1 hour to less than 3 hours
   - ❑ 3 hours to less than 6 hours
   - ❑ 6 hours to less than 12 hours
   - ❑ 12 to less than 24 hours
   - ❑ More than 24 hours
   - ❑ Don't know

9. Thinking back to the **most recent** power outage you experienced (in 2016 or before) as an *ENWIN* customer, would you say the power outage …

   - ❑ Had a significant impact on my household
   - ❑ Had a minor impact on my household
   - ❑ Had barely any impact on my household, just a bit of inconvenience
   - ❑ Don't recall ever experiencing a power outage as an *ENWIN* customer
   - ❑ Don't know

10. Despite best efforts, no electrical distribution system can deliver *perfectly reliable* electricity. As a general rule, the more reliable the system, the more expensive it is to build and maintain.

    Please select what statement comes closest to your point of view.

    - ❑ I would be willing to accept more and longer power outages if that meant there would be a slight decrease on my electricity bill
    - ❑ I would be willing to pay slightly more on my electricity bill to maintain the current level of reliability
    - ❑ I would be willing to pay a modest amount more on my electricity bill to improve the level of reliability I currently receive from *ENWIN*
    - ❑ Don't know

Customer Feedback:
Key Priorities

ENWIN is in the process of engaging its customers to better understand how it should set priorities.

11. Please rank your top 3 priorities – where "1" would be most important, "2" the second most important, and "3" the third most important to you:

Priority Areas	Ranking
Delivering reasonable electricity prices	
Ensuring reliable electrical service	
Ensuring the safety of electrical infrastructure	
Providing enhanced customer service	
Helping customers with electricity conservation and efficient usage	
Modernizing the electrical system (e.g. electric vehicles, net-metering, etc.) to support the reduction of greenhouse gases and lessen climate change.	
Other (please specify: _____)	

12. Are any other important priorities that ENWIN should be focusing on, not mentioned above?

Pressures on the Distribution System

ENWIN's objectives are to ensure that the distribution system is able to deliver power at the quality and reliability levels desired by its customers and to minimize the lifetime cost of running the system by balancing preventative maintenance, life-extending refurbishment and end-of-life replacement.

However, from day-to-day events to major storms, there are a variety of ever-present pressures on *ENWIN*'s operating and capital budget. Many of these cost pressures and expenditures are items over which *ENWIN* has little or no control – such as adverse weather and the implementation of regulatory compliance directives, such as smart meters.

How does *ENWIN* determine the appropriate amount of capital spending related to existing infrastructure?

ENWIN monitors the health of its infrastructure very closely. It inspects the entire overhead distribution system, using infrared technology to detect and proactively prevent equipment failure. In addition, *ENWIN* inspects 100% of its distribution system assets every three years, in accordance with provincial regulations.

Has *ENWIN* previously set aside funds for required upgrades?

The OEB does not allow utilities in Ontario (including *ENWIN*) to create reserve funds.

Key Pressures on the Distribution System

Public electricity first came to Windsor in 1914. Since that time, the City has continued to expand, and reliance on electricity has continued to grow. Electricity keeps our homes warm in winter and cool in summer. It powers sump pumps to keep our basements dry during storms. It powers local industry and provides jobs. Electricity is a common denominator that supports our community, our prosperity and our way of life. At *ENWIN*, we know how important electricity is to our customers. We take seriously our responsibility to deliver electricity safely, reliably and affordably.

However, there are pressures on the electrical distribution system that result in increasing costs for the maintenance of a safe and reliable electrical service.

Aging Electricity Infrastructure

Like many utilities in Ontario today, *ENWIN* faces a primary challenge with aging electrical distribution infrastructure. Sections of *ENWIN*'s electrical distribution system are more than 50 years old, and are at the end of life. *ENWIN* is committed to extending the lifespan of its assets in order to minimize the cost impact of replacement on its customers. However, a time comes when distribution infrastructure can no longer be repaired, and must be replaced. So, *ENWIN* is investing in its electrical distribution infrastructure, to ensure its customers continue to have a safe and reliable supply of electricity.

ENWIN's Asset Management Plan addresses aging infrastructure. Assets, such as poles, are field tested, inspected and rated so they can enter *ENWIN*'s decision-making process, which determines which assets will get replaced first. Current projects include the replacement of old poles, wires and transformers with new equipment built to today's standards.

Compliance

Ontario's electricity industry is one of the most heavily regulated industries in Canada. *ENWIN*'s regulators include the Ontario Energy Board, the Ministry of Energy, the Independent Electricity System Operator, the Electrical Safety Authority and others. These regulators are continually creating new requirements with which Ontario utilities are obliged to comply. Ontario regulations cover a broad range of activities, and include physical plant items (such as smart meter installation), service items (such as customer wait time on the phone before reaching a person), the design and information provided on customer bills, mandated reporting on various performance indicators, prescribed equipment inspection frequencies, conservation targets, conservation program delivery and customer engagement activities.

Equipment Cost Increases

Increases in the world-wide demand for copper and aluminum are driving price increases. These increases drive *ENWIN*'s costs for conductors, transformers and other equipment. In addition, materials and equipment that are built in the US and purchased with Canadian dollars are subject to price increases, due to a drop in the Canadian dollar from over par in 2007 to a much lower value today.

Key Pressures on the Distribution System

Climate Change

It has been widely reported in the news that greenhouse gas emissions over many years have contributed to global warming. This has in turn resulted in stronger, more frequent storms, such as Hurricane Katrina and Super Storm Sandy in the U.S.A., and a major ice storm in Toronto in 2013.

Windsor and Essex County have experienced three tornados in recent years. This increase in storm activity not only damages electrical infrastructure, but causes utilities to build more robust infrastructure. *ENWIN* has begun installing outage management systems to provide early detection of outages, help manage restoration and provide information about when power will be back on. *ENWIN* has also begun installing more remotely operable switches in order to restore power more quickly.

Conservation

By offering Provincial energy savings programs to its customers, *ENWIN* has been helping to promote conservation as a key means of reducing greenhouse gas emissions and the need for new generating and transmitting facilities. However, while conservation helps combat climate change, it also reduces the amount of energy customers consume. This results in reduced revenue available to *ENWIN* to operate and maintain the distribution system. As electricity consumption is reduced, *ENWIN* will still need to invest the same amount money in operation and asset replacement, in order to maintain a reliable system.

Solar Generation

The Province has been promoting the use of renewable generation, such as solar panels, to reduce the impact of greenhouse gas emissions on the environment. While solar panels provide clean power, they are forcing a change in the distribution system. The system was originally designed to move electricity in one direction, from the generator to the customer. Now it must move electricity in two directions, as solar panels push electricity back onto the grid, from the customer. While small amounts of solar generation can be accommodated seamlessly, investments in sophisticated measurement, control and communication systems will be required as the system grows, in order to manage power flows that change direction at various times during the day.

Customer Service Expectations

While it is often difficult to know how long it will take to repair a downed power line or a blown underground power cable, *ENWIN* has been investing in systems to help identify and track outages and provide information. These investments will enable us to inform customers, via website, social media and other means, about the progress of power restorations. *ENWIN* has also been investing in web options for customer self-service, as many customers prefer to arrange changes to their service online.

Key Pressures on the Distribution System

Power Quality

As customers' use of, and reliance on, electricity increases, so does their sensitivity to variations in power quality. A tree touching a line during a storm can trigger equipment that momentarily interrupts the flow of power to the distribution system whenever it detects a spike in the voltage level supplied to a power line. The resulting outages generally last less than a second. *ENWIN's* distribution equipment is programmed to initiate these short interruptions in order to avoid longer outages.

Customers' electrical devices and machinery used to be able to tolerate these sub-second outages. However, utilities are hearing more frequently from customers who are upset by having to reset their electronic devices and equipment, which have become more sensitive to sudden changes in supplied voltage levels. While resetting household electrical devices may be annoying, resetting in-store electronic payment systems or highly automated robotic production lines in factories can be costly for businesses.

While *ENWIN* tries its best to minimize momentary power interruptions, delivering 100% power quality (void of momentary interruptions), all the time, across the system, is not an economical use of customer dollars. The benefits of 100% power quality gained by ratepayers would be far outweighed by the cost of investing in such a system-wide solution. That said, there are behind-the-meter solutions available to business customers needing to ride through these momentary interruptions. *ENWIN* engineering staff can identify industry contacts who can advise on the best investment suited for individual customers who wish to pay for their own plant-level power quality solutions.

Smart Grid/System Automation

As the electricity sector grows and changes, we need a grid that provides more functionality than today's grid. The Province is promoting utilities to develop a smart grid. A smart grid can be operated remotely or autonomously, and can identify and respond to problems on the grid. It is capable of interacting with customers' equipment, such as solar panels, electric car chargers, battery systems and appliances. A smart grid will provide more reliable electricity service, as new technology develops and places different challenges on the system. A smart grid minimizes costs to customers while meeting their needs for power. By better managing loads, it minimizes the investment needed to reinforce the generation, transmission and distribution systems that make up the grid.

ENWIN is investing in its grid in order to ensure that it will be capable of meeting the more sophisticated needs of customers in the future. The smart grid will be able to identify problems and have sufficient remotely operable switches in place to isolate the problem feeder sections. It will have enough cross connections between feeders to supply power from alternative sources to non-impacted sections while repairs are made. This will provide customers with a more consistent, reliable source of energy by creating a stronger, more reliable distribution system. A more automated grid will also allow *ENWIN* to provide the same level of service with fewer staff.

Smart meters are part of the smart grid.

Affordability

ENWIN recognizes that the cost of electricity has risen substantially over the last 10 years and that some customers are finding it difficult to afford the electricity that they have been accustomed to using. While the majority of the cost increases have been imposed by the Province to pay for conservation, generation and transmission initiatives, *ENWIN* tries to continually improve its efficiency, in order to absorb as many of the cost increases it faces as possible thereby minimizing long term costs to customers.

Investing in *ENWIN*'s Distribution System:
Capital Investments

What are the major issues *ENWIN* needs to address?

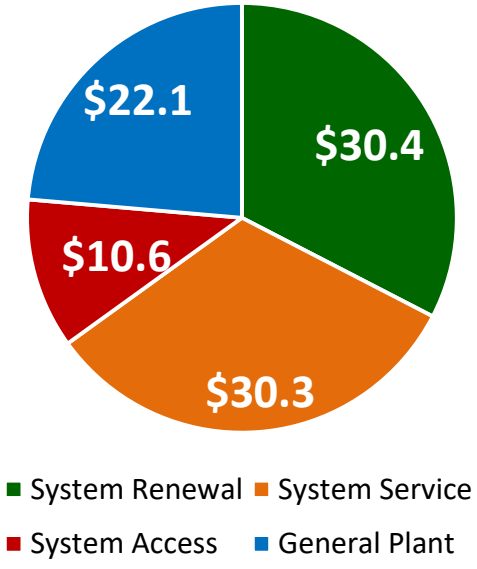
Over the years, *ENWIN* has worked hard to keep its equipment working up to, and well beyond, its expected useful life, providing maximum value for money. However, at present, the system's key capital requirements come from the need to replace these aging distribution assets.

The capital expenditure required to address system renewal, maintain system reliability and safety, and invest in other infrastructure priorities between 2019 and 2023 is estimated to be $93.4 million.

To assist in prioritizing what needs to be replaced, and when, *ENWIN* uses an Asset Management Plan to drive replacement decisions.

Using the information provided by the Asset Management Plan, *ENWIN* plans for four types of capital investment costs:

2019-2023 Forecasted Capital Expenditures: $93.4 million



System Access

Definition: Non-discretionary investments that respond to customer requests for new connections or new infrastructure development. These are high priority, "must do" projects, as *ENWIN* is mandated to connect new customers to the distribution system.

Projects Include: new subdivision and business customer connections, relocating assets based on infrastructure needs

System Renewal

Definition: These projects are a mix of discretionary (planned end-of-life replacement) and non-discretionary (emergency replacement) investments.

Projects Include: Municipal substation upgrade, underground cable replacement, overhead wire replacement, and pole replacement.

System Service

Definition: These discretionary investments consist of projects that improve system reliability and customer service.

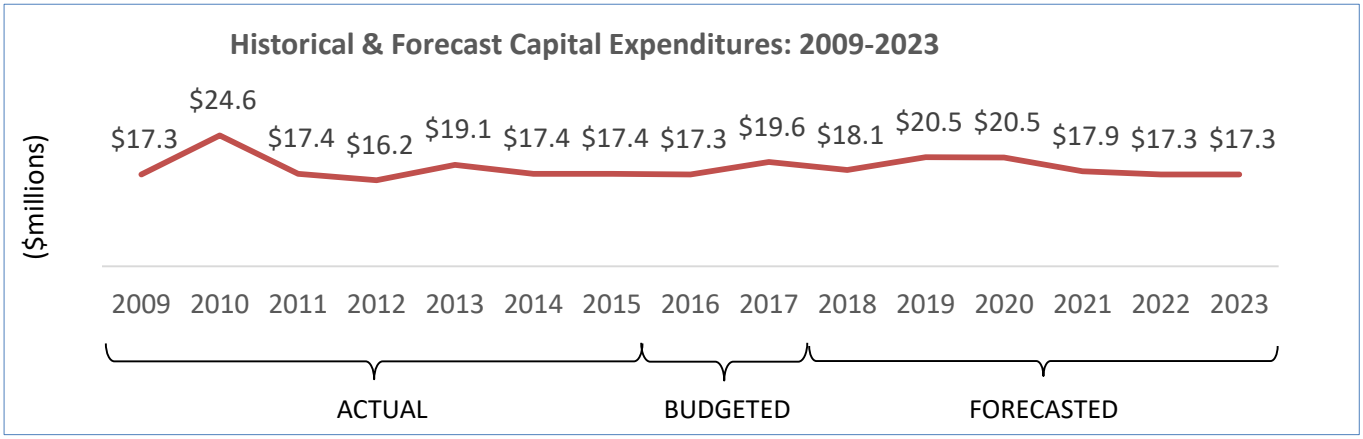
Projects Include: automated switches, better distribution system monitoring equipment

General Plant

Definition: These are discretionary investments that are needed to support the distribution system: such as tools, vehicles, buildings, and information technology (IT.) IT systems used to manage financial and customer information are necessary in order to operate and maintain the distribution system efficiently and service customers.

Projects Include: Financial and customer information system, facilities, equipment and vehicle replacement

Cost Drivers
Capital Investments



Proposed Investment Projects for 2017

ENWIN's proposed 2017 capital budget is $19.6 million.

System Renewal Investments:

- Replacement of aging plant will take approximately $6.8 million with the largest portion of that expenditure at $3 million for pole replacement.
- *ENWIN* is also planning to spend $4.9 million on enhancements to the system including $2.2 million to build a portion of a high-capacity feeder ring around the City. This feeder ring will be built as a storm-hardened line that can survive major storms and move large amounts of power around the City, from areas that might have been harder hit by a storm than other areas. This section is being built as a replacement for lines that are at their end-of-life, so that the incremental cost of constructing this hardened, high capacity line is minimal.

System Access Investments:

- Mandatory expenditures on customer connections and relocations for things like road widenings is estimated at $2.1 million.

System Service Investments:

- Other enhancements include adding more remote operable switches and cross connections between feeders, and providing backup supply connections to moderate to large areas where there is only a single source of supply.

General Plant Investments:

- Finally, *ENWIN* plans to undertake $5.8 million of general plant expenditures for things like fleet replacements, building infrastructure replacement, computer system upgrades, billing and telephone system upgrades. These infrastructure investments will contribute to maintaining the level of service reliability that customers expect, and ensure compliance with regulatory requirements.

Customer Feedback: *Capital Investments*

13. As a company, *ENWIN* needs vehicles and tools to service the power lines and IT systems it needs to manage the system and customer information. Which of the following statements best represents your point of view?

    - ❑ *ENWIN* should find ways to make do with the equipment and IT systems it already has.
    - ❑ While *ENWIN* should be wise with its spending, it is important that its staff have the equipment and tools they need to manage the system safely, efficiently and reliably.
    - ❑ *ENWIN* should increase its level of investment to replace aging infrastructure to improve system reliability, even if that modestly increases my monthly electricity bill.

14. With regards to projects focused on replacing aging equipment in poor condition, which of the following statements best represents your point of view?

    - ❑ *ENWIN* should invest what it takes to replace the system's aging infrastructure to maintain system reliability, even if that increases my monthly electricity bill by a few dollars over the next few years.
    - ❑ *ENWIN* should lower its investment in renewing the system's aging infrastructure to lessen the impact of any bill increase, even if that means reduced reliability and more, or longer, power outages.
    - ❑ Don't know

15. With regards to investment in grid technology designed to improve the reliability of the electricity distribution system, which of the following statements best represents your point of view?

    - ❑ Investments in new technologies are more of a luxury than a necessity and will cost customers more than they are willing to pay.
    - ❑ Investments in new technology will increase system reliability, make our local distribution system more efficient, and save us money in the long run.
    - ❑ Don't know

16. To what extent do you agree or disagree with the following statement?
    I value accurate and timely information about outages and restoration during a storm, even if it costs me a little bit more for ENWIN to provide this service.

    - ❑ Strongly agree
    - ❑ Somewhat agree
    - ❑ Neither agree nor disagree
    - ❑ Somewhat disagree
    - ❑ Strongly disagree
    - ❑ Don't know

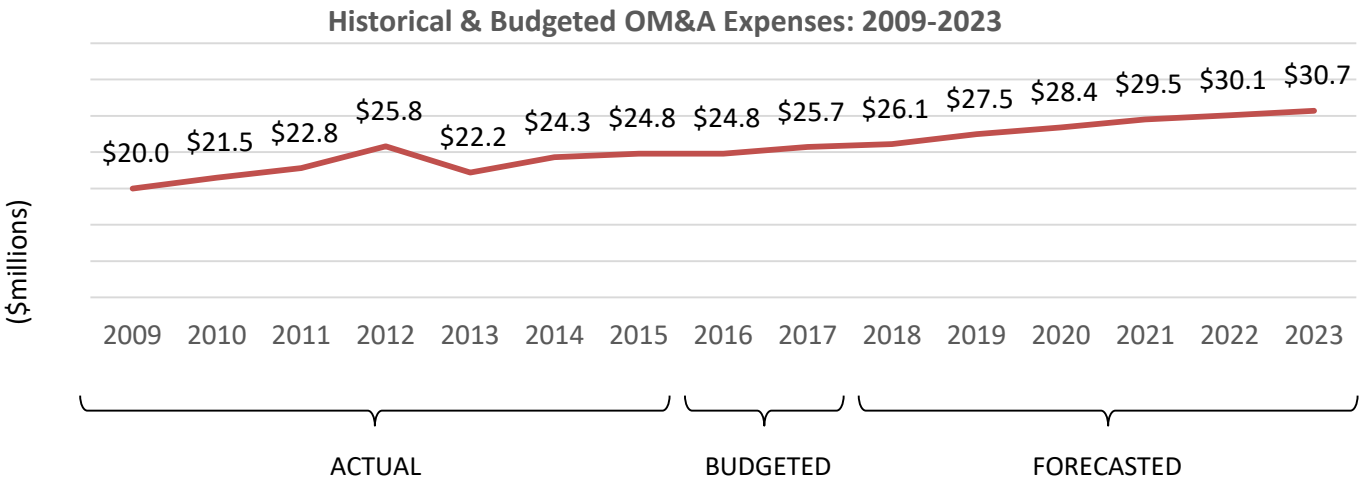
Operating Budget Cost Drivers

Operations, Maintenance & Administration (OM&A) Expenses

In addition to its capital budget, *ENWIN* needs to consider its operating budget, which also impacts customer bills.

Cost drivers contributing to the operating budget can largely be attributed to ongoing maintenance and management of the distribution system. An example of this type of cost driver is *ENWIN*'s vegetation program, including tree trimming, designed to lessen the impact of falling tree branches on power lines.

ENWIN is continually looking for ways to improve its business processes, in order to comply with the increasing responsibilities and obligations being established for local distribution companies, without negatively impacting overall costs to customers.



Nevertheless, the level of OM&A is expected to increase. These increases are primarily related to the following factors:

- Increases in labour costs due to negotiated increases, plus the impact of non-discretionary statutory employee benefits.
- Funding for apprentices and other technical staff necessary for succession planning, and in preparation for a number of pending retirements.
- Increased operating expenses related to the implementation of, and transition to, replacement financial, customer service and other information systems. These expenses are necessary to improve management information and to provide enhanced self-serve functionality for customers.
- Increases in IT costs for software licenses, technical support and cyber security.

Finding Efficiencies and Cost Savings

ENWIN has not applied to the Ontario Energy Board for a Cost of Service (COS) rate application since 2009, as it has been able to find efficiencies within the organization to contain costs.

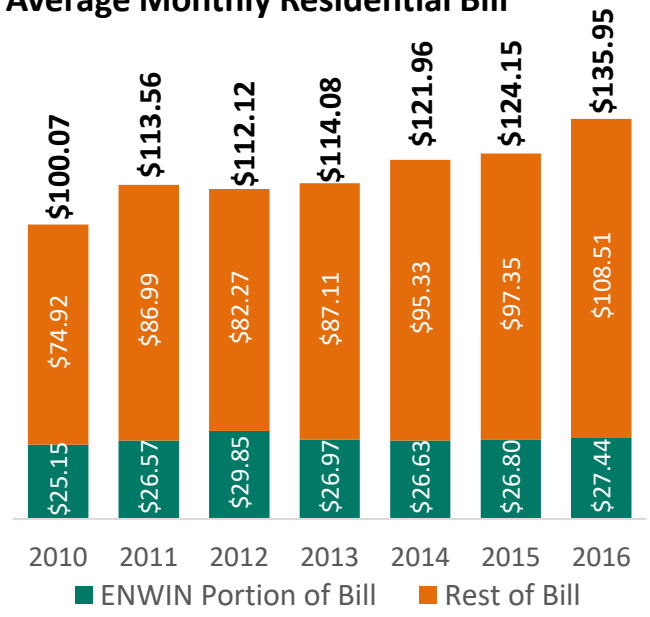
One of the ways in which *ENWIN* has achieved internal cost saving is through investments in automation.

- This includes remote operation of switches and other distribution devices, data collection equipment, computer systems and communication systems.
- *ENWIN* has also worked hard to streamline and develop common processes between its Hydro and Water divisions, sharing as much as possible between the two entities with the goal of making both more efficient and cost effective for its customers.
- *ENWIN* has sought out contract arrangements rather than replace certain retiring staff. These arrangements are competitively bid to achieve the best prices, minimizing cost increases to be passed on to customers.

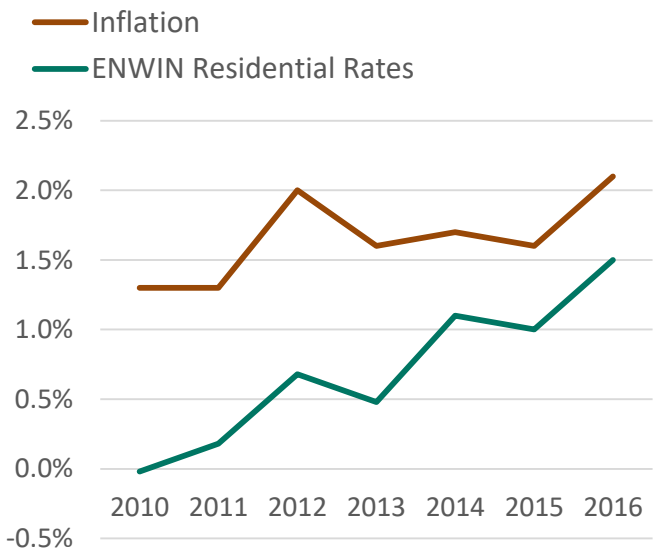
Case Study: *In 2010, ENWIN replaced its metering infrastructure with new smart meters mandated by the Province. ENWIN delayed the installation of the smart meters as long as possible, and was able to purchase them while the Canadian dollar was at an all-time high relative to the US dollar. ENWIN was able to hire contractors that had finished installation jobs for other utilities, were experienced in smart meter installation and gave ENWIN a very good price for installation. ENWIN was able to achieve the lowest overall cost for smart meters in the Province, thereby saving its customers money.*

ENWIN's distribution charges have remained relatively flat between 2010 and 2016, with annual increases below the annual rate of inflation. The elements making up the rest of the bill have increased significantly.

Average Monthly Residential Bill*



ENWIN Rate Increases vs. Inflation



* Based on consumption of 750 kWh per month.

Customer Feedback:
Operating Expenses & Specific Initiatives

17. Do any of *ENWIN*'s forecasted expenses or expenditures appear unreasonable to you? If so, which areas appear unreasonable and why?

18. Please rank the service items below in the order in which they would have the greatest positive impact to you as an *ENWIN* customer, where 1 represents the item that would have the most positive impact and 7 represents the least positive impact.

Service Items	Ranking
Billing: Improve the format and presentation of bills	
Ease of doing business: Provide customized customer service through phone, mobile or online	
Energy management: Provide tools so you can manage your usage and view your consumption	
Power outage restoration: Provide more accurate estimates of when your power will be restored	
Renewable generation: Enable customers to integrate their renewable energy devices into the grid.	
Electric vehicles and storage: Enable customers to use their high capacity home batteries and electric vehicle batteries to provide power during outages.	
Power quality: Monitor and reduce the number of power quality issues (e.g. flickering lights).	

19. Electronic billing saves money on postage and paper. The more customers who use electronic billing, the more money *ENWIN* saves; savings which ultimately get passed along to customers. How interested would you be in changing to electronic billing?

- ❑ Very interested
- ❑ Somewhat interested
- ❑ Not very interested
- ❑ Not at all interested
- ❑ Already signed up for e-billing
- ❑ Don't know

20. Why haven't you switched to e-billing yet?

Customer Feedback:
Specific Initiatives

21. How much more would you be willing to pay, on top of your monthly bill, for the following customer services?

Customer Service Offerings	-nil-	$0.01 to $0.24	$0.25 to $0.49	$0.50 to $0.99	$1.00 to $1.99	$2.00+
Telephone conversation with a live customer service representative outside of regular business hours						
Enhanced website portal						
Online chat with customer service representatives						
Self service forms (Request a New Account, Submit a Move Request, Locate Request, Submit a Meter Read, Tree Trimming Request)						
Facebook updates						
Twitter updates						
Mobile apps (to pay bills, monitor electricity consumption, and/or access outage information)						
Other *please specify*: _____						

22. Have you ever participated in an *ENWIN* electricity conservation program?

- ❑ Yes
- ❑ No
- ❑ Don't know

23. How likely are you to participate in <u>future</u> *ENWIN* conservation programs that could help reduce your electricity consumption?

- ❑ Very likely
- ❑ Somewhat likely
- ❑ Not very likely
- ❑ Not at all likely
- ❑ Don't know

What Will *ENWIN*'s Plan Cost Customers?

As mentioned earlier, *ENWIN* is funded by the distribution rates paid by its customers. Every few years, *ENWIN* is faced with the decision to file a Cost of Service (COS) application with the OEB to request funding to operate and maintain the distribution system in accordance with its spending and investment plan. As part of its rate filing, *ENWIN* must submit evidence to justify the amount of funding required to safely and reliably distribute electricity to its customers.

Rate Design

ENWIN's last COS application was filed for rates effective May 1st, 2009. During the years between COS applications, the OEB approves marginal increases to distribution rates (based on an allowance for inflation, less an adjustment for expected efficiency gains). When necessary, utilities apply for new distribution rates, to rebalance revenue requirements with the actual costs associated with operating and maintaining the distribution system.

ENWIN is now in the process of preparing for an application to the OEB for new distribution rates to cover the cost of maintaining and operating a safe and reliable distribution system that will meet the changing needs of our customers in the coming years. Reaching out to customers like you is the **first step** in that process. By offering your informed opinions, you are helping create our local distribution plan for the future.

Residential Bill Impact

Current monthly distribution charges are about **$27.44 per month or 20% of the total monthly bill** for the average *ENWIN* residential customer who consumes 750 kWh of electricity per month.

By 2023, subject to *ENWIN* Board of Directors and OEB approval, it is estimated that the average residential bill could increase to between **$30.90 and $32.70** per **month** so that *ENWIN* can operate, maintain and modernize the local electricity distribution system.

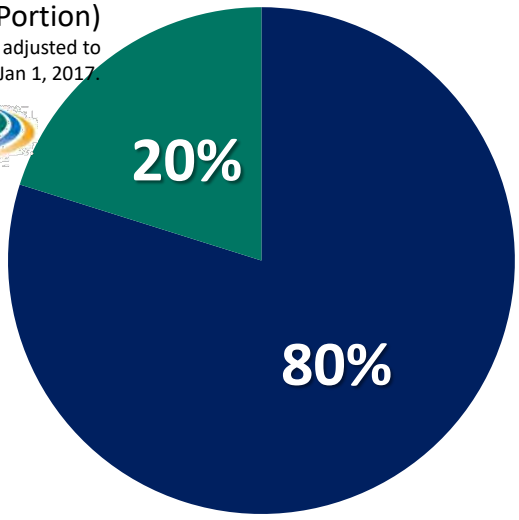
The majority of this impact could take place by 2019, with customers experiencing a monthly increase of between **$1.70 and $3.40** during this period. Following an approved Cost of Service rate increase, annual distribution rates are expected to increase only marginally, to account for inflation.

By 2023, it is estimated that the seven-year total *ENWIN* increase for the average residential household could be between **$3.45 and $5.25** per month.

The proposed rate increase will only impact the 20% of the average residential electricity bill that stays with *ENWIN*. The rest of the bill goes to power generation companies, transmission companies, the government and regulatory agencies.

Delivery: Distribution (*ENWIN*'s Portion)

* Based on 2016 rates, adjusted to reflect 8% rebate as of Jan 1, 2017.



Customer Feedback:
Assessment of Proposed Plan

24. Considering what you know about the local distribution system, which of the following best represents your point of view?
    - ❑ The proposed range of rate increases is reasonable and I support it
    - ❑ I don't like it, but I think the proposed range of rate increases is necessary
    - ❑ The proposed range of rate increases is unreasonable and I oppose it
    - ❑ Don't know

25. Thinking about your answer to the previous question (question 24), why do you either support the proposed range of rate increases, think the proposed range of rate increases is necessary, oppose the proposed range of rate increases, or don't know?

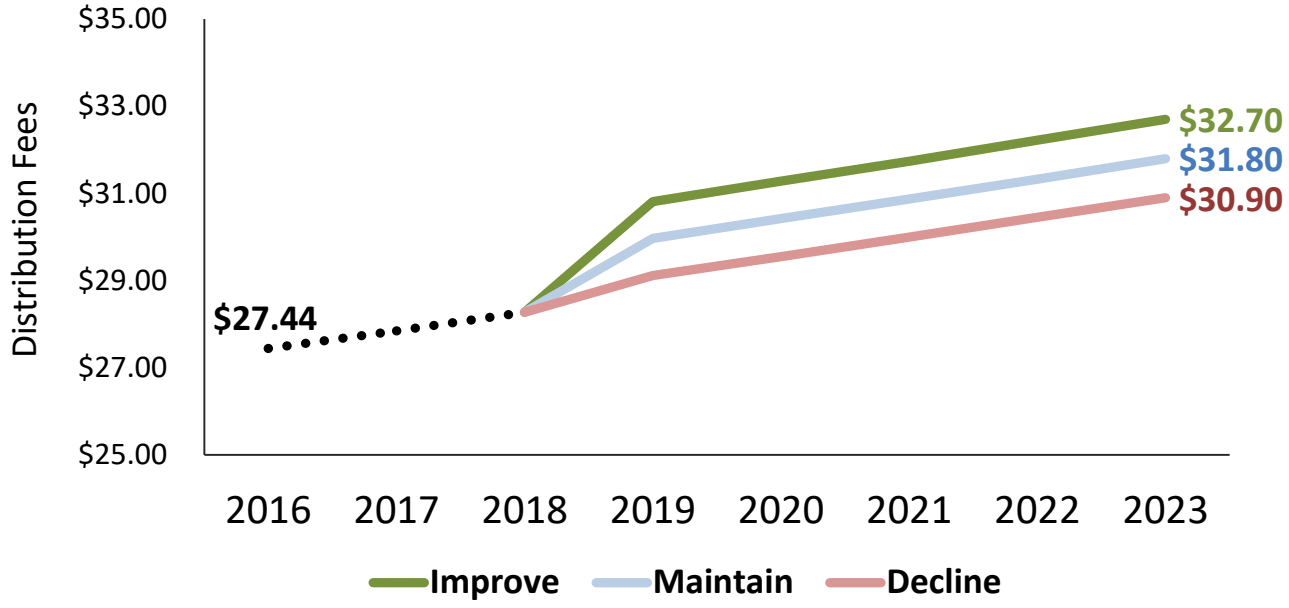
Alternative Scenarios

While *ENWIN* has presented a preliminary plan that ***maintains*** the current level of reliability and service performance, as part of its planning process, *ENWIN* has looked at two alternative scenarios:

- one where reliability and service levels ***decline***;
- and one they ***improve***.

Each scenario impacts customer rates differently.

Rate Impact vs. Reliability & Service Level Scenarios



26. Given the varying reliability and services levels under each scenario and the projected customer rate impact of each, please indicate by marking an "X" which approach would you want *ENWIN* to pursue between 2019 and 2023?

Preferred Option	***Reliability Scenario***	***Service Level and Estimated Rate Impact*** *(for average residential customer with 750 kWh monthly consumption)*
	Improve	Would you be willing to accept a 9% distribution delivery rate increase where reliability and service performance improves?
	Maintain	Would you be willing to accept a 6% distribution delivery rate increase where reliability and service performance remains the same as it is now?
	Decline	Would you be willing to accept a 3% distribution delivery rate increase where reliability and service performance eventually declines?

Final Thoughts

***ENWIN* values your feedback. This is the first time the utility has conducted a review about its upcoming investment plan in this type of format.**

Overall Impression: What did you think about the workbook?

Volume of Information: Did *ENWIN* provide too much information, not enough, or just the right amount?

Content Covered: Was there any content missing that you would have liked to have seen included?

Outstanding Questions: Is there anything that you would still like answered?

Suggestions for Future Consultations: How would you prefer to participate in these consultations?

If you have any additional questions or comments about ENWIN's rate application or customer engagement, email:
CustomerEngagement@enwin.com

or send your questions or comments to:

Enwin Utilities Ltd.
Attn: Customer Engagement
787 Ouellette Avenue
P.O. Box 1625, Station A
Windsor, Ontario
N9A 5T7

Appendix C – Building Consolidation

Attachment C : Facilities Business Plan

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ENWIN FACILITIES BUSINESS PLAN

LAND & BUILDINGS - CONOSLIDATE OPERATIONS INTO ONE SITE.

1. **EXECUTIVE SUMMARY**

ENWIN Utilities Ltd. ("ENWIN") electricity business owns and is currently operating out of two main electricity and water facilities, both located within the City of Windsor. The Rhodes Drive Operations Centre serves as an Operations and Engineering facility (the “Rhodes Drive Operations Centre” or “RDOC”), and the second location is an Administrative facility housing Information Technology, Call Centre, Billing and Collections, Finance, Human Resources, Regulatory, Executive and Communications (the “Ouellette Facility”).

In an effort to find productive and efficient ways to serve customers, ENWIN identified that a site consolidation would benefit ratepayers by reducing operating costs of one site while also allowing for improved operational efficiencies and ensuring the appropriate service levels to customers. Several options were considered including new construction, leasing space or even staying with the two facilities but it was determined that the most efficient option was to sell the Ouellette Facility and renovate the RDOC to accommodate all of the ENWIN staff into one location.

Based on the business case along with Board of Director and Shareholder approval, ENWIN put the Ouellette Facility up for sale to the public. An acceptable offer was received and ENWIN is now in the process of finalizing the sale of the property and has begun the process of renovating the RDOC to accommodate the additional staff that are planned to be moving into the facility. This consolidation of facilities will allow ENWIN to become more productive, minimize costs and also provide customers with a one-time rate reduction as a result of the sale of the existing Ouellette Facility.

2. **BACKGROUND AND NEEDS ASSESSMENT**

ENWIN Background & Operating Structure

1936 - 1999

The Windsor Utilities Commission ("WUC") (operating both electricity and water utilities) was created through the City of Windsor Act 1936, wherein the Act granted WUC the authority to build, own and maintain water treatment and distribution, and a hydro distribution system for the City of Windsor. Over the following decades, the hydro and water functions housed staff and equipment at various addresses, but most recently and notably, and until the year 2000, at 350 Erie Street (hydro engineering and operations), 2555 Pillette Road (water engineering and operations), 3665 Wyandotte Street East (water treatment plant and storage), and 787 Ouellette Avenue (hydro and water administration). With the passage of Bill 35 (Electricity Act) 1998, the structure of Utility Commissions dramatically changed throughout the Province. Hydro and water entities, referred to as Public Utility Commissions, were disbanded and succeeded by 300 plus hydroelectric entities (OBCA companies), and the water portion of the former PUC's were transferred to the municipalities, with the exception of four. One of those four was Windsor, and through a Managed Services Agreement (MSA), later replaced with a Water System Operating Agreement (WSOA), ENWIN has managed and operated the hydro, as well as the water distribution systems, since then. The Windsor Utilities Commission (a special purpose body under the City of Windsor Act, 1936) continues to own the water distribution system, as well as the treatment and storage facilities.

2000 - present

The RDOC was built between 1999 and 2000 to house all hydro and water operations and engineering staff, and because of the site size, eventually housing all staff and functions. The construction of the RDOC allowed for the sale of the Erie Street and Pillette Road sites.

From a facilities perspective, ENWIN owns and operates out of the Ouellette Facility and RDOC. The water treatment plant and storage facility listed above is not owned by ENWIN however ENWIN manages the facility on behalf of WUC.

Facilities Background

<u>Ouellette Facility</u>

The Ouellette Facility was built in 1955 to house the former Windsor Utilities Commission ("WUC") (the predecessor entity to ENWIN Utilities Ltd.). The building was intended to function as an administrative building and that required ENWIN (then WUC) to own other facilities for operational activities including warehousing of inventory, vehicle and equipment storage, along with engineering and operational activities from field staff.

The Ouellette Facility currently has Information Technology, Call Centre, Billing and Collections, Finance, Human Resources, Regulatory, Executive and Communications functions operating from this facility. Over time the number of staff in this location has declined. Previous activities such as fiber optics, an outsourced call centre, and overall reductions in administrative functions have left the building underutilized. See discussion below regarding the opportunity for consolidation for more details.

The Ouellette Facility consists of two property parcels. 787 Ouellette Avenue is a 170.83 ft. x 180.00 ft. site that has a five level building (including the basement level) with total floor space of 43,576 sq. ft., and 54 parking spaces. 741 Pelissier Street is 120.00 ft. x 90 ft. site and consists of 37 space paved parking lot for employee parking.

RDOC

Built in 2000, the RDOC was built to replace two operational facilities which have since been sold. The RDOC was also an attempt to consolidate operations and improve efficiencies. The RDOC was designed to accommodate approximately 100 additional employees and now that the Ouellette Facility has approximately that number of staff, the opportunity for another consolidation aligned.

The RDOC currently has the ENWIN hydro and water engineering, operations support, geomatics, fleet, metering and meter reading, purchasing and warehouse functions, as well as Conservation Demand Management.

The RDOC is located on a 17.2 acre site and consists of a two storey building with 167,740 sq. ft. of office space, shop areas, inventory warehousing, and indoor vehicle parking, 5.8 acres of outdoor inventory storage, 1.7 acres of outdoor vehicle and equipment parking, and 2.0 acres of employee parking.

3. CONSOLIDATION ALTERNATIVES

Opportunity for Consolidation

The following factors initiated the review of a potential site consolidation:

- Ouellette Facility building, while in reasonably good condition, will require material capital investments to address roof, facade, and HVAC repairs.
- The Ouellette Facility is underutilized and it is not anticipated that the administrative staff headcount will increase in the foreseeable future.
- Attrition and headcount reductions now aligned where the current Ouellette Facility staff could reasonably fit into the RDOC footprint without any expansions to the building.
- Operational efficiencies may be enhanced if all staff are within the same building.

Alternatives Considered

The following alternatives were considered when evaluating the potential site consolidation:

1. Construct an addition to RDOC;

2. Renovate the interior of the existing footprint of RDOC;

3. Sell Ouellette Facility and lease space for the Ouellette Facility employees;

4. Build a combined operations centre and administrative office at a new location;

Alternatives Evaluated

1. Construct an addition to RDOC

Analysis yielded that the cost to expand the RDOC existing foot print was more costly than renovating the available space at the site. Further, and as per Option 2 below, spending for an addition when

there is ample space within the existing building would be financially imprudent. Table 1 below shows the comparison of the cost of this construction compared to the cost of a renovation.

2. Renovate the interior of the existing footprint of RDOC

This option reviewed the available under-utilized floor space, incorporated standardized space planning, and concluded that the Rhodes Facility has more than ample space for the current and proposed addition of the Ouellette Facility staff and functions. As shown below this option was more financially viable compared to the new construction option. Table 1 shows the cost of this alternative.

3. Sell Ouellette Facility and lease space for the Ouellette Facility employees

This option was considered by ENWIN staff and included a search of available vacant office space to accept a portion, or all of the Ouellette Facility staff and functions, on the premise that the RDOC may or may not be able to hold all of the Ouellette Facility employees. Upon the completion of a preliminary renovation design and associated Class C estimate for the RDOC, this option was quickly dismissed because RDOC could hold all of the existing staff.

4. Build a combined operations centre and administrative office at a new location

While this was identified as an option, little attention and time was devoted to this option given that there is sufficient space and property at the Rhodes site to exercise Options 2. The financial payback of option 2 suggested that a complete new construction building would be much more expensive than renovating existing space.

Table 1 – Comparison of Options for RDOC Renovations

Options Considered	Construction Costs Estimate	Additional "soft costs" identified (e.g. building permits, professional consultants etc.)	Overall project cost
Option 1 - Construct an addition to the RDOC building	$4,067,200*	$573,600	$4,640,800
Option 2 - Renovate the existing RDOC building and Wyandotte Street East**	$3,221,000	$279,000	$3,500,000,

*The above estimate of costs for Option 1 above is based on an addition consisting of 26,875 sq. ft.

** Analysis being completed by ENWIN staff as required, and as informed by Baird Architecture and Engineering (Baird) who completed a Class C estimate for 4545 Rhodes Drive. The Preliminary Feasibility Report was completed by Baird in February of 2018.

Customer/FTE Growth

Existing customer growth and future employee growth was also considered as part of this decision.

	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Bridge Year	Test Year
Number of Customer	85,213	85,589	86,185	86,616	87,149	87,697	88,032	88,369	88,707
Number of FTE's	367	357	338	334	332	335	324	314	314
Admin. Sq. Ft.	130,249	130,249	130,249	130,249	130,249	130,249	130,249	130,249	130,249
Sq. Ft./Customer	1.53	1.52	1.51	1.50	1.49	1.49	1.48	1.47	1.47
Sq. Ft./FTE	354.90	364.84	385.35	389.97	392.32	388.80	402.00	414.81	414.81

Customer growth has been stagnant and is not expected to increase substantially.

FTE has seen some reductions through attrition but offset by staffing apprentices and other significant positions required for succession planning. The overall expectation however is that in the short term there will not be increases in FTE and therefore there is not an expectation that more room is required to hold the future FTE complement.

Benchmarking

To support and validate that this approach of consolidating into one Facility was reasonable the following benchmarking was conducted:

	ENWIN	Waterloo North Hydro Inc.	InnPower	Milton Hydro Distribution Inc.	PUC Distribution Inc.
Sq Ft/FTE	307	840	882	1,494	1,269

Appendix C provides additional details with respect to benchmarking but the overall outcome is that the anticipated consolidation on space will result in less space per person and FTE than currently exists and will result in operating cost savings along with opportunities for greater efficiencies because most administrative staff will be in one location.

4. **RECOMMENDATION**

The opportunity to become more operationally efficient, avoid future capital and operating costs in the future was the reason for the pursuit of a site consolidation plan. When several alternatives were considered and evaluated the most efficient and economical option with a reasonable payback period was to sell the Ouellette Facility and renovate the RDOC.

Financial Payback:

Table 2 below illustrates a payback period for the proposed project of 4.6 years assuming a “Base Case” scenario where the selling price is the most recent sale amount, the construction costs are based on the most recent cost estimate and there is a component of the gain on sale of the Ouellette Facility that will be shared with ratepayers. Without sharing the gain the payback period is 4.0 years.

Table 2 – Payback Period Calculation

Payback Period Calculation							
Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	
PP&E Spending/Disposal							
Rhodes construction/retrofit	(2,000,000)	(1,720,000)					
Closing costs (legal, other)		(50,000)					
Ouellette - sale price		2,000,000					
Total net cost of move	**(2,000,000)**	**230,000**	**-**	**-**	**-**	**-**	**(A)**
Undiscounted Cash Flow:							
Avoided Capital Spending estimate - Ouellette		80,000	80,000	80,000	80,000	80,000	
Estimated incremental operating costs - Rhodes		(20,000)	(20,000)	(20,000)	(20,000)	(20,000)	
Operational Savings - Ouellette		374,000	378,000	382,000	386,000	390,000	
Potential return of gain to ratepayers		(250,000)	-	-	-	-	
Total Undiscounted Net Cash Flows	**-**	**184,000**	**438,000**	**442,000**	**446,000**	**450,000**	**(B)**
Net Cash Flow (A) + (B)	**(2,000,000)**	**414,000**	**438,000**	**442,000**	**446,000**	**450,000**	
Cumulative net cash flow		**(1,586,000)**	**(1,148,000)**	**(706,000)**	**(260,000)**	**190,000**	
Payback Period	**4.58**	**Years**					

At the time of this analysis the actual cost of the renovation is unknown but the following sensitivity analysis below shows that even with higher than anticipated renovation costs, the payback is still within 6.23 years.

The impact on payback period of different level of these key assumptions is summarized in Table 3 below:

Table 3 – Payback Calculation – Risk Analysis

Payback Calculation - Sensitivity Analysis			
Scenario	Cost of Renovation	Extraordinary repairs avoided	Payback Period (Years)
Base Case	3,770,000	-	4.58
Favourable renovation costs	3,000,000	-	2.29
Unfavourable renovation costs but avoided capital spending	4,770,000	400,000	5.35
Higher costs to renovate	4,770,000	-	6.23

Under the scenario where ‘extraordinary repairs are avoided’ the additional $400,000 represents approximately $150,000 for repair of the sandstone cladding on the building, roof repairs of up to

$300,000. This also excludes the potential window replacement which may be required and that could cost an additional $400,000.

Cost of Service Assumptions:

The Ouellette building was sold in-between the time when the budgets were approved and when the Cost of Service application was filed. As a result, the budget figures included in the application include estimates for the transaction but the analysis below includes the actual sale price.

The following assumptions and calculations were made of the Cost of Service application:

	2020 COS	**Updated Forecast**	**Difference**	**Comments**
Proceeds from Sale of building	$2,192,000	$2,000,000	($192,000)	Market price from the competitive bidding process
Closing Costs	(135,000)	(50,000)	$85,000	Estimated at this time
Estimated NBV	(927,000)	(987,000)	($60,000)	Originally assumed to sell Dec 31, 2020. The actual sale is for June 30, 2020 so the NBV will be higher
Estimated Gain on Sale	1,130,000	$963,000	($167,000)	

The actual amount of the gain or loss is unknown at this time but it is anticipated to be approximately $1 million. As demonstrated above, these facilities (both Ouellette Facility and RDOC) are used as shared service assets. The Water operation of ENWIN is allocated their proportion of the operating costs and is charged a return on asset every year for using these ENWIN shared service assets. As a result, within the budget, the Water portion of the gain was allocated to Water as they have paid and participated in the Facilities in the same way the electricity operations has. The remaining gain was then shared 50% to the shareholder and 50% to the ratepayer. As a result, Appendix 2-H has $576,062 of the gain from this sale.

Site Consolidation Plan:

ENWIN has developed the following plan in respect of its land and buildings:

- Relocate all of the Ouellette Facility functions to the existing RDOC located at 4545 Rhodes Drive. ENWIN will renovate the RDOC building to accommodate the Ouellette Facility personnel and functions. ENWIN expects to complete the personnel and function move to the RDOC site in late 2020. The IT server room located at the Ouellette Facility will be relocated to 3665 Wyandotte Street East. This site is the WUC water treatment facility that ENWIN manages and operates in accordance with a Water Services Operating Agreement (WSOA).

- ENWIN advertised the existing Ouellette Avenue building for sale in November of 2018 with a closing date for bids of February 1, 2019. A compliant bid of $2.0M was approved by ENWIN in February/2019, and subsequently by the Shareholder on March 25, 2019. The proceeds from the sale of the building will be used to fund the renovation project at RDOC and 3665 Wyandotte Street Est which has an estimated cost of $3.5M. ENWIN will use the proceeds of $2.0M towards the cost of the renovation. The remaining cost of the renovation is effectively financed through operating costs savings because the Ouellette Facility will no longer be in use. The payback on this option is presented below.

- Renovations at the RDOC will consist of the demolition and reconstruction of specified internal areas within the RDOC building footprint on each floor (two floors) to create offices and work spaces, based on adopted sizing standards for each role and function that will ultimately be housed in this building. Specifically, the planned renovations will create office and work space capacity for the combined requirements of present day RDOC and the Ouellette Facility, with sufficient space for future growth.

- In summary, renovations at the RDOC will accommodate the current office and work space requirements at the RDOC for 145 office employees and 81 field employees (don't require office space at the RDOC) needs, and 100 office employees from the Ouellette Facility. The project will also include the creation of parking spaces as required, in addition to the existing 246 spaces, for the 100 employees to be transferred from the Ouellette Facility. For clarification, the staff numbers listed above are for both Electricity and Water operations.

Appendix A - Space and Primary Use for Buildings

Table 4 summarizes the current facilities space:

Table 4: Current Facilities Space

Building	Administration square feet	Operations square feet	Primary Use
787 Ouellette Avenue	43,000	0	Finance, IT, Server Room, Call Center, Billing & Collections, Regulatory, Human Resources, Communications, President & CEO, Boardroom, Records Storage
4545 Rhodes Drive	87,249	80,494	Hydro Engineering, Water Engineering, Geomatics, Server Room, CDM, Hydro Control Room, Meter Reading, Energy Efficiency (CDM), Operations Supervision, Senior Executive Offices, Records Storage, Meeting Rooms, Training Room, Purchasing, Project Management, Lunch Room, Health & Safety, Clerical Support, Meter Shop, Inventory Warehouse & Receiving, Vehicle Storage, Mechanics Bay, Operations Shops, Locker Room & Showers, Weld Shop, Transfomer Repair, Storage, Fleet
Totals	**130,249**	**80,894**	

Table 5 summarizes the proposed space for each building and primary use for each building (based on the plan).

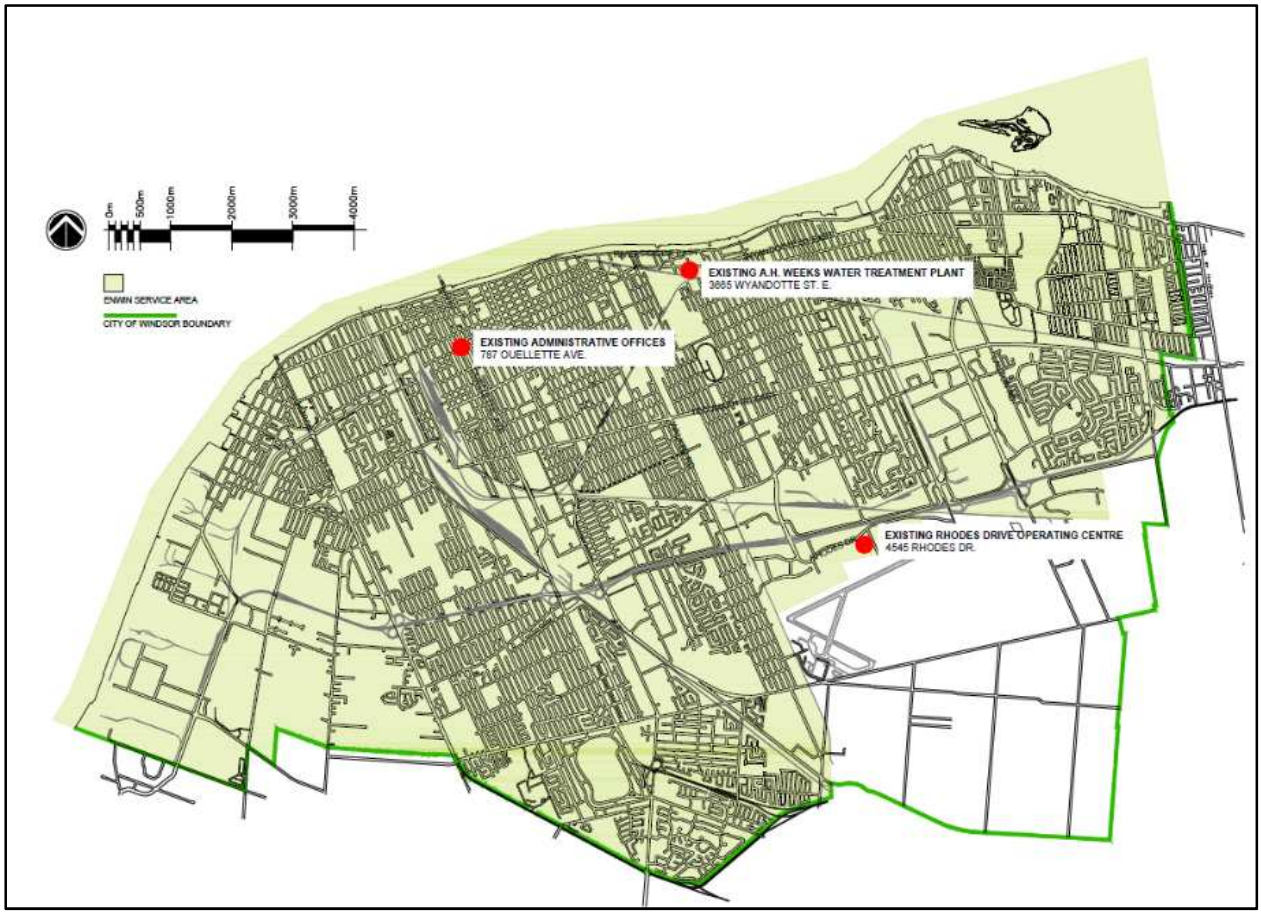
Table 5: Proposed Facilities Space Use

Building	Administration square feet	Operations square feet	Primary Use
4545 Rhodes Drive	87,249	80,494	Leadership Team, Customer Service & Billing, Finance & Regulatory, Human Resources & Safety, Energy Efficiency (CDM), Information Technology Services, Hydro & Water Engineering, Purchasing, Records Storage, Project Management, Geomatics, Hydro Control Room, Meter Reading, Meeting Rooms, Meter Shop, Inventory Warehouse & Receiving, Fleet & Vehicle Storage, Mechanics Bay, Operations Shops, Locker Rooms & Showers, Weld Shop, Transfomer Repair, Storage
3665 Wyandotte Street East	500	0	Server Room
Total	**87,749**	**80,494**	The combined staff and functions of the above two facilities
Overall Total	168,243		

Appendix B - Building Locations

Figure 1 below shows the location of the current buildings.

Figure 1: Location of Current Buildings



Appendix C - BENCHMARKING

In Table 6 below, the cost and utilization for the preferred option are compared to data taken from rate applications for a number of other distributors. Note that the ENWIN plan compares very favorably to other new facilities.

Table 6: Cost and Utilization Comparison to Other Distributors

LDC	4545 Rhodes Drive & 3665 Wyandotte Street East	Waterloo North Hydro Inc.	InnPower	Milton Hydro Distribution Inc.	PUC Distribution Inc.
OEB Docket	N/A	EB-2015-0108 EB-2010-0144	EB-2014-0086	EB-2015-0089	EB- 2012-0162
Year of Occupancy	2020	2011	2015	2015	2012
Functions	Administration & Operations	Administration & Operations	Administration & Operations	Administration & Operations	Administration & Operations
Type of Project	Refurbish	Custom Build	Custom Build	Purchase / Refurbish	New Build
Capital Cost (est.)	$$3,500,000	$26,682,000	$10,896,704	$12,524,798	$23,000,000
Total Square Ft Sq. Ft. to Be Renovated	168,243 56,233	105,000	36,172	91,872	110,382
FTEs	324	125	41	61.5	87
Square Foot per FTE	519	840	882	1,494	1,269
Capital Cost per FTE	$$10,802	$213,456	$252,139	$203,655	$264,368
Capital Cost/Square Foot	$$62.24	$254.11	$285.79	$136.33	$208.37

APPENDIX D – SITE DETAILS

FIGURE 2 – 787 Ouellette Avenue and Parking Lots, Site Aerial View

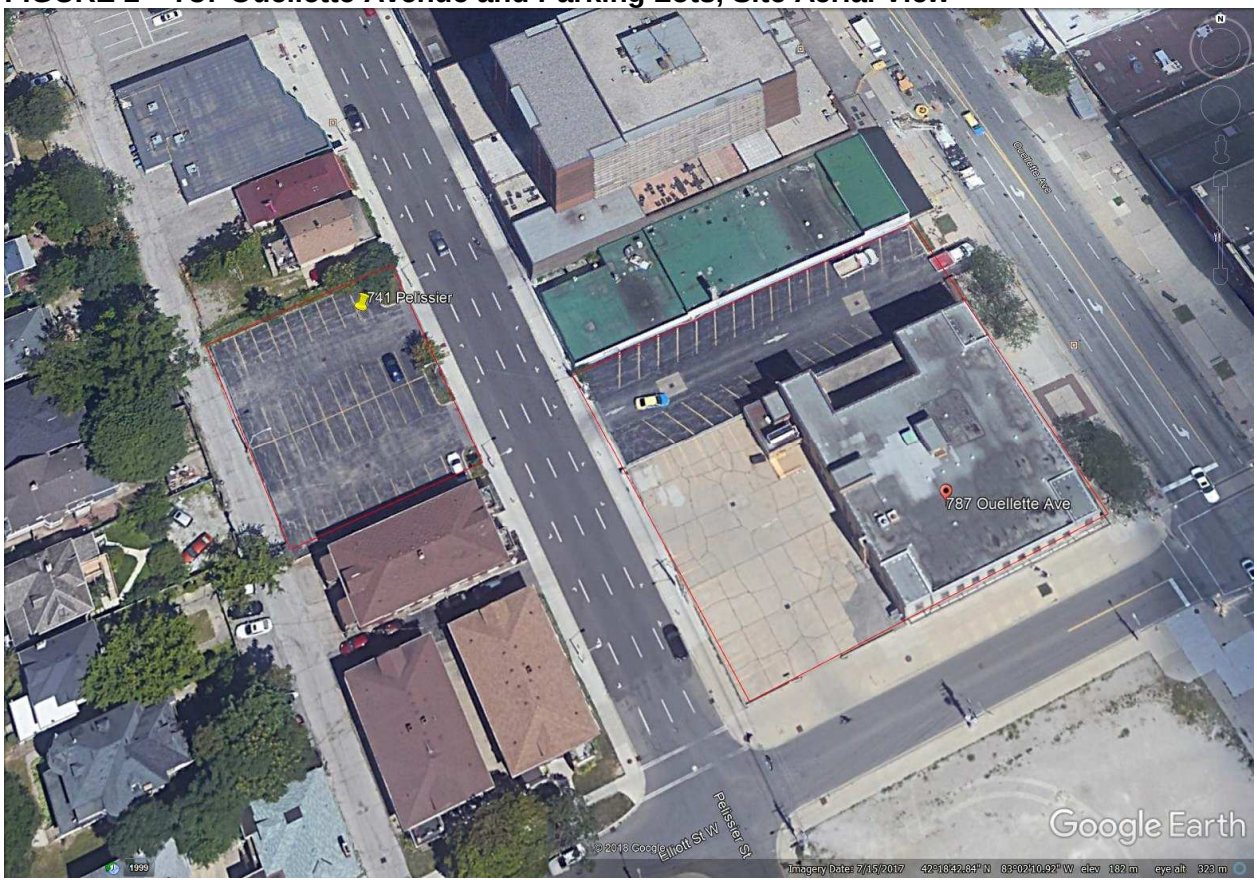


Figure 3 - 4545 Rhodes Drive – Site Aerial View

Figure 4 - 4545 Rhodes Drive – First Floor Plan (Admin)

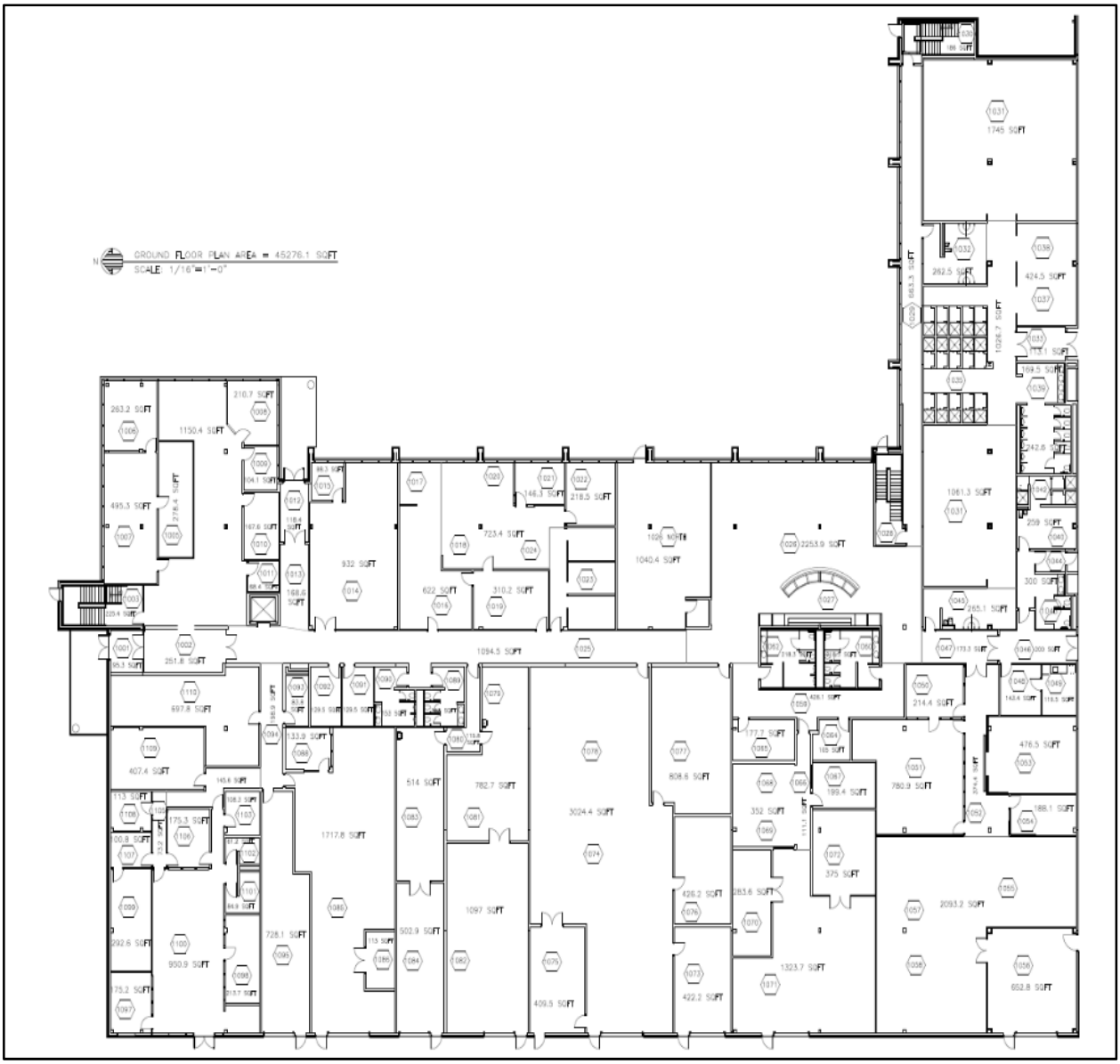


Figure 5 - 4545 Rhodes Drive – First Floor Plan (Parking Garage & Warehouse)

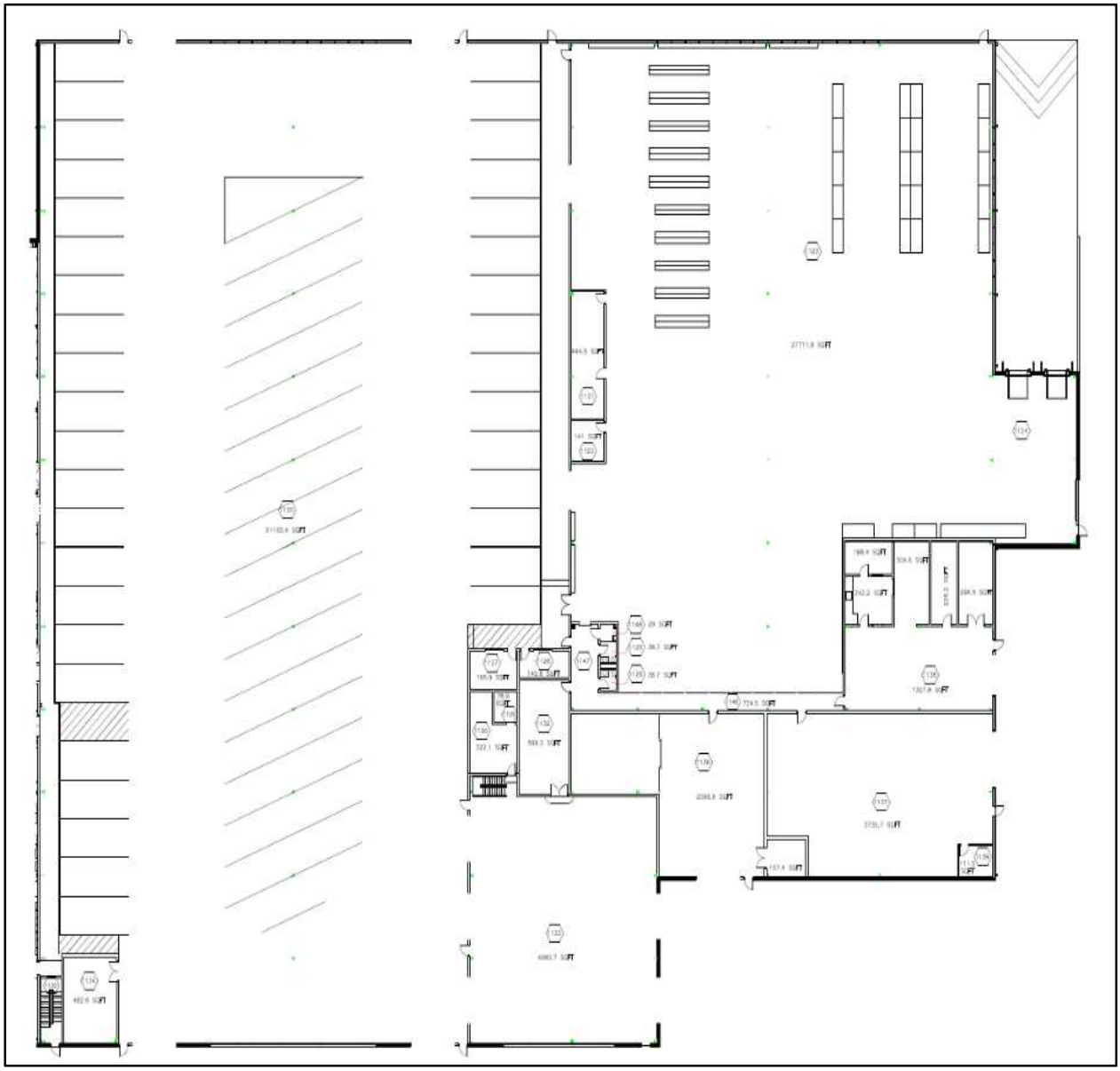


Figure 6 - 4545 Rhodes Drive – Second Floor Plan (Admin)

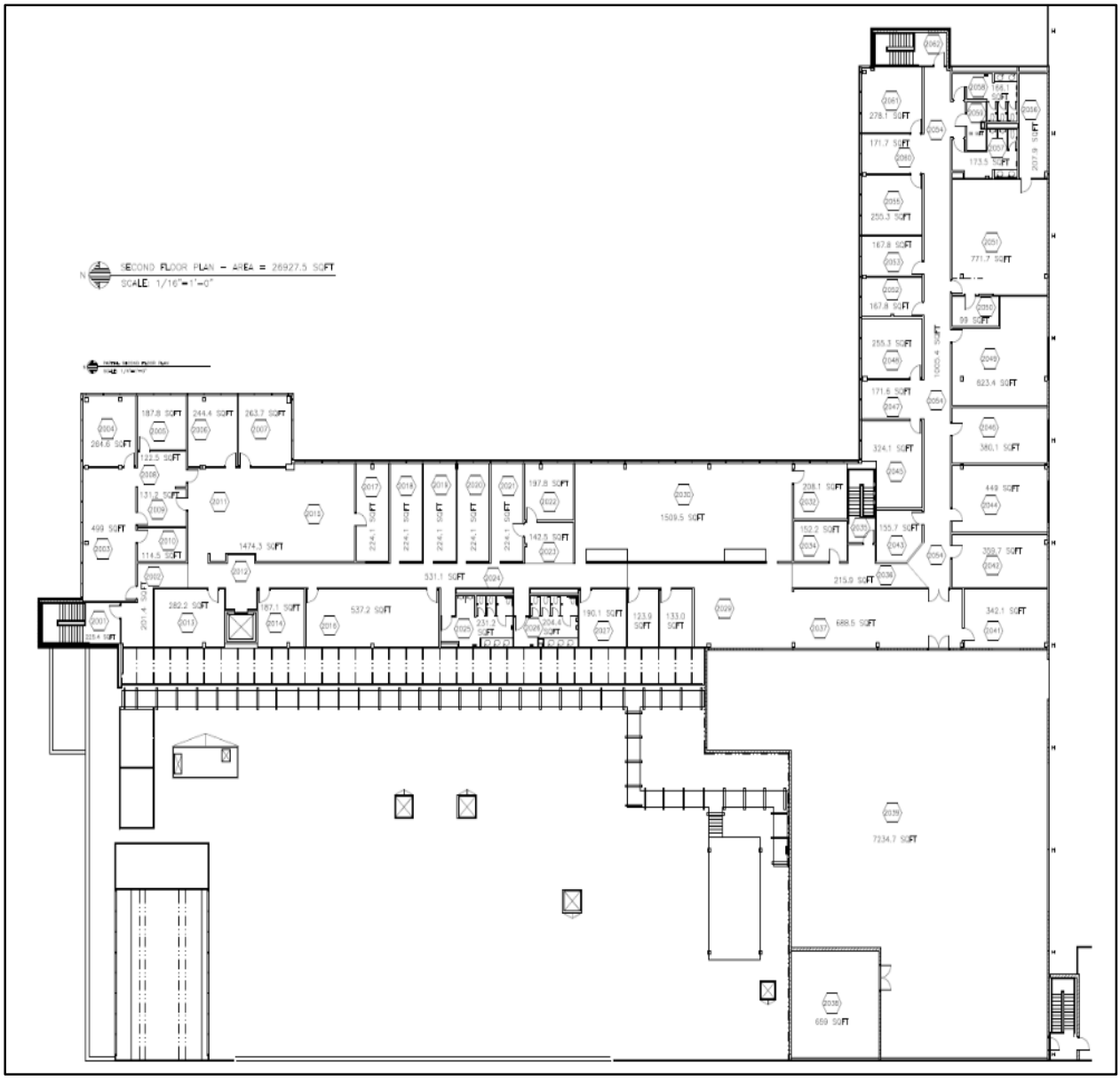
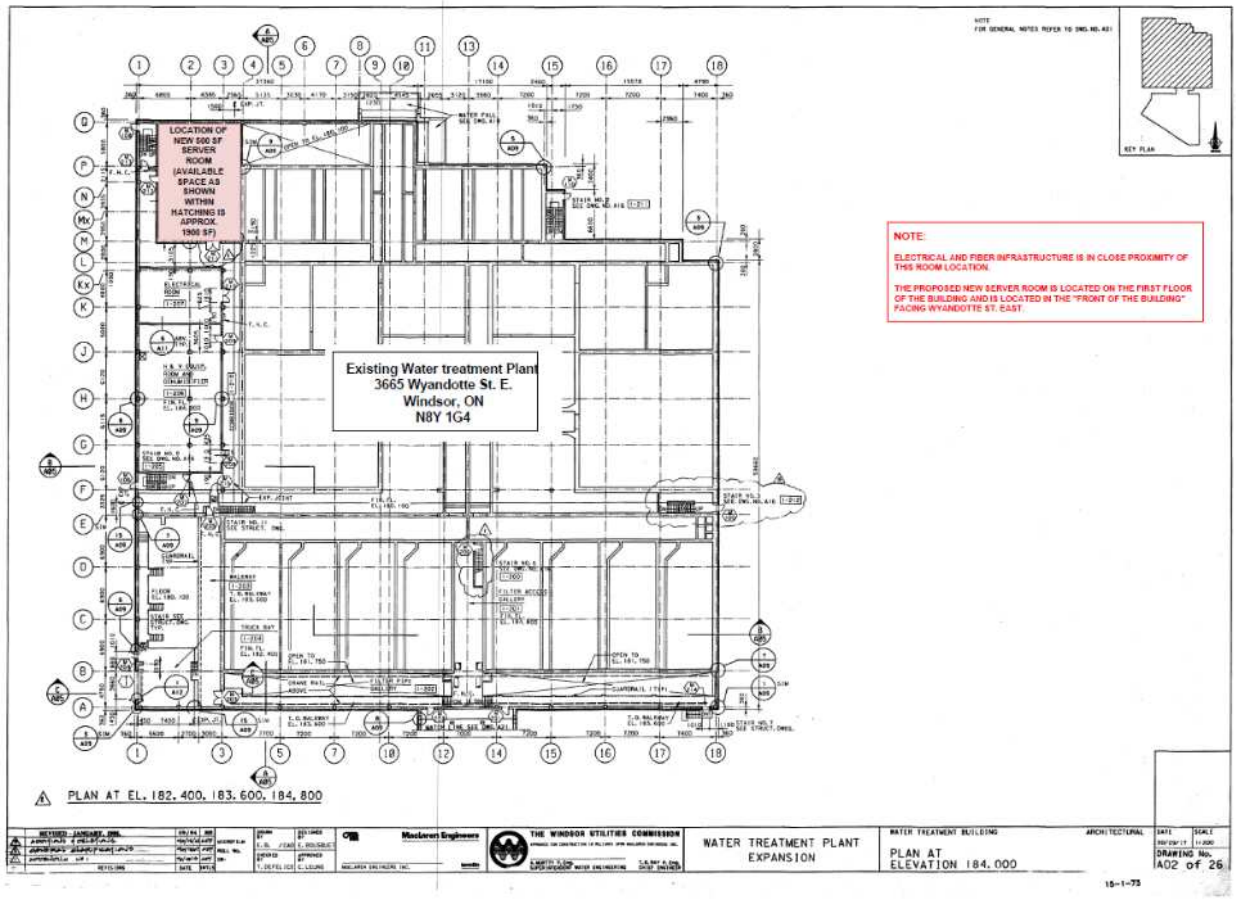


Figure 7 - 3665 Wyandotte Street East – Partial Floor Plan



Appendix D – IRRP Load Forecast

Appendix – IRRP Load Forecast

IRRP – ENWIN Load Forecast.

As part of its IRRP, the IESO requires LDCs to develop weather-corrected gross transformer station demand forecasts for the period 2018-2037.

ENWIN chose “London Economics International LLC” for the preparation of above report. The following tables are the spreadsheets which constituted ENWIN’s submission to the IESO for the IRRP.

Load Forecast Template (Summer - Gross)

LDC: Master

Transformer Station	Historical Actual Station Peak Demand (MW)					Historical Weather-Corrected Station Peak Demand			Date/Time of Station Pk	Base	Gross Median Weather Station Peak Demand Forecast (MW)																		
	2013	2014	2015	2016	2017	2015	2016	2017	2017		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Chrysler WAP MTS	32.71	33.10	31.66	34.40	30.99	31.66	34.40	30.99	22/06/2017 17:00																					
EnWin Utilities Ltd.										31.10	31.10	31.21	31.32	31.43	31.53	31.63	31.73	31.83	31.94	32.04	32.14	32.24	32.34	32.45	32.55	32.55	32.55	32.55	32.55	32.55
Crawford TS	63.34	76.33	64.40	78.70	70.14	70.93	81.35	65.37	25/09/2017 15:00																					
EnWin Utilities Ltd.										71.59	71.25	71.07	70.69	70.31	69.95	69.78	69.78	69.96	70.30	70.80	71.38	72.04	72.78	73.60	74.49	74.99	75.51	76.04	76.59	77.15
Essex TS	51.54	49.17	50.78	54.00	57.84	53.30	57.45	57.68	26/09/2017 15:00																					
EnWin Utilities Ltd.										50.78	50.55	50.53	50.34	50.13	49.94	49.88	49.95	50.13	50.43	50.85	51.32	51.84	52.42	53.06	53.74	54.08	54.43	54.79	55.16	55.53
Ford Annex MTS	8.03	8.21	7.59	7.20	6.58	7.59	7.20	6.58	17/08/2017 13:00																					
EnWin Utilities Ltd.										6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58
Ford Essex CTS	10.16	9.72	8.86	9.50	9.93	8.86	9.50	9.93	21/09/2017 12:00																					
EnWin Utilities Ltd.										9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93
Ford Windsor MTS	18.55	16.91	17.25	15.60	15.37	17.25	15.60	15.37	29/05/2017 9:00																					
EnWin Utilities Ltd.										15.48	15.48	15.60	15.71	15.81	15.91	16.02	16.12	16.22	16.32	16.43	16.53	16.63	16.73	16.83	16.94	16.94	16.94	16.94	16.94	16.94
G.M. Windsor MTS	1.14	0.81	0.04	0.00	14.63	0.04	0.00	14.63	26/09/2017 16:00																					
EnWin Utilities Ltd.										10.60	10.57	10.61	10.58	10.58	10.58	10.60	10.65	10.73	10.83	10.96	11.10	11.25	11.41	11.59	11.77	11.87	11.97	12.08	12.19	12.30
Keith TS	78.16	72.17	89.71	90.20	97.78	90.47	90.20	96.31	19/07/2017 16:00																					
EnWin Utilities Ltd.										49.4	49.11	48.653	48.09	47.576	47.077	46.704	46.453	46.318	46.297	46.387	46.528	46.721	46.964	47.258	47.603	47.798	47.998	48.201	48.41	48.623
Lauzon DESN1	99.08	91.73	104.64	96.35	128.40	104.00	100.67	103.89	22/09/2017 16:00																					
EnWin Utilities Ltd.										121.4	120.78	119.87	118.75	117.69	116.68	115.98	115.58	115.47	115.64	116.09	116.66	117.37	118.21	119.18	120.28	121.02	121.79	122.57	123.38	124.21
Malden TS	125.19	112.08	139.25	131.12	168.72	146.80	139.82	140.38	22/09/2017 15:00																					
EnWin Utilities Ltd.										84.4	83.812	82.915	81.915	80.969	80.049	79.345	78.848	78.55	78.447	78.534	78.709	78.971	79.32	79.756	80.279	80.631	80.99	81.357	81.732	82.116
Walker MTS #2	96.88	85.88	84.32	87.80	75.38	84.32	90.19	90.64	12/06/2017 16:00																					
EnWin Utilities Ltd.										76.7	76.452	76.195	75.772	75.375	75.008	74.838	74.857	75.06	75.443	76.001	76.647	77.38	78.199	79.107	80.102	80.781	81.479	82.198	82.94	83.704
Walker TS #1	71.76	63.94	80.92	65.10	59.95	77.95	71.11	69.23	01/08/2017 16:00																					
EnWin Utilities Ltd.										56.8	56.612	56.535	56.307	56.06	55.834	55.753	55.811	56.005	56.33	56.785	57.303	57.882	58.524	59.228	59.995	60.434	60.884	61.346	61.82	62.306

	Base year
	Forecast to be provided

LDC Assumptions
1) 90% Power Factor
2) 1-in-2 weather scenario

Load Forecast Template (Summer - Net)

LDC: Master

Transformer Station	Historical Actual Station Peak Demand (MW)					Historical Weather-Corrected Station Peak Demand			Date/Time of Station Pk	Base	Gross Median Weather Station Peak Demand Forecast (MW)																		
	2013	2014	2015	2016	2017	2015	2016	2017	2017		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Chrysler WAP MTS	32.71	33.10	31.66	34.40	30.99	31.66	34.40	30.99	22/06/2017 17:00																					
EnWin Utilities Ltd.										30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99	30.99
Crawford TS	63.34	76.33	64.40	78.70	70.14	70.93	81.35	65.37	25/09/2017 15:00																					
EnWin Utilities Ltd.										68.53	68.06	67.08	66.13	65.18	64.26	63.51	62.93	62.51	62.25	62.14	62.10	62.13	62.22	62.38	62.61	62.84	63.06	63.29	63.52	63.74
Essex TS	51.54	49.17	50.78	54.00	57.84	53.30	57.45	57.68	26/09/2017 15:00																					
EnWin Utilities Ltd.										48.97	48.67	48.00	47.34	46.69	46.06	45.55	45.17	44.90	44.74	44.69	44.68	44.73	44.82	44.97	45.16	45.35	45.54	45.73	45.92	46.11
Ford Annex MTS	8.03	8.21	7.59	7.20	6.58	7.59	7.20	6.58	17/08/2017 13:00																					
EnWin Utilities Ltd.										6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58
Ford Essex CTS	10.16	9.72	8.86	9.50	9.93	8.86	9.50	9.93	21/09/2017 12:00																					
EnWin Utilities Ltd.										9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93
Ford Windsor MTS	18.55	16.91	17.25	15.60	15.37	17.25	15.60	15.37	29/05/2017 9:00																					
EnWin Utilities Ltd.										15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37	15.37
G.M. Windsor MTS	1.14	0.81	0.04	0.00	14.63	0.04	0.00	14.63	26/09/2017 16:00																					
EnWin Utilities Ltd.										9.96	9.90	9.77	9.64	9.51	9.39	9.29	9.21	9.16	9.13	9.13	9.13	9.14	9.17	9.20	9.24	9.28	9.33	9.37	9.41	9.45
Keith TS	78.16	72.17	70.15	73.20	78.54	72.94	70.88	79.77	10/06/2017 19:00																					
EnWin Utilities Ltd.										48.49	48.11	47.37	46.64	45.93	45.22	44.65	44.19	43.84	43.61	43.48	43.40	43.37	43.39	43.46	43.57	43.68	43.79	43.90	44.02	44.13
Lauzon DESN1	99.08	91.73	103.10	94.94	126.07	101.90	98.63	101.51	22/09/2017 17:00																					
EnWin Utilities Ltd.										117.28	116.45	114.74	113.07	111.43	109.81	108.50	107.47	106.72	106.24	106.02	105.92	105.93	106.06	106.30	106.65	107.01	107.36	107.72	108.07	108.43
Malden TS	118.25	105.13	125.61	114.30	150.65	130.00	123.12	123.78	22/09/2017 16:00																					
EnWin Utilities Ltd.										82.75	82.12	80.86	79.63	78.43	77.24	76.27	75.49	74.91	74.53	74.32	74.20	74.16	74.20	74.32	74.53	74.73	74.93	75.13	75.34	75.54
Walker MTS #2	96.88	85.88	84.32	87.80	75.38	84.32	90.19	90.64	12/06/2017 16:00																					
EnWin Utilities Ltd.										72.56	72.11	71.11	70.14	69.19	68.25	67.50	66.93	66.53	66.29	66.22	66.22	66.29	66.43	66.64	66.92	67.20	67.48	67.77	68.05	68.33
Walker TS #1	71.76	63.94	80.92	65.10	59.95	77.95	71.11	69.23	01/08/2017 16:00																					
EnWin Utilities Ltd.										54.38	54.05	53.31	52.58	51.88	51.18	50.63	50.20	49.91	49.74	49.69	49.69	49.75	49.87	50.03	50.25	50.47	50.68	50.90	51.12	51.34

	Base year
	Forecast to be provided

LDC Assumptions

1) 90% Power Factor

2) 1-in-2 weather scenario

Load Forecast Template (Winter - Gross)

LDC: Master

Transformer Station	Historical Actual Station Peak Demand (MW)					Historical Weather-Corrected Station Peak Demand			Date/Time of Station Pk	Base	Gross Median Weather Station Peak Demand Forecast (MW)																		
	2013	2014	2015	2016	2017	2015	2016	2017	2017		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Chrysler WAP MTS	28.33	25.93	27.41	27.30	25.24	27.41	27.30	25.15	26/04/2017 17:00																				
EnWin Utilities Ltd.										25.26	25.26	25.36	25.47	25.57	25.67	25.77	25.86	25.96	26.06	26.16	26.25	26.35	26.45	26.55	26.64	26.64	26.64	26.64	26.64
Crawford TS	75.25	64.77	59.13	58.60	50.95	58.13	58.60	46.83	04/10/2017 18:00																				
EnWin Utilities Ltd.										45.64	46.23	47.02	48.95	47.35	47.70	46.61	45.95	45.69	45.79	46.23	46.74	47.31	47.94	48.63	49.38	49.76	50.14	50.54	50.95	51.37
Essex TS	40.87	40.23	46.84	47.50	63.34	46.84	46.31	51.00	09/10/2017 16:00																				
EnWin Utilities Ltd.										49.18	49.74	50.39	52.34	50.39	50.60	49.20	48.28	47.79	47.70	47.99	48.34	48.75	49.23	49.77	50.37	50.65	50.92	51.21	51.50	51.80
Ford Annex MTS	7.22	7.12	7.30	6.40	6.07	7.99	6.40	5.88	04/10/2017 13:00																				
EnWin Utilities Ltd.										5.880	5.880	5.881	5.881	5.881	5.881	5.882	5.882	5.882	5.882	5.883	5.883	5.883	5.883	5.883	5.884	5.884	5.884	5.884	5.884	5.884
Ford Essex CTS	8.62	7.11	6.64	8.60	9.33	6.64	8.60	9.33	04/10/2017 16:00																				
EnWin Utilities Ltd.										9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33
Ford Windsor MTS	16.60	16.52	16.56	14.90	14.83	16.56	14.90	14.83	14/11/2017 14:00																				
EnWin Utilities Ltd.										14.94	14.94	15.04	15.15	15.25	15.35	15.45	15.54	15.64	15.74	15.84	15.93	16.03	16.13	16.23	16.32	16.32	16.32	16.32	16.32	16.32
G.M. Windsor MTS	1.43	2.00	0.05	0.00	15.84	0.05	0.00	15.84	07/10/2017 16:00																				
EnWin Utilities Ltd.										8.56	8.67	8.85	9.20	8.92	9.01	8.82	8.72	8.69	8.73	8.83	8.95	9.08	9.21	9.36	9.53	9.60	9.68	9.76	9.85	9.94
Keith TS	67.23	65.15	79.72	85.21	79.67	79.72	85.21	79.67	20/12/2017 13:00																				
EnWin Utilities Ltd.										54.53	55.04	55.27	57.04	54.48	54.35	52.42	51.02	50.10	49.62	49.57	49.60	49.69	49.84	50.07	50.37	50.52	50.67	50.83	50.99	51.15
Lauzon DESN 1	73.51	84.56	70.66	70.87	93.98	70.66	74.02	93.98	11/12/2017 10:00																				
EnWin Utilities Ltd.										75.85	76.78	77.57	80.39	77.35	77.59	75.40	73.94	73.14	72.94	73.33	73.81	74.40	75.09	75.89	76.78	77.33	77.89	78.47	79.07	79.68
Malden TS	113.56	106.58	116.74	109.12	134.09	116.74	109.12	134.09	05/10/2017 15:00																				
EnWin Utilities Ltd.										67.73	68.42	68.73	70.98	67.86	67.74	65.40	63.72	62.63	62.10	62.09	62.16	62.33	62.58	62.92	63.34	63.60	63.86	64.13	64.41	64.69
Walker MTS #2	58.97	61.77	60.44	54.80	47.87	73.81	53.78	47.87	04/01/2017 18:00																				
EnWin Utilities Ltd.										47.02	47.71	48.48	50.43	48.83	49.22	48.14	47.51	47.27	47.41	47.90	48.45	49.08	49.77	50.52	51.34	51.86	52.39	52.94	53.50	54.08
Walker TS #1	48.12	57.70	64.52	64.80	60.07	64.52	51.34	49.44	28/12/2017 17:00																				
EnWin Utilities Ltd.										52.50	53.14	53.80	55.88	53.82	54.04	52.57	51.60	51.09	51.01	51.32	51.71	52.16	52.69	53.28	53.94	54.29	54.65	55.01	55.38	55.77

	Base year
	Forecast to be provided

LDC Assumptions

1) 90% Power Factor

2) 1-in-2 weather scenario

Load Forecast Template (Winter - Net)

LDC: Master

Transformer Station	Historical Actual Station Peak Demand (MW)					Historical Weather-Corrected Station Peak Demand			Date/Time of Station Pk	Base	Gross Median Weather Station Peak Demand Forecast (MW)																		
	2013	2014	2015	2016	2017	2015	2016	2017	2017		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Chrysler WAP MTS	28.33	25.93	27.41	27.30	25.24	27.41	27.30	25.15	26/04/2017 17:00																					
EnWin Utilities Ltd.										**25.15**	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15	25.15
Crawford TS	75.25	64.77	59.13	58.60	50.95	58.13	58.60	46.83	04/10/2017 18:00																					
EnWin Utilities Ltd.										43.26	43.75	43.82	45.22	43.12	42.96	41.36	40.18	39.38	38.95	38.85	38.81	38.82	38.88	39.00	39.17	39.34	39.51	39.68	39.85	40.02
Essex TS	40.87	40.23	46.84	47.50	63.34	46.84	46.31	51.00	09/10/2017 16:00																					
EnWin Utilities Ltd.										47.75	48.26	48.30	49.82	47.47	47.27	45.47	44.14	43.24	42.73	42.59	42.52	42.50	42.54	42.64	42.80	42.96	43.12	43.28	43.43	43.59
Ford Annex MTS	7.22	7.12	7.30	6.40	6.07	7.99	6.40	5.88	04/10/2017 13:00																					
EnWin Utilities Ltd.										5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88	5.88
Ford Essex CTS	8.62	7.11	6.64	8.60	9.33	6.64	8.60	9.33	04/10/2017 16:00																					
EnWin Utilities Ltd.										9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33	9.33
Ford Windsor MTS	16.60	16.52	16.56	14.90	14.83	16.56	14.90	14.83	14/11/2017 14:00																					
EnWin Utilities Ltd.										14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83	14.83
G.M. Windsor MTS	1.43	2.00	0.05	0.00	15.84	0.05	0.00	15.84	07/10/2017 16:00																					
EnWin Utilities Ltd.										8.06	8.15	8.17	8.43	8.05	8.02	7.72	7.51	7.36	7.28	7.27	7.26	7.27	7.28	7.31	7.34	7.38	7.41	7.45	7.48	7.52
Keith TS	67.23	65.15	61.14	62.60	71.71	61.14	64.75	71.71	09/02/2017 19:00																					
EnWin Utilities Ltd.										53.77	54.26	54.22	55.84	53.11	52.79	50.67	49.08	47.98	47.31	47.07	46.89	46.79	46.74	46.77	46.85	46.94	47.03	47.12	47.21	47.30
Lauzon DESN 1	73.51	84.56	70.66	70.63	93.63	70.66	73.98	93.63	11/12/2017 10:00																					
EnWin Utilities Ltd.										72.66	73.45	73.53	75.86	72.30	72.01	69.29	67.28	65.92	65.16	64.97	64.87	64.86	64.95	65.11	65.37	65.63	65.89	66.14	66.40	66.66
Malden TS	90.74	83.77	93.16	86.30	110.05	93.16	86.30	110.05	14/12/2017 18:00																					
EnWin Utilities Ltd.										66.48	67.11	67.10	69.14	65.79	65.44	62.86	60.93	59.60	58.81	58.55	58.36	58.27	58.25	58.31	58.46	58.61	58.75	58.90	59.04	59.19
Walker MTS #2	58.97	61.77	60.44	54.80	47.87	73.81	53.78	47.87	04/01/2017 18:00																					
EnWin Utilities Ltd.										43.84	44.38	44.49	45.96	43.87	43.76	42.18	41.03	40.28	39.88	39.83	39.83	39.89	40.00	40.17	40.38	40.60	40.82	41.04	41.26	41.48
Walker TS #1	48.12	57.70	64.52	64.80	60.07	64.52	51.34	49.44	28/12/2017 17:00																					
EnWin Utilities Ltd.										50.59	51.14	51.20	52.83	50.35	50.15	48.26	46.86	45.92	45.39	45.26	45.19	45.19	45.25	45.37	45.55	45.73	45.91	46.09	46.27	46.45

	Base year
	Forecast to be provided

LDC Assumptions

1) 90% Power Factor

2) 1-in-2 weather scenario

Appendix E – Renewable Energy Generation Plan

Renewable Energy Generation Investment Plan

Per: OEB Chapter 5 Consolidated Distribution System Plan
Filling Requirements – 5.2.2 (d)

October 31, 2018

Executive Summary

ENWIN Utilities Ltd. (ENWIN) has developed a Renewable Energy Generation (REG) Investment Plan to provide to the Ontario Energy Board (OEB) and the Independent Electricity System Operator (IESO). The purpose of the plan is to outline ENWIN's ability to connect Distributed Generation (DG) systems to its distribution system as well as determine any investments required to accommodate these connections over the next five years.

ENWIN currently has 716 MicroFIT, 71 FIT, 6 load displacement, 5 net metering and 3 CHP systems connected to the distribution system, representing a total of 47.7MW of potential generation. ENWIN forecasts that there will be 466 new generation connections over the next 6 years, adding 22.5MW of combined generation. The amount of generation is expected to decrease in 2019 due to the cancellation of the MicroFIT and FIT programs. Customers will shift their focus to NET metering and CHP projects, but adoption may be guarded temporarily until costs decrease and technology advancements materialize.

ENWIN's distribution system is constantly monitored to ensure the ability to connect renewable energy generation to the grid. ENWIN does not currently see a need for immediate investment to accommodate generator connections, but is prepared to add items to our long term budget if there are unforeseen changes on specific feeders, causing investment to be required.

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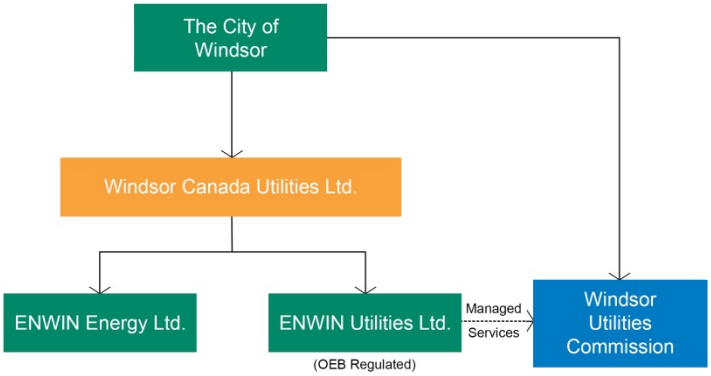
Introduction

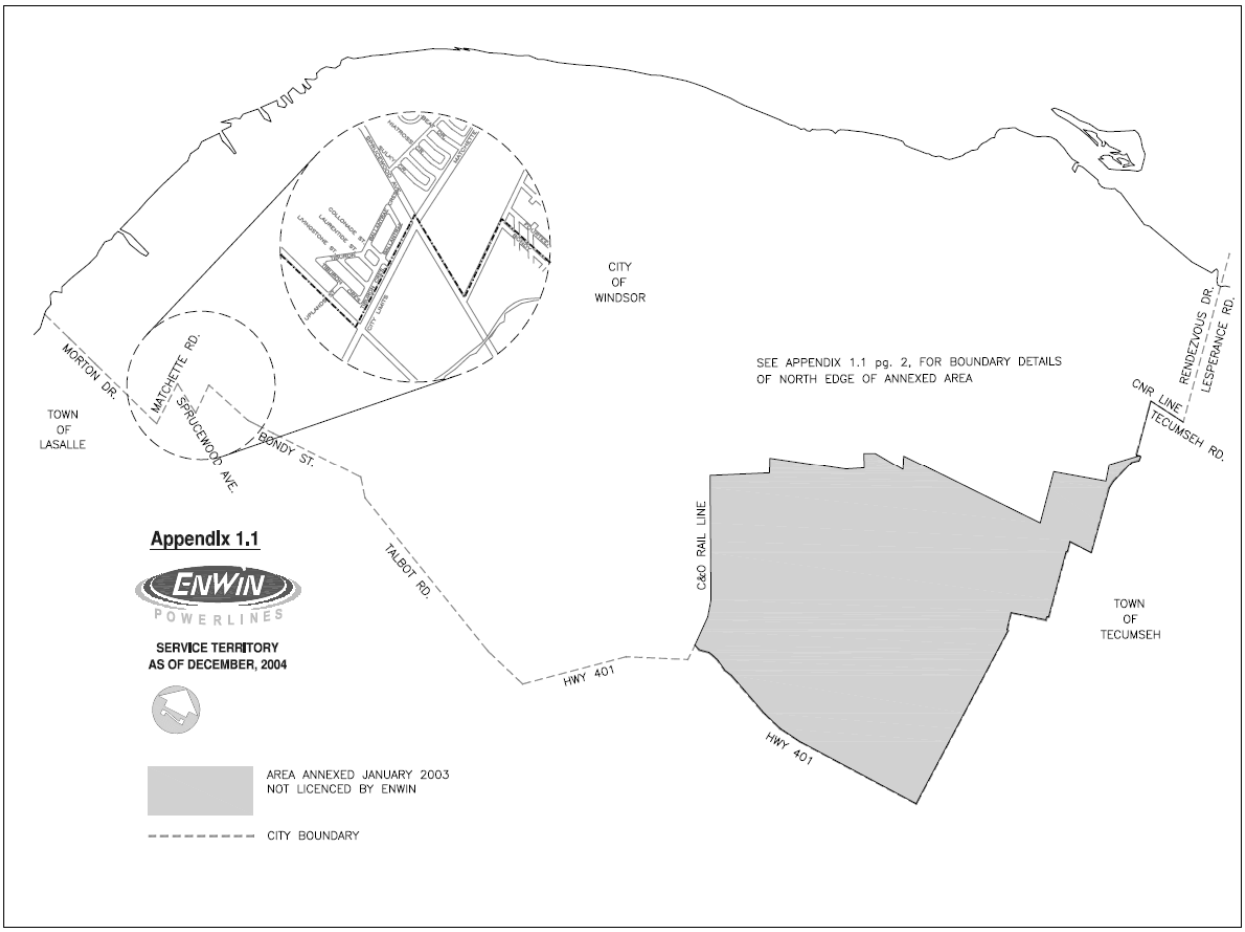
In accordance with the Ontario Energy Board's (OEB) filing requirements for Electricity Transmission and Distribution Applications, Chapter 5, Consolidated Distribution System Plan filing Requirements, ENWIN has prepared the following Renewable Energy Generation (REG) Investment Plan. The REG Investment plan details the readiness of ENWIN's distribution system to accommodate the connection of renewable energy generation facilities and details any expansion or enhancements necessary to remove grid constraints for the period 2018 to 2024.

ENWIN Utilities Ltd. System Overview

ENWIN Utilities Ltd. (ENWIN) is a local distribution company serving approximately 90,000 customers in the City of Windsor, Ontario. ENWIN is a corporation wholly owned by Windsor Canada Utilities Ltd., which is in turn wholly owned by the City of Windsor.



The vast majority of ENWIN's service territory is urban and is continuous, covering approximately 121 square kilometers.



ENWIN receives power from 6 transformer stations owned by Hydro One Networks Inc. (Hydro One) as well as 2 transformer stations that are owned by ENWIN. ENWIN owns 4 municipal transformer stations, one of which (GM MTS) serves ENWIN's distribution system. Table 1 summarizes the transformer stations in the City of Windsor as well as the number of feeders from each station.

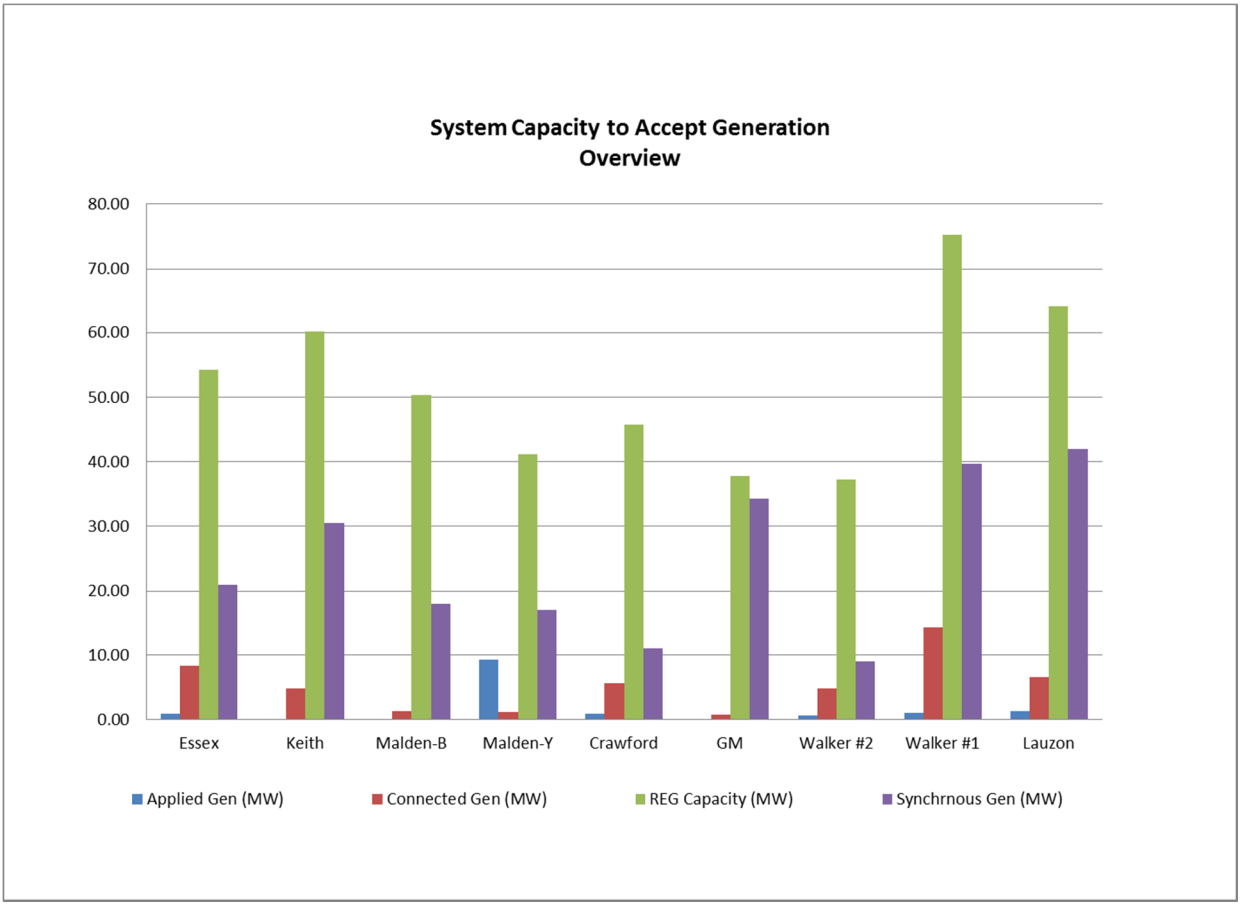
Station Name	Owner	Supplied By	HV (kV)	LV (kV)	Transformer Rating (MVA)	Number of Feeders (55)
Crawford TS	Hydro One	Hydro One	115	27.6 kV	50/67/83	10
Keith TS	Hydro One	Hydro One	230	27.6 kV	50/67/83	3
Malden TS	Hydro One	Hydro One	230	27.6 kV	75/100/125	6
Lauzon TS	Hydro One	Hydro One	230	27.6 kV	50/200	7
Essex TS	Hydro One	Hydro One	115	27.6 kV	50/67/83	6
Walker 1 TS	Hydro One	Hydro One	115	27.6 kV	50/67/83	5
Walker 2 TS	ENWIN	Hydro One	115	27.6 kV	50/67/83	6
GM MTS	ENWIN	Hydro One	115	27.6 kV	20/27/33	2
Chrysler MTS	ENWIN	Hydro One	115	27.6 kV	30/40/50	4
Ford Powerhouse MTS	ENWIN	Hydro One	115	27.6 kV	30/40/50	2
Ford Annex MTS	ENWIN	Hydro One	115	13.8 kV	18/24/33	4

Table 1: Summary of Transformer Stations

Distribution System DG Capacity Assessment

The following table and graph summarizes the available capacity at all of the transformer stations in ENWIN's distribution territory as well as the connected and proposed generation.

Station Name	Bus Name	Feeder Name	Voltage (kV)	Minimum Load (MW)	Short Circuit Capacity (MVA)	Thermal Capacity (MW)	Renewable Generation (PV) MW	Generation (Syn) MW
ESSEX TS	JQ	M5, M6, M7, M8, M10, M11	27.6	14.33	104.6	54.3	54.3	20.9
CRAWFORD TS	EY	M5, M6, M7, M8, M8, M9, M10, M11, M12, M13, M14	27.6	25.11	54.9	65.1	45.8	11.0
MALDEN TS	B	M1, M3, M5, M7, M9, M11	27.6	25.43	89.1	50.4	50.4	17.8
MALDEN TS	Y	M2, M4, M6, M8, M10, M12	27.6	16.21	84.5	41.2	41.2	16.9
LAUZON TS DESN1	BQ	M1, M2, M3, M4, M5, M6, M7, M8	27.6	24.10	210.0	64.1	64.1	42.0
WALKER TS #1	QE	M1,M2,M3,M5,M6	27.6	35.30	198.6	75.3	75.3	39.7
WALKER TS #2	QE	M1,M2,M3,M5,M6	27.6	17.00	44.7	86.0	37.3	8.9
KEITH TS DESN1	BY	M1, M2, M3, M4, M5, M6	27.6	20.17	152.8	60.2	60.2	30.6
GM MTS	BY	M1,M2	27.6	5.38	171.6	37.9	37.9	34.3



Present Levels of Distributed Generation Connections

ENWIN has connected more than 800 generators, totaling over 47MW of potential generation to the distribution system which is summarized in the two tables below:

Type	Pre-2000	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
CHP									1	2	3
FIT			1	5	10	24	7	18	5	1	71
LD	4	1		1							6
mFIT		23	56	89	82	27	117	128	94	100	716
NET							4			1	5
Total	**4**	**24**	**57**	**95**	**92**	**51**	**128**	**146**	**100**	**103**	**801**

Table 3: Existing Number of Generator Connections by Year and Type

Type	Pre-2000	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
CHP									400	4200	4600
FIT			38	1250	2219	5058	1555	3773	1434	480	15807
LD	21400	1		10							21411
mFIT		153	402	667	644	208	1062	1242	746	763	5887
NET							20			10	30
Total	**21400**	**154**	**440**	**1927**	**2863**	**5266**	**2637**	**5015**	**2580**	**4973**	**47735**

Table 4: Existing Generator Connected Load (kW) by Year and Type

Graph of historical DG Connections

Present Capacity for the Connection of Distributed Generation

ENWIN has done an assessment to determine the amount of generation that can be connected to the distribution system. It is imperative that the addition of new generation does not damage distribution equipment or create safety concerns due to short circuit conditions. Equipment must also be rated to meet the thermal capacity requirements of the system at all times, so as to minimize line losses and to reduce the risk of premature failure of equipment. All generation that is connected to ENWIN's system must be equipped with anti-islanding and protections schemes, which ensures that generators do not create islanding situations, which may cause damage to equipment during outages. Large generators operating in parallel with the distribution system are required to install transfer-trip as per Hydro One's TIR.

Current details of connections and pending connections by feeder can be seen in Table XX.

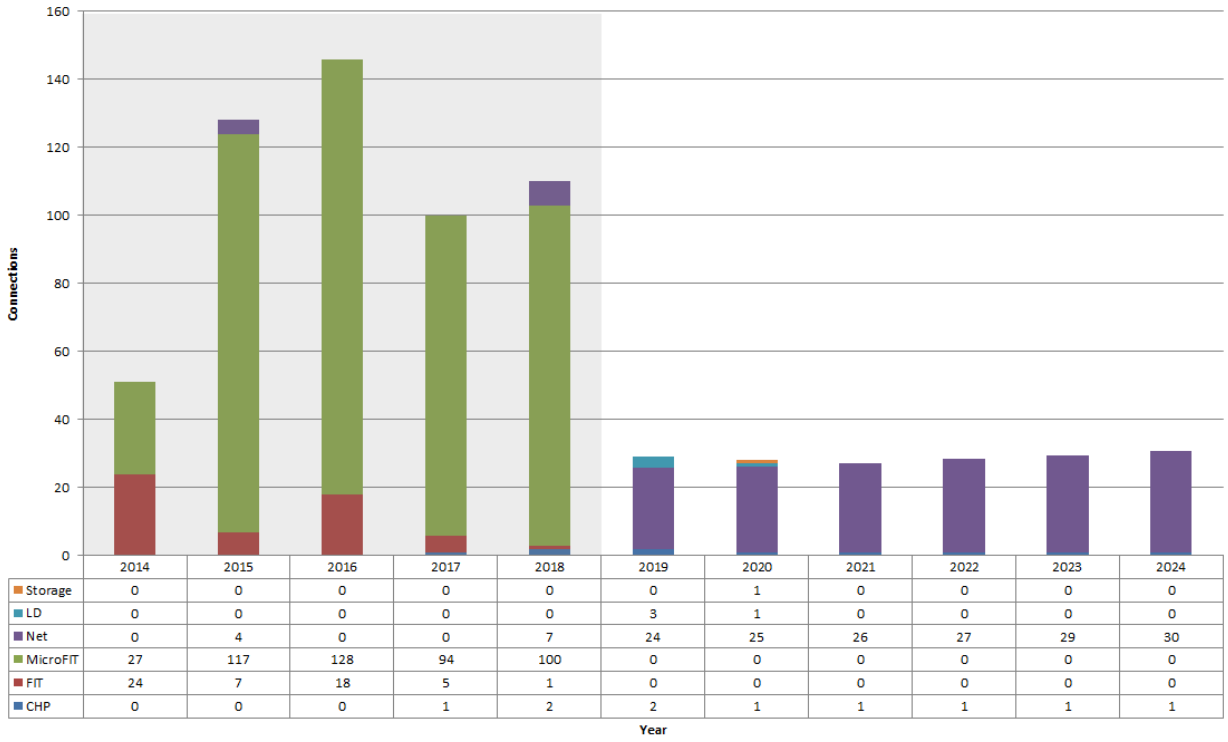
Station	Feeder	Pending (kW)	Connected (kW)	Total (kW)	Remaining Capacity at Breaker (kW)
Essex	15M10	-	121	121	8,208
	15M11	123	823	946	8,208
	15M5	-	131	131	8,208
	15M6	-	6,444	6,444	8,208
	15M7	-	88	88	8,208
	15M8	750	766	1,516	8,208
Keith	23M1	-	4,351	4,351	12,100
	23M2	100	407	507	13,585
	23M6	-	-	-	13,588
	23M21	-	-	-	13,588
Malden	24M1	-	750	750	635
	24M2	9,200	-	9,200	10
	24M3	-	105	105	634
	24M4	-	271	271	634
	24M5	5	514	519	10
	24M6	-	884	884	634
Crawford	25M10	10	146	156	3,338
	25M11	912	386	1,298	3,338
	25M12	-	-	-	3,338

	25M13	10	68	78	3,338
	25M14	-	625	625	3,338
	25M5	-	78	78	3,338
	25M6	-	-	-	3,338
	25M7	-	4,248	4,248	3,338
	25M8	-	-	-	3,338
	25M9	-	10	10	3,338
GM	4M1	-	723	723	17,150
	4M2	-	86	86	17,150
Walker #2	55M21	10	121	131	6,923
	55M22	7	683	690	6,923
	55M23	-	26	26	6,923
	55M24	220	106	326	6,923
	55M25	-	1,410	1,410	6,923
	55M26	440	2,530	2,969	6,923
Walker #1	55M1	10	109	119	9,000
	55M2	-	73	73	17,700
	55M3	1,014	1,682	2,696	17,690
	55M5	-	197	197	17,690
	55M6	-	12,220	12,220	7,300
Lauzon	56M1	-	194	194	19,000
	56M2	-	161	161	19,000
	56M3	650	985	1,635	11,350
	56M5	230	2,342	2,572	19,000
	56M6	-	31	31	19,000
	56M7	-	2,031	2,031	18,050
	56M8	400	819	1,218	19,000
Total		**14,090**	**47,743**	**61,833**	

Table XX – Current and Pending Distributed Generation Forecast 2018-2024

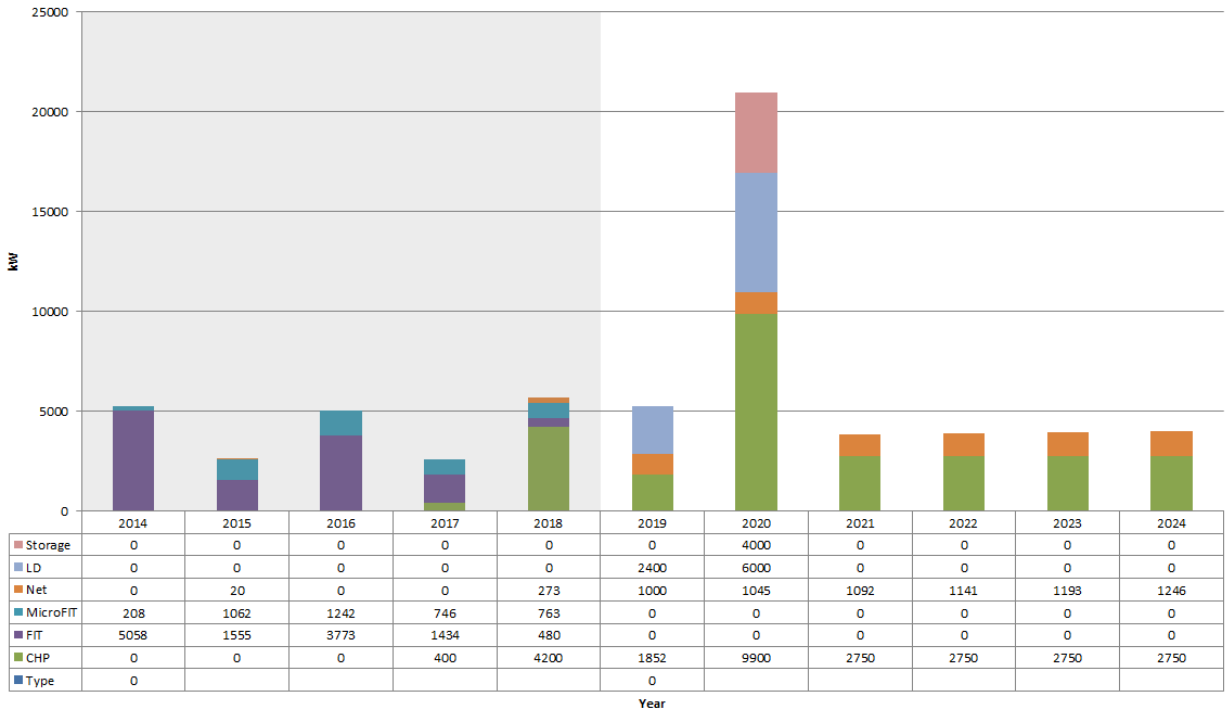
With the elimination of the FIT and MicroFIT programs, ENWIN has already seen a large decrease in the number of distributed generation projects. Projects have shifted to net metering, load displacement and CHP/cogen projects. Based on connection and application activity over the months since the MicroFIT program has ended, ENWIN anticipates distributed generation connections in 2019 to drop to roughly 30% of 2018. 2020 should see a large rise in generation connected due to a 9.2 MW project that is scheduled to be connected, a 6 kW load displacement project as well as a 4.2MW energy storage project that has recently applied for connection. ENWIN's forecast for 2019 to 2024 can be seen in Figure 4. This forecast is based on the projects where applications have been submitted as well as the National Energy Board's report titled Canada's Energy Market 2018[1]. In this report it is implied that solar generation will increase from 2.3GW to 6.3GW from 2017 to 2040. This implies a growth rate of 4.5% per year.

[1] https://www.neb-one.gc.ca/nrg/ntgrtd/ftr/2018/2018nrgftr-eng.pdf



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Storage	0	0	0	0	0	0	1	0	0	0	0
LD	0	0	0	0	0	3	1	0	0	0	0
Net	0	4	0	0	7	24	25	26	27	29	30
MicroFIT	27	117	128	94	100	0	0	0	0	0	0
FIT	24	7	18	5	1	0	0	0	0	0	0
CHP	0	0	0	1	2	2	1	1	1	1	1

Figure XX – Forecast REG Connections



	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Storage	0	0	0	0	0	0	4000	0	0	0	0
LD	0	0	0	0	0	2400	6000	0	0	0	0
Net	0	20	0	0	273	1000	1045	1092	1141	1193	1246
MicroFIT	208	1062	1242	746	763	0	0	0	0	0	0
FIT	5058	1555	3773	1434	480	0	0	0	0	0	0
CHP	0	0	0	400	4200	1852	9900	2750	2750	2750	2750
Type	0					0					

Figure XX – Forecast REG Connection Capacities

Investments to Facilitate Renewable Energy Generation

ENWIN is committed to investments related to connecting renewable energy generation if it is required. ENWIN actively practices load balancing during the engineering design phase in order to accept more generation on all feeders to try to avoid the need for transfer trip. In the past, ENWIN has invested to re-arrange circuits in order to balance load across our feeders. This allows more generation to be connected to specific feeders since the 50% minimum load threshold can be increased on one feeder that requires capacity and decreased on another where the capacity is not currently required.

Transformer stations in ENWIN's service territory are Hydro One owned, with the exception of Walker #2 TS and GM MTS. GM MTS only has two customers with transformers that are 1.5 MVA or larger, so at this time, plans for station upgrades of GM MTS are not necessary since it is unlikely to have the need to connect a large DG customer. Walker #2 TS has 20 customers with a transformer rated KVA 1.5 MVA and over. ENWIN considers these 20 customers as possible CHP customers in the future, as customers look to reduce their bills through global adjustment busting. Should ENWIN determine that capacity is required for these potential systems on Walker #2 TS, budgeting and planning for a station reactor will take place.

ENWIN will be continuously monitoring whether additional investments need to take place so REG can be connected to the system.

Appendix F – Material Investment Summaries

A. General Information on the Project / Program

Investment Category	System Service

Project Name / Description

Walker Road – Foster to Airport Road – Feeder Connection

Estimated Cost	Gross $750,000	Net $750,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	This line will serve approximately 2,770 customers in South Windsor
Load	10 MW

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety	Moderate	Unlikely	17	5.1	Moderate	Rare	7	2.1	POLES IN FAIR CONDITION, CLOSE TO ROAD
0.25	Reliability	Moderate	Almost Certain	68	17	Insignificant	Rare	1	0.25	SOUTH WINDSOR SYSTEM CAN'T PICKUP COLD LOAD
0.25	Financial	Moderate	Likely	51	12.75	Insignificant	Rare	1	0.25	CUSTOMER AND UTILITY COSTS $1K TO $100K
0.2	Sustainability	Insignificant	Unlikely	2	0.4	Insignificant	Rare	1	0.2	PREPARES FOR ROAD WIDENING, COMPLETES HC FEED

The risk with this project is associated with the fact that it was originally part of a road widening project of the City of Windsor that has stalled. The City began road reconstruction on Walker Road, a major north-south artery in Windsor, a number of years ago. The reconstruction included a widening of the road, repaving and infrastructure replacements (water, sewer, gas, electricity). The work was completed in sections both north and south of this section over a number of construction seasons. The section in question crosses a projection of the major runway at the adjacent Windsor airport. There were also difficulties with this section because of height restrictions imposed by the airport that limit ENWIN's pole height in the ROW. After completing sections north and south of this section, the City has lost interest in completing the remaining section. While ENWIN has a proposal to proceed there is risk that the City, upon re-engaging their plans, may change their plans and put ENWIN's running line in the way of new construction. There are no contributions to the transmitter for completion of this section of line.

Expenditure Information & Timing	This expenditure will complete a section of line that was constructed during earlier road widening projects. The expenditure timeline is expected to

	be from the start date to the in-service date. Expenditures on earlier sections of this line had different scopes so that would make comparisons between those sections and this section meaningless. The work is intended to start in Q2 and complete by Q4 with expenditures spread evenly throughout this period.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

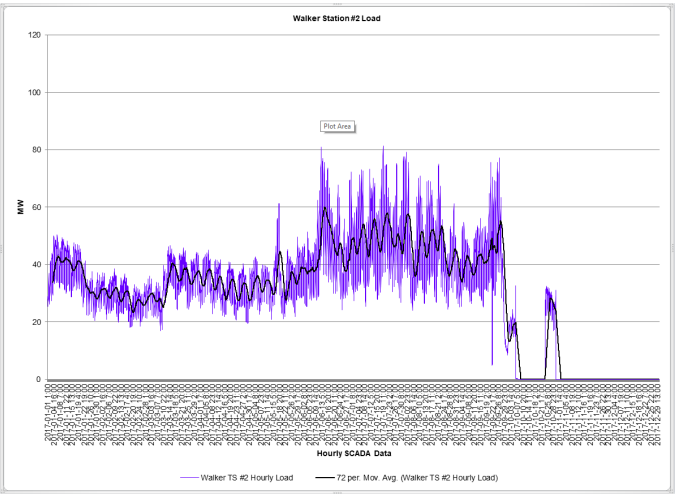
(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for completion of this line section is that the line is intended to relieve an overloaded section of line serving South Windsor. South Windsor is served by the 55M25 feeder from the Walker 2 station. As South Windsor has grown, that feeder's load has grown to the point where now the feeder is not able to support cold load pickup when there is a momentary outage during peak load times. The consequence of this is that staff have to be dispatched to open switches on sections of the system supplied from the 55M25 feeder and then close them one-by-one so that the load can be picked up. This means that the outage time for customers in South Windsor is extended longer than it should be. As well, a secondary driver is compliance with ENWIN's design criteria. The load in South Windsor should be fed by two feeders in order to meet ENWIN's design criteria for inter-feeder support. In order to accomplish this, an available feeder position was taken in Hydro One's Essex TS and supplies this feeder. This makes fuller use of the available capacity to ENWIN to serve its distribution system, as noted in the description of ENWIN's Asset Management System in section 5.3.1. Another, secondary driver for this investment is that this feeder is designed to be a high capacity feeder that can be used in case of loss of one of the stations supplying ENWIN's distribution system. The feeder is constructed of 795 MCM Al conductors and provides 900 A capacity between the Essex TS and the Malden TS. Consequently, this feeder provides increased level of resilience and reliability to the ENWIN system.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)



This section of line serves two purposes. First it provides a needed supply into South Windsor to relieve a feeder that is overloaded and is unable to close in and pick up peak season cold load without further tripping. The 55M25 feeder has a large footprint because of this and has been one of ENWIN's worst performing feeders for the last 5 years. Secondly, it provides a high capacity feeder between Essex TS and Malden TS so that in the event of loss of either of those stations or where load at those stations may be curtailed, load may be readily transferred to the other station. Additionally, unloading the 55M25 feeder will redistribute load off the Walker 2 station, which is ENWIN's most highly loaded station and which is peaking at its 10-day LTR rating (83MVA, see graph). Removal of load from this station will distribute load to the Essex station which has an excess of capacity and will make better use of the station assets serving ENWIN. Redistribution of load off the Walker 2 station to stations that are underutilized will make use of existing station capacity and negate the need for an additional transformer station in the forecast period. The investment will also assist in making the distribution system more resilient in order to cope with climate change.

(c) Priority

Indicate the priority of the investment relative to others; giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

This project has a risk-benefit score of 50.8 and a CRBF of $14,778/risk point. This places the project at 37th of a possible 65 line items. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

There are no alternative ownership options for this line. The line is part of an ENWIN feeder and no other ownership options exist.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

The total line has been constructed as part of road widening projects over a number of years and has consequently cost little to provide the benefit to Customers. The missing section is proposed to be funded by ENWIN as there is no timeframe for the City to continue their road widening work and the current investment is stranded without the section to connect both ends of the line. Additionally, when the City does re-engage with this section of their project, this work will have been completed – albeit without the 50% labour contribution from the City, so the investment will need to be made at some point in the future.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

The benefits for Customers include shorter outage times for Customers in South Windsor and increased system resilience for all customers. The increased resilience will facilitate routing power around the City during major storms. The line has been built along major roadways on concrete poles so that the line is more resilient and if it is damaged, would have easier access for repair if needed.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

Reliability will be improved with the construction of this line. South Windsor customers will have improved reliability in peak times and an additional back-up supply should their normal feeder be impacted by an issue.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

A number of alternatives were considered for this project including building the line underground, building the line with a compact construction technique on lower poles and building the line a block west of Walker Road in a location where taller poles will be allowed in accordance with airport rules. A final design has not been selected however it is intended to choose the design alternative that provides the least cost while satisfying the airport height restrictions and ensuring that the running line will not conflict with future City plans. The amount budgeted is the amount judged necessary for the most likely alternative, without full engineering evaluations being completed.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

The existing poles in this section are in fair condition and are close to the roadway. Completing this section of the line will mitigate the condition of the poles and mitigate the risk of a car hitting a pole.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are no cyber security nor privacy issues with this investment.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

This project was planned with roadwork that was being undertaken by the City of Windsor. That roadwork was along Walker Road and then along Cabana Road that was also being widened. That route was connected between the Essex TS and the Malden TS so constructing the line between those two stations during the road widening was opportune. There was a single circuit on the route so that the when the poles were moved for the road widening, a double circuit with larger conductor was constructed for a very modest additional cost. As well, since the poles were moved for road widening, labour costs were subsidized in accordance with the Public Service on Highways Act. As well, an expensive ducted crossing of the EC Row Expressway was done with the road construction, further minimizing costs. When the City decided to indefinitely delay the section of road widening for this project, it stranded the investment made to date and prevented the remedy of the South Windsor cold load pick-up issue. With regard to interoperability, the line provides the ability to supply power between Essex and Malden TS' in the event of an upset at either station. There are no other regional planning links than mentioned in "Main Drivers" above and "Regional Planning" below, or opportunities to work with 3rd parties. The project does not enable any future technological functionality but addresses the operating requirements mentioned earlier.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

There are no environmental issues associated with this project.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:
- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

There are no applicable conservation and demand management opportunities that would be cost effective and could afford an opportunity to defer the investment.

C. Category-Specific Requirements

System service – projects/programs in this category are driven by the distributor's expectations that evolving customer use of the system may create system capacity constraints or otherwise adversely impact operations and the delivery of quality distribution services. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures. Information used by a distributor to justify projects/programs in this category should include, but need not be restricted to:

Benefits for Customers

An assessment of both the benefits of the project for customers based on achievement of the project objectives and the cost impact to customers of the Investment

The benefits for Customers include shorter outage times for Customers in South Windsor and increased system resilience for all customers. The increased resilience will facilitate routing power around the City during major storms. The line has been built along major roadways on concrete poles so that the line is more resilient and if it is damaged, would have easier access for repair if needed. The cost impact of this construction on residential customers is approximately $0.135/year.

Regional Planning

Where applicable, information on regional electricity infrastructure requirements identified in a regional planning process that affected the initiation or final configuration of the project; and on the corresponding distribution of the benefits and responsibility for project costs

This investment provides a side benefit for the region in that the Malden and Keith transformer stations are shared by county utilities (Hydro One and Essex Powerlines) and ENWIN. When there is a contingency at either Malden or Keith TS, Hydro One will move load to the other station. There is not enough capacity at Keith to move the county load and ENWIN load from Malden to Keith and as ENWIN has alternatives, Hydro One will ask ENWIN to move its load to other stations. This feeder will facilitate moving ENWINs Malden load so that there is sufficient supply to the county. Similarly, a Keith contingency will see county load moved from Keith to Malden. ENWIN will move Keith load to Crawford TS and Malden however there may be times of the year when Hydro One will ask ENWIN to minimize load transfer to Malden in the event of a Keith contingency. This line will facilitate that load transfer. This ability to transfer load is an ENWIN intiative that has not been identified in any regional plan as it is a "side benefit" and not identified as a critical operation for which other utilities are assigned cost responsibility.

Advanced Technology

Description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

ENWIN has already installed remote operable switches in order to alleviate the cold load pick-up issue in South Windsor however this is not a complete solution and while this solution assists in mitigating the issue, it does not fully address the situation. The construction of this Walker Road project represents the full solution to the problem with cold load pick-up in South Windsor.

Reliability, Safety, Efficiency

Identification of any reliability, efficiency, safety and coordination benefits or affects the project will have on the distributor's system

This solution enhances reliability and resiliency for customers in South Windsor in particular and for all customers. Customers supplied by the Malden TS (>9,200 customers) and Keith TS (>4,800 customers) will also see direct benefits. As noted earlier, the redistribution of load off the Walker 2 TS will make more efficient use of system supply transformation by unloading the Walker 2 TS which is near capacity and loading the Essex TS which has spare capacity. There are no effects to safety as a result of this project.

Timing / Priority Factors

Identification and explanation of the factors affecting implementation timing/priority

The line has been constructed over a number of years and its completion is important for reliability improvement for Customers in general and for residents living in South Windsor in particular. The completion of the line has been planned with the intention of balancing expenditures across years so that the effect on rates is minimized as much as possible in the long term. While it is preferable to have constructed this section earlier, it has been pushed to 2020 to balance capital expenditures and minimize long run rate impacts for customers. The project cannot be pushed indefinitely however as the Walker 2 TS is approaching its 10-day LTR rating on hot summer days and exceeding that limit on a frequent basis may shorten the life of the station transformers.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing the proposed project to a) doing nothing and b) technically feasible alternatives to the proposed project considered that meet the same objectives as the proposed project.
Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, information should be provided that describes these qualitative factors in relation to the proposed project and all alternatives, including how these factors affected the selection of the proposed project.

In the “do-nothing” approach, the benefit of having the line to relieve loading in South Windsor and transfer power between the Malden TS and the Essex TS is not realized , nor would reliability improvements be realized. As an example, in 2018, Hydro One twice lost their 230 kV supply to the west end of Windsor, losing both Keith and Malden TS. Had the outage been longer and this line in place, ENWIN could have managed a shorter duration outage for their customers. The construction of this section of line will address customer preferences for reliability of supply.

The balance of the line has been constructed as part of road widening projects that were not avoidable and the incremental cost to construct the line was consequently minimized. The line provides benefits of reliability and resiliency to specific customers as well as to the ENWIN distribution system as a whole. Those benefits are not realized however until both sides of this line are connected. While the City has indefinitely deferred this section of roadway for reconstruction, it is expected that they will get back to this section in the mid-term future and at that point this expenditure will be needed. As such, this investment provides a significant benefit for a relatively inexpensive incremental cost and enables the delivery of those benefits from the prior investments.

This section of line is complicated by the fact that its location opposes the end of the runway at the local airport and as such there are height restrictions on the reconstruction of overhead plant that did not exist in the past. Construction alternatives to deal with the height restrictions included use of standard construction on lower poles, the use of insulated “tree cable” on lower poles, use of “compact” construction standards on lower poles, putting the line underground and moving the location of this line a block west of its current location where higher poles could be used. The lowest price alternative will be selected which meets all the current design criteria regarding capacity, height restriction and that will not require relocation in the event the road is eventually reconstructed.

The ranking of this project using the PROSORT tool included the assignment of benefits for risk reduction related to safety, reliability, cost avoidance and sustainability, with a total of 32.45 points assigned. There were also other benefits considered including the fact that this alleviates a “worst performing feeder”, improves flexibility of operations and increases system capacity through load redistribution, for 18.3 points. The total points assignment of the project was 50.8 points

A. General Information on the Project / Program

Investment Category	General Plant

Project Name / Description

Life Cycle Upgrade

This program addresses the renewal and maintenance of ENWIN's 3 categories of IT assets:

Hardware: Assets in this grouping include servers, network switches and routers, firewall devices, personal computers, laptops, tablets, printers, disk drives and miscellaneous devices. ENWIN has 3 data centers, 3 facilities and approximately 650 endpoints. Asset conditions vary and are typically replaced on a 3-5 year life cycle taking into consideration the cost and risk of maintaining the aging asset both from a performance and security perspective.

Software: Included in this category are system and application software. Due to potential security risks, ENWIN strives to keep its system software at the highest patch level. Since this is often dependent on its application software, ENWIN plans regular upgrades to keep its software at the version that is at one version lower than the current vendor released version. This process enables ENWIN to be more agile, take advantage of enhanced features, and minimize the need and risk of large project upgrades. The oldest asset in this category is the Records Management software which is currently being replaced. Most software assets range in age from 1 to 5 years.

Telephone: ENWIN's phone assets include both hardware and software which provide analog, digital, and IP service between its three facilities. It includes software for voicemail, call recording, call management, and reporting. Hardware includes servers, proprietary vendor hardware, and digital, analog and IP phones.

Estimated Cost	Gross $500,000	Net $500,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	There are no customer attachments associated with this project.
Load	There is no system load associated with this project.

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									THERE ARE NO SAFETY RISK MITIGATIONS
0.25	Reliability	Moderate	Possible	34	8.5	Minor	Rare	3	0.75	RISK OF CUSTOMER FACING IT SYSTEMS FAILING
0.25	Financial	Moderate	Possible	34	8.5	Minor	Rare	3	0.75	RISK OF UTILITY COSTS

										TO RESTORE IT SYSTEMS
0.2	Sustainability	Moderate	Possible	34	6.8	Minor	Rare	3	0.6	RISK TO REPUTATION UPON LOSS OF CUSTOMER FACING SYSTEMS

Expenditure Information & Timing	The expenditure will be made in stages on various items throughout the year with $125k per quarter.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

Based on the criticality of the asset, industry best practice and vendor specifications, each IT asset is assigned an estimated asset life. ENWIN relies on this information to make investment decisions in addition to other key data, including: vendor, contract and license information; security risks; interdependencies with other IT assets; capacity planning; and utilisation reviews. The objective of ENWIN's IT investment planning process is to maintain the IT assets to satisfy optimal system reliability and availability. This is intended to provide satisfactory levels of service for customers and the utility, and to mitigate IT-related business and operational risks in a cost efficient manner, as noted in the description of ENWIN's Asset Management System in section 5.3.1. A secondary driver identified for this expenditure is that to the extent that the expenditure enables an ability to remain current with cyber security preventive measures, it enables compliance with the OEB directives on cyber security. A further secondary driver for these investments is that updated IT equipment is often more efficient and effective than the equipment it replaces and provides additional capabilities which benefit customers such as an improved ability to call customers in groups and leave messages about outages or payments.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

This expenditure ensures the continued operation and availability of both internally facing and external, customer facing IT systems. These systems are key to ENWIN providing service to Customers in an efficient manner. ENWIN's practises in effecting these IT asset replacements mirror best practises in the industry. ENWIN subscribes to Gartner – a leading IT research, advisory and consulting agency that monitors trends and provides insights and advice regarding IT practises, trends, benchmarks, strategies and industry changes. Through this advice and participation in other industry groups such as ENWIN's membership in the Utility Standards Forum (USF), ENWIN is able to gauge the practises in the industry and adopt those practises that best fit ENWIN's risk profile and capabilities.

(c) Priority

Indicate the priority of the investment relative to others, giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

Asset replacement priorities are tied to a variety of factors including impact to customers and

operations, security and regulatory risks. The project has a CRBF of 21,917 and is ranked 45th out of a project list of 65 investment opportunities. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. The project reduces risk of loss of customer facing systems such as CIS and Billing which impact ENWIN's ability to provide service to its customers. Loss of meter reading and billing systems will adversely affect the ability of the company to bill and collect owed revenues and may adversely affect the company's ability to finance operations. Such losses would also be coupled with a loss of reputation for ability to manage the company.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

Alternatives to pro-active replacement of IT hardware and software include run-to-failure which was considered. When IT takes a run to failure approach, there is a significant consequence to those failures. When enterprise systems fail, virtually all office staff are at a standstill until the systems can be brought back on-line. Where these systems are customer facing, customers will be unable to have their concerns dealt with and ENWIN will suffer reputational damage. While back-up systems are expected to be able to facilitate system restoration, ENWIN judges that a run to failure option will have consequences that should be avoided through the planned, timely replacement of IT infrastructure. This also enables ENWIN to remain current with software releases which are necessary to ensure cyber security.

ENWIN considers alternatives related to hosting of applications, purchase vs lease of equipment, cloud based services, etc. when deciding on the best alternative to maintaining IT infrastructure. These considerations include risk, consequence of failure, cost, privacy, cyber security, ability to maintain, licensing, etc. ENWIN also considers working with other utility partners to lower costs for maintaining IT infrastructure. An example of this is the Sensus Regional Network Interface (RNI) infrastructure. ENWIN purchases server housing and maintenance services from Sensus and those servers are housed along with the servers of other utilities in a Toronto facility. ENWIN also works with other utility groups such as a group led by Powerstream (now Alectra) to jointly test Sensus system upgrades.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

In many cases, the efficiency improvements by which ENWIN is able to minimize cost increases flowing to its customers comes through automations provided by its IT systems.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

Customer benefits from IT expenditures relate to ENWIN's ability to continue to provide "backroom" services such as meter reading and billing, customer inquiry regarding their bills and other customer facing information systems such as ENWIN's outage map. "Backroom" services also provide customers with information regarding their consumption so that they may better manage their consumption and costs.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

The components of ENWIN's back office services must be reliable in order to continue to provide services to customers. Outages to call centers, billing systems, meter reading systems, etc. all have a direct negative effect on the level of service provided to customers.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

Various alternatives are considered prior to each upgrade, including running the asset under an extended warranty contract, running unsupported or retiring the asset without replacement.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

If the asset supports safety systems or controls that could pose a health and safety risk, its impact to health and safety is taken into consideration when reviewing the life cycle replacements of those assets. An example is the hardware and software that manages building access. If that equipment is not available then access and entry to ENWIN's properties is compromised and intruders may steal or damage equipment and records.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

Cyber Security and Privacy are critical factors in ENWIN's asset life cycle planning. ENWIN conducts regular network penetration testing and web application tests and any recommendations along with the outcomes of the OEB Cyber Security Framework, help guide and prioritize investments under this program. These systems also protect the private information with which the customers have entrusted to ENWIN. ENWIN takes the safeguarding of this customer information very seriously and tries to ensure that the systems that contain and protect that information are up to date and as secure as they can be.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

These investments are not related directly to physical plant used in the distribution system and as such, expenditures are not coordinated with other utilities, regional planning or 3rd party providers. Updated IT equipment is often more efficient and effective than the equipment it replaces and provides additional capabilities. This may manifest as faster refresh rates on computer screens used by customer service representatives speaking with customers and consequently provide better service to customers or an ability to use the latest software updates from software providers which may have additional features which enable better customer service and positions ENWIN to take advantage of future upgrades.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

ENWIN anticipates continued energy improvements as old assets are replaced by newer more efficient equipment. Savings have previously been realised in the server rooms as equipment becomes smaller and uses less energy. For example, server room air conditioning requirements have decreased over many years allowing for that room to draw less power.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

This is not applicable to this expenditure.

C. Category-Specific Requirements

General plant – projects/programs in this category are driven by the distributor's evolving requirements for capital to support day to day business and operations activities. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures.
Information used by a distributor to justify material projects/programs in this category should include but need not be restricted to:

Quantitative and Qualitative Analyses

The results of quantitative and qualitative analyses of the proposed project/program, including assessments of financially feasible options to the proposed project (including the 'do nothing option' where applicable), identifying the (net) benefits of the proposed investment in monetary terms where practicable

Historical spend is used to forecast future requirements and provides a prospective budget envelope in which to plan spending. Assets are serialized and records maintained regarding their purchase dates, in-service dates, warranties, expected life and cost. Assets at end of life are reviewed to ensure that they are still required now and in the future. Reviews are done to determine if assets can be combined or services provided by other assets. An example is a virtual server where, rather than purchase and use a unique server for each specific use, a server can be partitioned and serve multiple concurrent uses. Once equipment is identified as at end of life and needing replacement the list of replacements is costed, compared to budgets and prioritized. Competitive procurement processes are used to ensure that ENWIN is able to fulfil its needs at lowest cost. The “do nothing” option was considered and rejected as discussed in section B(d) above. The net benefit of the investments include the avoidance of the consequences of failure of a number of support systems which enable the service to customers in a cost effective manner.
Business Case Documentation Where the capital cost of a project substantially exceeds the materiality threshold, (e.g. CIS, GIS, new office building) the distributor shall file a thorough business case documenting the justifications for the expenditure, alternatives considered, benefits for customers (short/long term), and impact on distributor costs (short/long term)
N/A ☒ Attached ☐

A. General Information on the Project / Program			
Investment Category			General Plant
Project Name / Description			
Records Management System Modernization			
Estimated Cost	Gross $332,000	Net $332,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
• Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
• Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
• Related customer attachments and load, as applicable
• Start date, in-service date and expenditure timing over the planning horizon
• The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
• If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
• Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
• Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2018-01-01
In-Service Date	2020-12-31
Customer Attachments	None
Load	None

Risks and Risk Mitigation:

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									THERE ARE NO SAFETY RISKS
0.25	Reliability									THERE ARE NO RELIABILITY RISKS
0.25	Financial	Minor	Unlikely	6	1.5	Minor	Rare	3	0.75	MINOR RISK OF AUDITS FROM REGULATORS
0.2	Sustainability	Minor	Unlikely	6	1.2	Minor	Rare	3	0.6	MINOR RISK OF AUDITS FROM REGULATORS

Expenditure Information & Timing	The existing records management software is 23 years old, running on an unsupported application. Software changes are difficult, limited and could be costly. Security updates are no longer available. To reduce security risks, access to the system is limited to a few individuals who can only access the system through protected means. The access method is clunky and the antiquated interface is difficult to use and navigate. Maintenance is centralized on the Records Manager role and limited functionality contributes to limited awareness from employees to what records are actually available within the system. The legacy system does not support newer requirements for electronic records and email. Electronic records are currently spread out between multiple sources. Expenditure

	for the entire project is to take place over 3 years, 2018 – 2020 and is estimated to cost $870,000. The test year is the final year and expenditures are budgeted at $332k in this final year. That expenditure is expected to be distributed evenly through the year.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this multi-year project is to replace an existing records management software that is 23 years old and running on an unsupported application. For almost 30 years, ENWIN has used a classification system that was based on "The Public Utilities Records Management System" (PUCRMS) in conjunction with a software program called Zolar. Both PUCRMS and Zolar were designed around the control of physical records and do not have the features to deal with the complexities and nuances of managing electronic records.

The classification system and retention schedule was first developed in 1990 and does not reflect the current information needs of ENWIN. Record-keeping requirements have significantly changed since the early 1990s and the classification system is inadequate. The current classification systems' corresponding retention schedule must be vetted to ensure it meets current legislative, regulatory and operational requirements, and industry best practices.

Departments are keeping copies of records on shared drives making it nearly impossible to ensure proper disposal. In addition to legal risks, this leads to inefficiencies and increased costs of storage and backup. Shared drives have limited search capabilities, version tracking and auditing functions like those found in modern RMS systems. As data storage needs continue to grow exponentially, these problems will only intensify.

A secondary driver is the need for compliance with new privacy and freedom of information (MFIPPA) legislation. Currently, ENWIN is not able to fully scrutinize its existing records should an FOI request be received. Additionally, ENWIN may be storing records that need not be stored and without some means of purging old records, the record system will continue to grow and be increasingly difficult to manage.

The information used in the review of this investment included the old, DOS-based filing system as well as the volume of existing paper-based files. This project does not directly affect distribution system reliability or safety.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

This investment does not affect grid performance but does improve the efficiency of the organization in terms of filing and managing information, enabling future technological functionalities such as

advanced search capabilitiesand it facilitates compliance with OEB records retention rules and other freedom of information and privacy rules. ENWIN is also taking this opportunity to review and update its records management practices with a goal of achieving timely and effective classification, retention and retrieval of business records while maintaining confidentiality and security of the data.

(c) Priority

Indicate the priority of the investment relative to others, giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

This project does not compare well against other system investments as the criteria upon which the priorities are judged lean heavily in favour of projects that affect the distribution grid. This project obtaining a CRBF rating of $92,222/rating point and is ranked 63rd of 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. Nevertheless, ENWIN has an obligation to make records of the work that it does and to manage those records in a responsible manner so that regulators and the public have a reasonable expectation of having inquiries answered in a reasonable time frame with accuracy. ENWIN has mitigated the impact of this project and its priority by spreading the expenditure over 3 years.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

ENWIN considered the "do nothing" approach however the current records management system is well beyond end of life and ENWIN remains at risk for poor records management at a time when regulations and legislation is mandating rules for records retention, privacy and freedom of information. Additionally, as more records are digital rather than paper records, ENWIN's aging records retention system is inadequate to manage those digital records. Consequently, the "do nothing" approach was rejected. The project was started in 2017 with an RFP for a records system design. That RFP was over the budget estimate for the project and the proposals were weak. The 2017 alternative was rejected and a new proposal sought in 2018. The 2018 proposal was considered stronger and more cost effective and the project was consequently begun in 2018 with effort and cost spread over 2018, 2019 and 2020. There are no viable options for part ownership or joint ownership with 3rd parties.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

As noted in (d) above, a do nothing alternative was rejected. Efforts were made in 2017 and 2018 to ensure that an effective and cost effective system was selected. A competitive RFP process was undertaken to ensure cost effectiveness of proposals. This project will not affect the physical distribution system efficiency however it will make the "back office" operations that support the records for that system more effective and efficient.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

The inability to find records when needed reduces the quality of service provided to external and internal customers in the form of delayed service responses, inefficient transactional processes, lengthy compliance preparation, duplication of effort in recreating documents, and lost productivity with sharing and collaborating around content and documents. This project will mitigate the current risk for lost or prematurely destroyed or improperly categorized records.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

There is no impact of this investment on the frequency and duration of outages.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to

configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

ENWIN remains at risk for lost records, records destroyed prematurely and improperly categorized records. As noted in (d) above, ENWIN considered a "do nothing" alternative as well as proposals from a 2017 RFP and rejected those alternatives before committing to a proposal from a 2018 RFP. A qualification in the design request and the proposals submitted included assurance of compliance with regulations and legislations. While this compliance may be a secondary benefit from the drive to replace an end of life system, it was a primary requirement for the new system and this compliance was not offered nor considered as an additional cost option.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

This project will not affect the health and safety performance of the distribution system.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

Privacy and security of records was a significant consideration in selecting a successful proponent from the RFP process. It is intended that the new records management system conform to all applicable regulations, laws and good utility practise. Electronic aspects of the new records system will be protected under the umbrella of ENWIN's cyber security protocols.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

are no opportunities for coordination with other utilities, regional planning or industry. A third party consultant is working with ENWIN to customize new record system. One of the primary functions of the new system is to enable future operational requirements in the records area.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

One of the environmental benefits of the project is the ability to manage electronic records which is expected to reduce ENWIN's reliance on paper records. This should reduce the amount of paper going to landfill or recycling stations in the future.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

Does not apply.

C. Category-Specific Requirements

General plant – projects/programs in this category are driven by the distributor's evolving requirements for capital to support day to day business and operations activities. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures.
Information used by a distributor to justify material projects/programs in this category should include but need not be restricted to:

Quantitative and Qualitative Analyses

The results of quantitative and qualitative analyses of the proposed project/program, including assessments of financially feasible options to the proposed project (including the 'do nothing option' where applicable), identifying the (net) benefits of the proposed investment in monetary terms where practicable

It is not possible to quantitatively analyse the benefits for undertaking this project. The current system is inadequate and at end of life. A discussion of the alternatives considered is in section B(d) above.

Business Case Documentation

Where the capital cost of a project substantially exceeds the materiality threshold, (e.g. CIS, GIS, new office building) the distributor shall file a thorough business case documenting the justifications for the expenditure, alternatives considered, benefits for customers (short/long term), and impact on distributor costs (short/long term)

N/A ☒ Attached ☐

A. General Information on the Project / Program

Investment Category	System Renewal

Project Name / Description

Underground Padmount Transformer Sustainment Program

Estimated Cost	Gross $255,000	Net $255,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	Varies
Load	Up to 3000 kVA per transformer

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety	Moderate	Rare	7	2.1	Insignificant	Rare	1	0.3	SAFETY IMPROVED MOVING TO DEAD FRONT TX
0.25	Reliability	Minor	Likely	19	4.75	Minor	Rare	3	0.75	RISK OF FAILURE OF EOL TX
0.25	Financial	Moderate	Likely	51	12.75	Moderate	Rare	7	1.75	COST TO CUSTOMER >$1K
0.2	Sustainability	Minor	Possible	13	2.6	Insignificant	Rare	1	0.2	RISK OF OIL LEAK IN FAILING TX

The sustainment alternatives for padmount transformers are to either proactively maintain and replace the transformers or run them to failure. Padmount transformers, except for single phase residential style padmount (mini-pad) transformers, are generally used to serve larger commercial customers. Such customers are judged to suffer a greater degree of hardship due to loss of power than a residential customer. Consequently, to best serve those customers, ENWIN proactively maintains and replaces those transformers in order to avoid an in-service failure.

Expenditure Information & Timing	ENWIN has budgeted $255,000 for 6 padmount transformer replacements in 2020. An example project for 2020 is the replacement of the 300KVA padmount transformer TP0433 – servicing a high rise residential building in Windsor. Average replacement cost is $42,500 per unit. Expenditures will be $42.5k at end of Q1, $85k at end of Q2, $85k at end of Q3 and $42.5k at end of Q4.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒
Contribution to Transmitter	There are no contributions to the transmitter for this program expenditures.

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for replacement of three-phase padmount transformers is to maintain or improve system reliability for the customer's benefit. ENWIN has considerable transformer infrastructure and much of its infrastructure and its ability to deliver value to customers is dependent upon the ability of transformer systems to withstand the environment in which they exist. Replacing three-phase padmount transformers which are at end of life is fundamental to being able to maintain service to customers. As noted in the description of ENWIN's Asset Management System in section 5.3.1, inspections are performed as part of the 3-year OEB inspection cycle and the transformers with the lowest, worst, health index are replaced first. There are no secondary drivers for this investment program however a secondary benefit is that many of the transformers that reach end-of-life and qualify for replacement are live-front transformers and they are replaced with safer, dead-front transformers. Live front transformers are not as safe as dead front transformers because they have high voltage terminations that are exposed and when crews open the door, the high voltage is present at the termination point. Dead front terminations utilize molded, load-break elbows, which enclose the actual termination point and are consequently safer for the crews and the general public in the event a car hits a transformer..

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

There are approximately 480 commercial padmount transformers in the ENWIN network ranging in age from new to over 50 years old. Assets in this family have an industry life expectancy of approximately 40 years. The inspection methodology identifies assets at the highest risk in the next 2-5 years and determines the life expectancy and schedule for rehabilitation or replacement. The oldest padmount transformers are given a detailed inspection before they are slated to be replaced. Sites that are scheduled for inspection are identified by the System Planning department as having potential for failure in the 5 year planning window. If the inspection confirms that the padmount transformer requires replacement, it will be scheduled for replacement, along with the underground primary cable feeding the transformer. In most cases, the cable has a shorter life expectancy than the transformer and will need to be replaced at the same time as the transformer. If the inspection determines that the padmount transformer has significantly more useful life remaining, it will not be replaced that year and the next padmount transformer in the project list will be analyzed the same way.

(c) Priority

Indicate the priority of the investment relative to others, giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

The priority of this program is high. The underground padmount transformer sustainment program has been prioritized through the PROSORT evaluation system obtaining a CRBF rating of $1,737/rating point and is ranked 26rd of 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. Despite that ENWIN has been proactively replacing padmount transformers for a number of years, the fleet continues to age and the units scheduled for replacement are identified from a data driven, forced ranking of padmount transformers at risk over a 5 year planning horizon.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or

ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

The program proactively replaces padmount transformers in order to avoid in-service failures. ENWIN believes that in-service failure of these units results in a high level of inconvenience to large customers and higher replacement costs due to the long outages caused by the un-planned nature of the work. The program is also eliminating live front transformers that are in bad condition throughout the city. They are being replaced with safer, dead front transformers.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

The benefits that Customers will obtain from the padmount transformers sustainment program is an increase in reliability of their electrical service.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

Reliability will increase to the same levels as for other commercial customers serviced from newer dead front padmount transformers. The failure of an in-service transformer will typically result in protection operations that may result in a widespread outage for other customers on the feeder, depending on the location of the transformer and the interaction of other protective elements. This may have a minor effect on the overall reliability of the distribution system. It will have a significant effect on the customers served by the transformer with typical times to change a transformer in excess of 8 hours. This can present a significant hardship on the customer which depends on the date and time of the failure and the nature of the customer's use of power. The alternative to a pro-active, planned replacement is a "run-to-failure" model. See below for further discussion.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

ENWIN has considered run-to-failure and proactive replacement to address the end-of-life failures of the padmount transformers. Run-to-failure was problematic as an in-service failure of padmount transformer would result in a high level of inconvenience to commercial customers and higher replacement costs. In either alternative the customer suffers an outage. ENWIN has made a judgment that for larger customers supplied by dedicated 3-phase transformers, a planned outage is the better alternative. In this way, the customer is able to plan for the outage and in a planned replacement, the outage time is often minimized to just the time required to reconnect the customer's service/secondaries to the new transformer. As well, a planned replacement is generally performed on regular rather than overtime which drives up the cost of the transformer replacement. When an in-service failure does occur, even if it is on a day shift time frame, crews are pulled from other jobs and other regular work, including work coordinated with customers, is interrupted resulting in additional costs and inconvenience for customers. The preferred alternative for the reasons mentioned was the proactive replacement of three-phase padmount transformers.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

The program is eliminating live front transformers that are in bad condition throughout the city. They are being replaced with safer, dead front transformers.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are no customer privacy, cyber security nor privacy issues associated with this program.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

a) There are no co-ordinations with other utilities, regional planning linkages or 3rd party providers involved.
b) Padmount transformer replacements can be done in conjunction with end-of-life replacement of direct buried, non-tree retardant cable. This leaves customers with a relatively robust electrical distribution system. There are generally no future technological capabilities enabled by this investment.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

The proactive replacement of end-of-life padmount transformers minimizes the risk of oil leaking into the environment.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:
• Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
• The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
• A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

There are no direct conservation or demand management initiatives that are associated with this program. However, with a pro-active replacement of the transformers, ENWIN takes the opportunity to review the loading of the transformer both historically and in discussion with the customer. Where the customer's load is less than the capacity of the existing transformer and can be satisfied with a smaller transformer, the transformer is replaced with a smaller sized transformer at lower cost and a lower level of line loss for the transformation.

C. Category-Specific Requirements

System renewal – projects/programs in this category are driven by the relationship between the ability of an asset or asset system to continue to perform at an acceptable standard on a predictable basis and the consequences for customers served by the asset(s) of a deterioration of this ability (i.e. failure). A distributor's discretion over the timing and priority of projects in this category may lessen over time, such as where assets with high consequence of failure are consistently operating outside applicable operating limits. On the other hand, a distributor may have considerable discretion over timing and priority where deteriorating asset condition has little or no impact on performance and the consequences of an asset failure on customers and the system are relatively low.
A distributor's justification of each sustainment project/program must discuss these issues including (where applicable) but not restricted to:

Asset Performance-Related Targets

A description of the relationship between the characteristics of the assets targeted by a project and the consequences of asset performance deterioration or failure, referring to:
• The distributor's asset performance-related operational targets and asset lifecycle optimization policies and practices (i.e. filings in relation to sections 5.2.3 and 5.3.3)

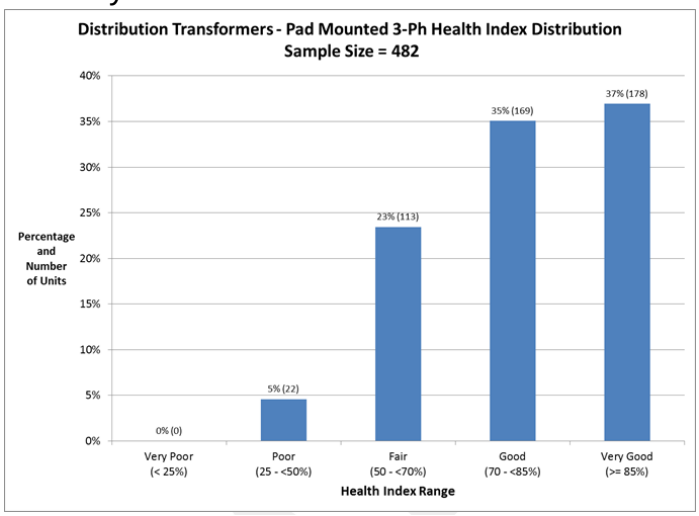
Kinectrics OEB Asset Useful Life study puts the average life of a padmount transformer at 40 years which is the value ENWIN sets for its depreciation of this asset. ENWIN's goal is that padmount transformers be replaced on a planned basis with a sustaining investment in the asset group maintained at approximately $270k annually to ensure a reliable system performance and avoid a significant investment ramp as infrastructure begins to fail at end of life. In-service failure of distribution transformers is typically sudden, without warning and difficult to predict with accuracy. Consequences of failure for the customer served by the transformer are typically significant. Additionally, it is common to encounter conditions which complicate and extend the work and time required to replace a transformer and which amplifies the inconvenience and cost which the customer suffers through the asset replacement process. An example is that most of the oldest transformer assets sit on flat concrete pad while new replacement transformers require a manufactured base to be placed and upon which the new transformer designs sit. Needing to perform preparatory civil work in advance of the transformer replacement will significantly extend outage time for the customers. Consequently, as outlined in section 5.3.3 (a), ENWIN proactively rather than reactively replaces these assets.

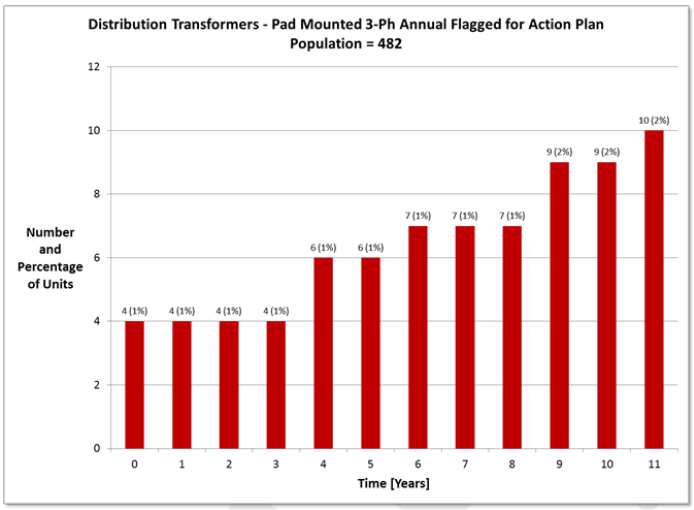
Condition of Assets

Information on the condition of the assets relative to the typical life-cycle and performance record of the assets targeted by the project

The Kinectrics Asset Condition Assessment study identified that 28% of padmounted 3-phase

transformers were in fair to poor condition. Kinectrics suggests 4 units per year to be included in the flagged for action plan for the next 4 years and then gradually increase up to 10 units by the end of the study horizon.





ENWIN's actual planned investment for the program for the 5 year horizon is as follows:

2019	2020	2021	2022	2023
$280k	$255k	$277k	$297k	$256k

The investment schedule noted above represents the replacement of approximately 7 units per year. This is very closely aligned to the flagged for action plan recommended in Kinectrics' 2017 Asset Condition Study. The table below details the number of units replaced over the next ten years and how they compare to the 2017 Asset Condition Study.

Kinectrics and ENWIN Plan Comparison (# of Units)		
Year	**Kinectrics**	**ENWIN**
2019	4	7
2020	4	6
2021	6	7
2022	6	7
2023	7	6
5-Year Total	**27**	**33**
5-Year Average	**5.4**	**6.6**
2024	7	6
2025	7	6
2026	9	6
2027	9	6
2028	10	7
10 Year Total	**69**	**64**
10 Year Average	**6.9**	**6.4**

The planned spend matches the action plan recommended by Kinectrics over the next 5 to 10 years. Slight variations can be attributed to the additional health index information collected in the last 2

years.

Project Impacts

• The number of customers in each customer class potentially affected by a failure of the assets included in the project o Quantitative customer impacts (e.g. frequency or duration of interruptions or number of customers affected) with associated risk level(s)
• Qualitative customer impacts (e.g. customer satisfaction, customer migration) with associated risk level(s)
• The value of customer impact (e.g. high, medium, low) considering the characteristics of customers potentially affected by asset failure and the cost of failure

Unplanned interruptions will generally result in a single (1) large commercial customer interruption. Where a transformer feeds multiple customers such as a strip mall, failure of the transformer may affect a number of commercial customers. The outage might take 1-2 hours or more, depending on time of day, to call-in/dispatch crews, troubleshoot and disconnect the defective padmount transformer. Thereafter, an additional 12 hours or more, depending on conditions, may be required to remove and replace the transformer and reconnect the service. If additional civil work is required, these times can double. Where a project is planned there is usually a single outage to replace the transformer. Outages will typically last 4-8 hours to do this. Additionally, with a planned replacement, the customer has the opportunity to consider replacing his secondary cables which are generally as old as the transformer and its cables. Often customers will choose to do this and because the work is planned, results in lower costs for the customer's work than if they needed to arrange an outage on an unplanned basis, at a later time. ENWIN judges the impact to a customer for a transformer failure as moderate, meaning in excess of $1,000 and likely to occur for transformers with low health indices.

Project Timing

Other factors that may affect the timing of the proposed project such as the pacing of investments and the priority relative to other projects

The replacement of padmount transformers has a high priority for ENWIN because of the importance of large customers and age and condition of the group asset.

O&M Cost Duplications

The consequences for system O&M costs, including the implications for system O&M of not implementing the project

There is little O&M expense associated with the operation and maintenance of padmount transformers other than the inspections themselves. Whether a transformer is new or near end of life, the transformer drives the same level of inspection, hence there is negligible affect on system O&M costs for replacing the transformer.

Reliability / Safety

The impact on reliability and safety factors

Old and deteriorated padmount transformers have an adverse effect on reliability as noted earlier. Additionally, where the older transformer is a live-front transformer, a safer installation results when it is replaced with a dead-front transformer. Transformers with poor health indices often have perforations of their external shell where small animals and insects get access to the live components in the transformer and can cause flashovers and faults within the connection access chamber of the transformer.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing alternatives to the timing of the proposed project, highlighting the trade-offs between rate of expenditure and mitigation of the consequences of asset performance deterioration. Where the ranking of the proposed project relative to the alternatives has been adjusted to account for significant benefits and costs, the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

Reliability improvements will be significant for those customers served from padmount transformers. The main benefits for this investment is the improvement in reliability that customers will experience as well as the improvement in safety that customers and employees will see. There is also a risk reduction related to minimizing the frequency of occurrence where a transformer leaks oil into the environment. Cost savings/benefits for undertaking planned vs unplanned replacements include undertaking the work on regular rather than overtime (only 40/168 hours of the week are regular time hours) and the cost to the customer in sustaining an outage for 12-24 hours or more than would otherwise be required. Additionally, planning the work allows the customer to renew his secondary cables, which are also likely at end-of-life, at a reduced cost. The cost savings/benefits for proactive

transformer replacement to the customer depends on the value each customer places on the costs associated with a long outage. These cost savings/benefits are balanced by the cost of replacing a transformer that may have a modest amount of service life left. Assuming a random distribution of time when a transformer may fail, and a nominal $10,000 of labour for replacement work, then the incremental cost of labour to run to failure would be $7,700. If a modest customer cost of $2,300 is added to this then the incremental cost of a run-to-failure model is $10,000. The lost opportunity cost for early replacement of the transformer might be the depreciation cost of $42,500/40 years or $1,063/year. Thus, if the transformer may have lasted an additional 5 years then the opportunity cost for the run-to-failure model would have been $5,300 while the pro-active model would save $10,000.

Additional Factors

Where the proposed project is a 'like for like' renewal but has been configured at extra cost to address other distributor planning objectives, an analysis of project benefits and costs must be provided comparing a) a project configured solely to meet the requirement; b) the proposed project; and c) technically feasible alternatives to the proposed project that meet the same objectives as the proposed project. Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

Transformer replacements are essentially like-for-like replacements and there are no additional costs for addressing other objectives. There are no additional factors for consideration.

A. General Information on the Project / Program

Investment Category	System Renewal

Project Name / Description

Manhole Sustainment Program – Example: MH25 REPAIR – PELISSIER N. OF ELLIOTT
Replacement and repointing of the top five courses of brick on the North, South and West walls

Estimated Cost	Gross $$150,000	Net $150,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	N/A
Load	N/A

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety	Major	Unlikely	46	13.8	Insignificant	Rare	1	0.3	RISK OF INJURY DUE TO COLLAPSE OF WALLS
0.25	Reliability	Moderate	Unlikely	17	4.25	Insignificant	Rare	1	0.25	RISK OF CABLE DAMAGE DUE TO COLLAPSE
0.25	Financial	Minor	Unlikely	6	1.5	Insignificant	Rare	1	0.25	CUSTOMER COSTS DUE TO OUTAGE FROM COLLAPSE
0.2	Sustainability	Insignificant	Unlikely	2	0.4	Insignificant	Rare	1	0.2	REPUTATIONAL DAMAGE

This manhole has been inspected by a professional engineer and identified as having spalling present near the North wall measuring 100mm x 1200mm. Spalling was also present on the roof slab near the West wall in two locations with damage measuring 100mm x 1200mm and 100mm x 500mm. The brick walls were generally seen to be in poor condition. The top five courses of the North, South and West walls require replacement and repointing. The risk that the deterioration of the manhole presents is that of collapse of the structure with potential for injury to people and vehicles. As well, there is risk that the collapse would damage the cables inside the manhole resulting in loss of service to customers. Outages would be extensive as feeder cables running through the manholes and would require extensive work for isolation and repair. This could lead to both inconvenience and cost for customers. These risks are mitigated by performing the repairs and by conducting regular inspection of the manholes.

Expenditure Information & Timing	The estimated cost for this example project is $23,100. The project is budgeted as part of a program for manhole repair and replacement every year. The forecast for the budget line item is based on historical spend in this program.

	Expenditures for close years are based on estimates for the identified projects for the year rather than the category spend for years that are further out. This expenditure is planned for Q3 as are most manhole replacement projects. Generally, concrete patching requires warmer weather and traffic is somewhat lighter in summer months making work easier.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this program and project is the deterioration of the manhole structures which carry the cables and splices for major feeder cables. Manholes are generally used in the underground network which runs in our downtown core. Consequently, many manholes are in high traffic, major arterial roadways and are subject to a high amount of road salt. This road salt penetrates the concrete lids of the manholes and results in delamination of the roof slab, loss of contact with reinforcing bar resulting in loss of strength in the roof and side walls of the manhole and ultimate collapse of the structure. As noted in the description of the asset management process in section 5.3.1, manhole condition is determined during rotating inspections. These inspections are contracted to a civil engineering firm specializing in assessing these types of structures. The civil engineer provides professional opinions regarding the fitness of the structure to remain in service and any repairs needed to maintain it in serviceable condition.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

ENWIN contracts with a professional civil engineering firm to inspect the manholes and vaults in ENWIN's distribution system. The inspection report includes areas where repair or replacement are required, the estimated cost for those repairs, a design for the repairs and a recommendation for the time frame in which the next inspection should take place. In any event, no inspection timeframe by the engineer will exceed 5 years. This inspection time frame is recommended by the consulting engineer and ENWIN sets a maximum inspection frequency of 5 years. In many cases, the engineer may note a developing issue that is not yet sufficient to warrant a repair. In those cases, a shorter inspection time frame is recommended. Manhole sustainment investments do not have a material effect on reliability performance other than should a manhole fail in the downtown core, it is likely that there would be a significant negative effect on reliability. The goal of manhole sustainment is to ensure the manholes can safely remain in service.

(c) Priority

Indicate the priority of the investment relative to others, giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

Manhole Sustainment projects are a high priority item for ENWIN with a ranking of 22 of 65 capital line items. The reason for the high priority is that the consequence for failure is very high when manholes are in roadways with heavy vehicular traffic. The PROSORT $/CRBF rating is 685. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which

provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

Since manhole failures are so rare, they are not expected and hence do not factor into the determination of SAIFI or SAIDI reliability statistics. The expenditure hence is made just to maintain the reliability of the distribution system and does not enhance it. ENWIN does not maintain its own level of expertise in civil manhole design so contracts this work to professional civil engineers and relies on their expertise to ensure that safety and reliability are not compromised. The engineer that performs the inspection is also contracted to design any remediations and to inspect the work of a civil contractor that performs that work. Inspections are performed and recommendations are made for any repairs or replacements necessary along with the timing and estimated cost of those replacements. Additionally, a recommendation for the timing of the next inspection is also part of the deliverable. This information is used to inform the capital and operating budget planning for subsequent years. The only alternatives considered are repair or replace. ENWIN chooses to repair manholes providing the contracted engineer advises that repair is a safe and economic alternative to replacement. In some cases a partial replacement (generally the lid) is recommended. Augmented supports for the lid are generally not a cost effective, long term solution and provide obstacles to the use of the manhole to pull cables. On one occasion, wooden supports were provided on a temporary basis to support a lid until the lid could be replaced. Occasionally, manholes (vaults) have been provided by customers with large buildings who require transformation but do not have property footprint to place a transformer. In these cases, the customers are responsible for the structural integrity of the manhole or vault. Where an inspection determines the structural integrity to be questionable, the customer is responsible to hire a civil engineer, make the repairs and provide ENWIN with an engineer's attestation to the safe condition of the manhole or vault.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

The repairs and replacements which ENWIN conducts on its manhole infrastructure is judged to be very cost effective. The program is aimed towards conducting sufficiently frequent inspections so that deterioration is discovered early and is repaired so as to avoid a costlier replacement of the structural components. Where replacements are warranted the replacements are limited to those components that need replacement – typically the manhole lid and/or chimney structures. The expected useful life of the structure is tried to be achieved as much as possible however design life is not achievable without inspection and remedial actions. The remediation of manholes ensure that they can safely remain in service and consequently maintain system operation efficiency.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

Proper manhole sustainment reduces the safety risk to the public and reliability risk to customers. The inspection and repair of underground manhole structures has two direct benefits to customers. First, the maintenance of the structure in good repair ensures that an untimely collapse of the structure does not occur and consequently people and vehicles that pass over the manhole do not suffer any injury or losses. Secondly, when the manhole structures are maintained in good repair there is less likelihood that a delamination of the concrete in the lid or wall will fall into the cables or equipment in the manhole and cause damage to the cable's insulation, which could result in catastrophic cable failure and a significant outage for customers. The maintenance of manhole structures in good repair also ensures the safety of the people that need to enter those manholes and reduces corporate liability risk.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

A structural collapse of a manhole or a falling piece of concrete or brick that damages the cable insulation could result in catastrophic failure of the cable (manhole fire) which would damage all the cables in the manhole. All the cables entering the manhole would need to be replaced from the upstream/downstream manhole and any structural damage repaired or the manhole replaced. The time needed to repair the cables and manhole would depend on the number of cables in the manhole however it is likely to exceed a week and may exceed two weeks. Depending on the location of the failure, and ENWIN's ability to route power around the area, it is likely that some customers may be out of power for a week or more. These customers are likely to be large customers such as office buildings, apartment buildings, shopping centres, etc. than small residential or commercial customers. The remediation of the manholes will not affect the reliability of the distribution system.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

There are no known alternatives to repair and replacement of the structures. A run-to-failure option is not viable.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

The investment directly reduces the safety risk to both the public and to employees that need to work in the manholes.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are no cyber security nor privacy issues with this investment.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

Where possible, ENWIN tries to coordinate its manhole work with City roadwork where possible. In 2017, ENWIN was aware that the City was planning roadwork adjacent to an intersection where ENWIN needed to replace a lid on a manhole. ENWIN coordinated its work so that it occurred as part of the road closing that the City needed to do for their work. This helped to reduce inconvenience to customers and to reduce roadway surface restoration costs. The investment in manhole sustainment does not enable future technological functionality or operational requirements.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

No significant environmental benefits are ascribed to this project.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:
• Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
• The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
• A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

No conservation and demand management measures influence this work.

C. Category-Specific Requirements

System renewal – projects/programs in this category are driven by the relationship between the ability of an asset or asset system to continue to perform at an acceptable standard on a predictable basis and the consequences for customers served by the asset(s) of a deterioration of this ability (i.e. failure). A distributor's discretion over the timing and priority of projects in this category may lessen over time, such as where assets with high consequence of failure are consistently operating outside applicable operating limits. On the other hand, a distributor may have considerable discretion over timing and priority where deteriorating asset condition has little or no impact on performance and the consequences of an asset failure on customers and the system are relatively low.
A distributor's justification of each sustainment project/program must discuss these issues including (where applicable) but not restricted to:

Asset Performance-Related Targets

A description of the relationship between the characteristics of the assets targeted by a project and the consequences of asset performance

deterioration or failure, referring to:
• The distributor's asset performance-related operational targets and asset lifecycle optimization policies and practices (i.e. filings in relation to sections 5.2.3 and 5.3.3)

Manholes are important assets to the utility and enables the construction of underground plant that is less susceptible to weather phenomena. This class of asset includes manholes, vaults (generally customer owned) and splicing chambers. These are the point assets that connect linear duct assets that are part of an underground electrical distribution system. Kinectrics' Asset Useful Life study places the asset life at 50-80 years and ENWIN expects these assets to last 50 years. ENWIN does not have records of installation of these assets. The City of Windsor uses more salt per km of roadway than other municipalities and consequently, this salt percolates through pavement structures and to the manhole lids and chimneys and causes deterioration of roof slabs. ENWIN mitigates through inspection and maintenance of this critical infrastructure. The purpose of this program is to ensure the structural adequacy of these chambers to resist the loads placed upon them by traffic and overburden and to ensure they are kept in sufficient repair as to reduce the likelihood of cable damage and consequent risk of catastrophic failure resulting in significant, sustained customer outage. Manhole assets do not generally affect SAIDI and SAIFI reliability targets as described in section 5.2.3 and 5.3.3 with the exception that in the event of a failure, there would be a significant negative impact on reliability.

Condition of Assets

Information on the condition of the assets relative to the typical life-cycle and performance record of the assets targeted by the project

The Kinectrics Asset Condition Assessment reviewed 386 of 461 manholes for which data was available. Over 96 % of those assets were considered in good to very good condition. 14 manholes were rated in the fair/poor category and 1 manhole was rated in very poor condition and which was remediated with a new roof slab in 2017. Kinectrics' Flagged for Action (FFA) plan estimated an average of 42 units will need remediation each year for the period 2020 – 2024.

Project Impacts

• The number of customers in each customer class potentially affected by a failure of the assets included in the project o Quantitative customer impacts (e.g. frequency or duration of interruptions or number of customers affected) with associated risk level(s)
• Qualitative customer impacts (e.g. customer satisfaction, customer migration) with associated risk level(s)
• The value of customer impact (e.g. high, medium, low) considering the characteristics of customers potentially affected by asset failure and the cost of failure

The inspection and remediation work associated with this program will not normally affect customers as the work can typically be done with cables live in the manhole. Where work is substantial, a sub-structure is generally constructed of plywood to protect cables and other equipment from accidental damage that might occur should chunks of concrete fall. Manholes are typically constructed in roadways and work in the manholes will generally result in some traffic protection plans being implemented which will cause traffic delay inconveniences. Generally all the feeders serving the City core are built with underground cables that pass through manholes. Manholes also exist in other areas in the City where main trunk cables serve areas that were constructed with underground plant. It is difficult to quantify the number of customers affected, and the value of customer impact since there is no direct count of customers served by cables passing through manholes. However, there would be 10's of thousands of customers in this category and potentially affected by a manhole failure. Manhole failures are rare but create a situation which is difficult to mitigate as all power from all cables (feeders) which run through a manhole must be off in order to effect a repair of a manhole and any cables and splices therein. This means that associated outages would be widespread and would be very lengthy as first the manhole structure would require repair (with time for concrete to cure-days) and then cables running through the manhole would need to be repaired (days). As manholes serve the main commercial core of the City, any failure would result in a very significant commercial impact as well as an impact to residential customers.

Project Timing

Other factors that may affect the timing of the proposed project such as the pacing of investments and the priority relative to other projects

The timing of the remediation expenditures is proposed by the engineer that conducts the inspections. While repairs that are relatively minor may be deferred for a year or two, that deferral

brings inherent risk that the condition could deteriorate and require a more extensive and costly repair. The deferral of structural replacements is not recommended as it places additional risk and liability on the utility. Generally, the quantum of the costs for individual repairs is not material and deferrals provide little flexibility in the capital budgets.

O&M Cost Duplications

The consequences for system O&M costs, including the implications for system O&M of not implementing the project

There is little O&M expense associated with the operation and maintenance of the manholes other than the inspections themselves. Where appropriate, if repairs or replacements are not critical to perform in a short period of time, a recommendation for increased frequency of inspection is made in order to ensure that the condition requiring remediation does not deteriorate at a rate greater than expected.

Reliability / Safety

The impact on reliability and safety factors

The manhole sustainment program impacts safety and reliability as noted earlier in the Project Impacts section.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing alternatives to the timing of the proposed project, highlighting the trade-offs between rate of expenditure and mitigation of the consequences of asset performance deterioration. Where the ranking of the proposed project relative to the alternatives has been adjusted to account for significant benefits and costs, the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

The main benefits of this work is maintenance of safety for the public and employees, the maintenance of service reliability to customers and the avoidance of higher future costs including costs of liabilities related to catastrophic failure. The alternatives for manhole sustainment are repair or replace. Costs are minimized through the use of repairs to defer replacements and through competitive bids for the engineering and the repair work. The rate of expenditure for manhole sustainment will depend on the condition of the manholes. ENWIN is pursuing a regular inspection regimen for its manholes that will assist in ensuring that costs are relatively consistent. Prior to 2009, ENWIN did not have a regular inspection protocol but since that time, has “caught up” on manholes that were in poor condition and is operating in a relatively steady state.

Additional Factors

Where the proposed project is a ‘like for like’ renewal but has been configured at extra cost to address other distributor planning objectives, an analysis of project benefits and costs must be provided comparing a) a project configured solely to meet the requirement; b) the proposed project; and c) technically feasible alternatives to the proposed project that meet the same objectives as the proposed project. Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

There are no additional factors for consideration. Manhole sustainment expenditures are generally “like-for-like” replacements which restore original functionality and there are no other distribution planning objectives achieved through the expenditures.

A. General Information on the Project / Program

Investment Category	System Renewal

Project Name / Description

Submersible Transformer Sustainment Program

Estimated Cost	Gross $$690,000	Net $690,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	Varies – typically 12 to 16 customers per transformer
Load	Up to 100 kVA per transformer

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									NO SAFETY RELATED RISK IDENTIFIED
0.25	Reliability	Major	Likely	139	34.75	Minor	rare	3	0.75	CABLE FAILURES MEAN CUSTOMERS OUT > 8 HOURS
0.25	Financial	Moderate	Possible	34	8.5	Minor	rare	3	0.75	CUSTOMER COSTS $1K - $100K
0.2	Sustainability	Minor	Unlikely	6	1.2	Insignificant	rare	1	0.2	REPUTATION DAMAGE

The sustainment alternatives for transformers are to either proactively maintain and replace the transformers or run them to failure. Submersible transformers are generally used to serve residential customers. Due to high failure rates of submersible transformers it was decided to proactively replace submersible transformers with minipad transformers, where possible. To best serve customers, ENWIN proactively maintains and replaces submersible transformers in order to avoid an in-service failure. Should a submersible transformer fail in winter, there is a possibility that they may be frozen in place in an underground pit. This would then make their replacement extremely lengthy and having regard for the potential for significant inconvenience of customers, ENWIN has chosen a sustainment philosophy of proactive replacement.

Expenditure Information & Timing	ENWIN has budgeted $690,000 for submersible transformer replacements in 2020. An example project for 2020 is the replacement of submersible transformers in Polonia Park – a residential townhome subdivision in Windsor. The project will begin in early spring and extend until fall. Expenditures generally progress with 25% in Q2, 25% in Q3 and 50% in Q4.
REG Investment	Yes ☐ No ☒

Leave to Construct Approval	Yes ☐	No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for replacement of submersible transformers is to improve the reliability of service to customers served by these transformers, as noted in the description of ENWIN's Asset Management System in section 5.3.1. These transformers were at one time considered to be part of the residential underground transformer fleet – mostly minipad transformers. On-ground minipad transformer replacement philosophy is to "run-to-failure". However, the performance of the submersible transformers was so poor and the replacement so difficult that those transformers were separated into their own asset class in ENWIN's asset management planning and budgeting. This allowed separate budgeting for those transformers. ENWIN's experience with its submersible transformer fleet is that the units commonly fail in service prior to their expected useful life. In 2015 – 2017 there were 9, 7 and 7 in-service failures respectively of submersible transformers. This information as well as the condition inspections performed every 3 years inform the asset management process and the determination of which transformers are at end of life.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

ENWIN's philosophy for submersible transformers is to try to replace them with above-ground minipad transformers. Minipad transformers have fewer issues and are more easily and quickly replaced when they fail. The submersible transformers are at end of life and most were installed with non-tree retardant primary cable that is also at end-of-life. To replace a submersible transformer with a minipad transformer requires the replacement of the primary cable in order to maintain service to customers while the replacement transformer is being constructed. This means that submersible transformer replacements are done through a neighbourhood rather than individually. In some cases, customers that have submersible transformers on their front lawns object to having an on-ground transformer. In those cases, ENWIN tries to convince the customer that their electrical service will be more reliable however some customers strongly object. In those cases, ENWIN will perform a like-for-like submersible transformer replacement. When a submersible transformer is replaced like-for-like the new transformer is ordered with a stainless steel tank. The original submersible transformers were purchased with carbon steel tanks and those tanks are suffering severe corrosion and in some cases have had the shell penetrated by that corrosion. Prior to beginning construction in a neighbourhood, ENWIN provides notices of the construction to all affected homeowners and holds a public meeting where staff explain the project and its merits.

(c) Priority

Indicate the priority of the investment relative to others, giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

The priority of this program is high. Submersible Transformer sustainment is ranked 23rd of 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. Despite that ENWIN has been proactively replacing these transformers for a number of years, the submersible fleet continues to suffer a high rate of in-service failures as noted above in the Main Drivers section. As well, ENWIN receives written complaints from time to time regarding the reliability of service from customers in areas served

by submersible transformers.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

Where ENWIN replaces submersible transformers with minipad transformers a more efficient and cost effective distribution system is created. Minipad transformers are much more easily and quickly inspected, maintained and replaced when necessary than their submersible counterparts. ENWIN eliminates the need to maintain the "croc" in which the submersible transformers sit and the lids that cover them. As well, minipad transformers are less expensive than submersible transformers, although the cost of the installation makes the project more expensive than simply replacing the submersible transformers like-for-like. As well, generally, the HV cable is also replaced at the same time as the transformers and customers then have a newer, more reliable and more resilient electrical service. Submersible transformers were installed in a period when the HV cable was direct-buried and likely to be non-tree retardant. This means that the cable is typically at end of life when the transformers are at end of life. Where possible, ENWIN tries to create a project replacement where both HV cable and submersible transformers are replaced at the same time. Where possible, submersible transformers are replaced with above-ground minipad transformers. This makes future replacements much simpler, faster and less costly. The cost for a minipad replacement with HV cable in duct is more expensive than a simple like-for-like submersible replacement. Where customers object to an above ground transformer, ENWIN will replace the submersible with another submersible to accommodate customer's wishes. The cost to replace a submersible with a minipad, assuming HV cable splicing to the new transformer and service splicing as well, is $23,000 while a submersible to submersible replacement is $10,000. The cost of the submersible transformer alone is $6,000 while the cost of the minipad transformer alone is $3,400. If a complete new ducted HV cable is required, that cost is considered separately.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

The benefits that Customers will obtain from the submersible transformer sustainment program is an increase in reliability of their electrical service. As well, long-term costs will be lower. Some customers may not like the aesthetic look of above-ground minipad transformers that are used elsewhere in the City if they are accustomed to below grade infrastructure however ENWIN tries to accommodate these customer's wishes into the designs. Trip hazards that are presented by the submersible transformers are eliminated.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

Reliability will increase to the same levels as for other residential and small commercial customers. Currently, customers served by submersible transformers experience a lower level of reliability than enjoyed by customers served by minipad transformers.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

ENWIN has considered run-to-failure, proactive like-for-like replacement and proactive replacement with minipad transformers to address the end-of-life failures of the submersible transformers. Run-to-failure was problematic as the failure of the transformer could be during winter and the transformer could be locked in ice and difficult to extract and replace. It could also be during wet weather when the chamber in which the transformer sits is filled with water and makes removal and replacement difficult. As well, one of the failure modes of submersible transformers with carbon steel tanks was

the rusting through of the tank with loss of transformer oil. When this occurs, a clean-up must be performed before the new transformer is placed and this can result in extremely long outage times for the customers served by that transformer. Like-for-like replacement was considered and is undertaken if a minipad transformer cannot be placed. While this proactive option mitigates environmental issues and issues with the time of year which can make replacement more difficult and outage times longer, it does not solve long-term issues with future replacement and issues with ad-hoc failures during times of the year when replacement is made more difficult. As well, despite the transformers being "submersible", when the chambers housing the transformers are filled with water, the connections are not always fully waterproof and nor do they stay waterproof for 30+ years in service. This can cause issues with the customer's power quality and when transformer chambers have been full of water, it is not uncommon to find the water boiling. Additionally, submersible transformers are difficult for staff to work on. To reach the connections on the transformer, staff need to lay on the ground beside the transformer and reach down inside the chamber to access the connections. Many of these installations were constructed with tight clearances making work more difficult and time consuming. The preferred alternative for the reasons mentioned was the proactive replacement of submersible transformers with minipad transformers.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

The chambers in which submersible transformers sit often rise out of the ground slightly or the ground settles slightly around them.

This can result in a tripping hazard for people walking nearby. As well, a minipad transformer is safer for ENWIN employees to work on and more quickly and easily inspected and replaced in the future.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are no cyber security nor privacy issues associated with this program.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

Submersible transformer replacements are usually done in conjunction with end-of-life replacement of direct buried, non-tree retardant cable. This leaves customers with a relatively robust electrical distribution system. This work is generally not done in coordination with other utilities, regional planning and does not link to 3rd party providers nor industry. There are no future technological functionality issues addressed by these replacements. Replacements with minipad transformers

addresses operational requirements while like-for-like replacements do not, but are a compromise which respects customer desires where customers express them.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

The proactive replacement of end-of-life submersible transformers is intended to preclude the rusting through of the carbon steel tank in the original submersibles and hence reduce the risk of oil leaking into the environment. As well, replacement minipad transformers are easier to inspect for corrosion and replacement stainless steel tank submersible transformers are less likely to corrode than their carbon steel counterparts.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

Incremental conservation initiatives to defer or avoid submersible transformer replacements are not applicable. Conservation and demand management measures have reduced system loading in general however the reduction in loading has not been sufficient to install smaller capacity transformers nor fewer of them. As well, individual services are run to the transformer location and it would be difficult to eliminate a transformer as the services that are supplied by that transformer would need to be extended to a transformer in a different location. Some such runs may be too long and suffer too high a voltage drop.

C. Category-Specific Requirements

System renewal – projects/programs in this category are driven by the relationship between the ability of an asset or asset system to continue to perform at an acceptable standard on a predictable basis and the consequences for customers served by the asset(s) of a deterioration of this ability (i.e. failure). A distributor's discretion over the timing and priority of projects in this category may lessen over time, such as where assets with high consequence of failure are consistently operating outside applicable operating limits. On the other hand, a distributor may have considerable discretion over timing and priority where deteriorating asset condition has little or no impact on performance and the consequences of an asset failure on customers and the system are relatively low.

A distributor's justification of each sustainment project/program must discuss these issues including (where applicable) but not restricted to:

Asset Performance-Related Targets

A description of the relationship between the characteristics of the assets targeted by a project and the consequences of asset performance deterioration or failure, referring to:

- The distributor's asset performance-related operational targets and asset lifecycle optimization policies and practices (i.e. filings in relation to sections 5.2.3 and 5.3.3)

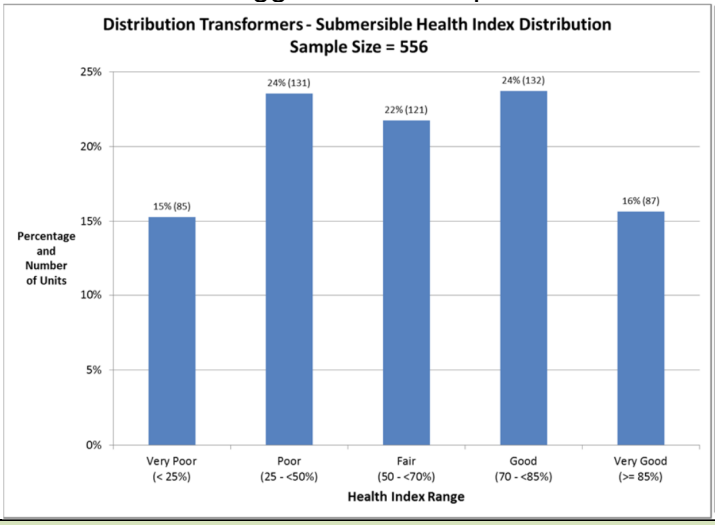
Kinectrics OEB Asset Useful Life study puts the average life of a submersible transformer at 35 years which is the value ENWIN sets for its depreciation of this asset. In 2016, ENWIN replaced 10 submersible transformers on a planned basis and 7 on an unplanned basis. In 2017, ENWIN replaced 9 transformers on a planned basis and 7 on an unplanned basis. ENWIN's goal is that submersible transformers be replaced on a planned, rather than emergent basis. Given the performance of the assets, ENWIN increased its capital budget for submersible transformer replacements from $220,000/year to $460,000 in 2018. Further in-service failures in 2018, including failures on recent like-for-like submersible replacements, and Kinectrics' flagged for action plan, caused ENWIN to increase its 2019 and beyond budget to $690,000 in order to try to get ahead of the in-service failures. ENWIN has targets for SAIFI and SAIDI as outlined in section 5.2.3. In-service failures of transformers can put significant pressure on the achievement of those targets. With an in-service failure, customers will be out of power for a significant amount of time, typically 8-12 hours. Where the transformer replacement is planned, that outage time will typically drop to about 15 minutes for the splicing of the customer's service over to the new transformer.

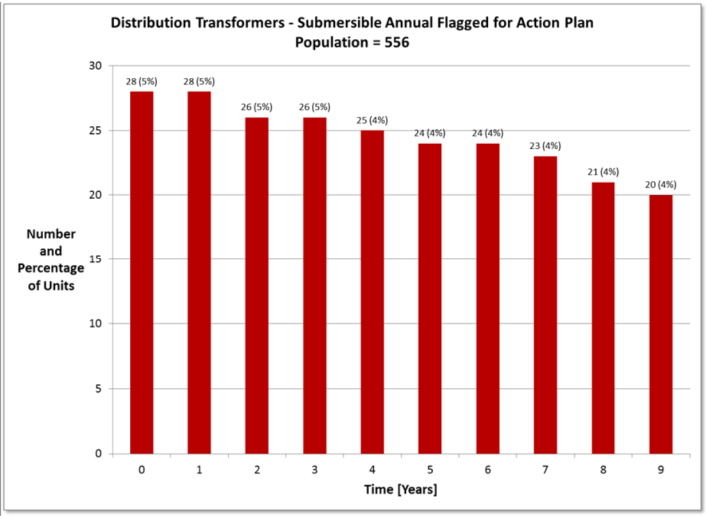
Condition of Assets

Information on the condition of the assets relative to the typical life-cycle and performance record of the assets targeted by the project

The Kinectrics Asset Condition Assessment study identified that 61% of submersible transformers were in fair to very poor condition. Kinectrics suggests that an average of 26 units per year be

included in the flagged for action plan.





Project Impacts

• The number of customers in each customer class potentially affected by a failure of the assets included in the project o Quantitative customer impacts (e.g. frequency or duration of interruptions or number of customers affected) with associated risk level(s)
• Qualitative customer impacts (e.g. customer satisfaction, customer migration) with associated risk level(s)
• The value of customer impact (e.g. high, medium, low) considering the characteristics of customers potentially affected by asset failure and the cost of failure

Unplanned interruptions will generally result in a feeder momentary interruption followed by a longer interruption of all customers on a fused branch. That outage might take 1-2 hours or more, depending on time of day, to call-in/dispatch crews, troubleshoot and disconnect the offending transformer. Thereafter, an additional 8-12 hours or more, depending on conditions, may be required to remove and replace the transformer and reconnect the services. Where a project is planned there is usually a single outage to remove the services, splice them to a new lead and then connect that to the new transformer. A consequence of replacement of submersible transformers with minipad transformers is that it will need to be done on an area basis rather than by single transformers because of the need to replace the primary cable as well. This results in some transformers being replaced before they have reached end-of-life. The cost of this is mitigated by putting those transformers back into inventory for re-use elsewhere in the system, provided they are of the new stainless steel type. Each transformer is typically connected to 12-16 customers who would be affected by a transformer failure. Other transformers may be affected as well, if they are connected through a radial HV cable branch which needs to be interrupted in order to replace the failed transformer. Submersible transformer failures typically occur suddenly and there is no means by which to repair the transformer and service restoration requires replacement of the device. Customers facing a long outage for transformer replacement are generally upset with the length of time it takes to effect the replacement and get them back in service. Because of the length of time associated with service restoration, in-service failure of a submersible transformer has a high impact on the customers directly affected by the failure however, from the perspective of the entire distribution system and that submersible transformers generally supply only residential customers, for purposes of prioritizing the projects in PROSORT, the consequences of failure have been identified as “minor”.

Project Timing

Other factors that may affect the timing of the proposed project such as the pacing of investments and the priority relative to other projects

The replacement of submersible transformers has a high priority for ENWIN because of the poor performance of the assets, repeated and excessive levels of in-service failures and complaints about the poor level of reliability that have been received by Customers served by these transformers. In early 2018 ENWIN received a complaint from a resident in a neighbourhood that was served by submersible transformers. There had been 12 defective transformer replacements in her

neighbourhood in the last 5 years including some more than once. There is a high water table in this area and submersible transformers were often submerged in water and were failing early because of this. This area was on ENWIN's list for replacement but not in 2018. Because of the complaints from customers, that were justified because of the poor reliability in this neighbourhood, ENWIN adjusted its plans and re-built the neighbourhood electrical supply with minipad transformers. Other factors affecting timing of replacement projects may be related to whether or not there are any City roadwork projects planned or more recently, whether there are any fibre-to-the-home projects planned for the area by communications services providers which might conflict with the proposed construction. As noted earlier, these projects have a relatively high priority with a PROSORT priority of 23rd out of a possible 62 project investments. This was determined on the basis of a single transformer replacement for $23,000 and considers separately the priority for underground cable replacement.

O&M Cost Duplications

The consequences for system O&M costs, including the implications for system O&M of not implementing the project

Where minipad transformers replace submersible transformers there is generally a reduction in O&M costs. This is because minipad transformers are much more easily inspected and generally do not require remedial actions. Submersible transformers however require a lid to be opened to inspect the transformer and often included pumping water out of the chamber. There is also lid maintenance and painting to be done periodically. Often these transformer chambers end up in driveways and additional problems and concerns are brought to ENWIN's attention by the homeowners. For like-for-like replacements, there is no reduction in O&M costs.

Reliability / Safety

The impact on reliability and safety factors

Submersible transformers have an adverse effect on both reliability and safety as note earlier in the sections entitled Impact on Reliability, Alternatives Considered and Safety.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing alternatives to the timing of the proposed project, highlighting the trade-offs between rate of expenditure and mitigation of the consequences of asset performance deterioration. Where the ranking of the proposed project relative to the alternatives has been adjusted to account for significant benefits and costs, the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

The main benefits for this investment is the improvement in reliability that customers will experience as well as the improvement in safety that customers and employees will see. Reliability improvements will be significant for those customers served from submersible transformers. The costs associated with replacement of the transformers is $23,000 for a minipad replacement and $10,000 for a submersible replacement. In the determination of the risk-benefit score in the PROSORT ranking, the avoidance of in-service failures contributed to the benefits of the project as well as the opportunity to undertake related projects (HV cable replacement). The risk-benefit score was also determined on the basis of a single transformer replacement, independent of any cable replacement work. The incremental cost to install the minipad transformer is judged worthwhile as it brings the supply of power to current standards, provides improved service to customers and reduces long-term costs.

Additional Factors

Where the proposed project is a 'like for like' renewal but has been configured at extra cost to address other distributor planning objectives, an analysis of project benefits and costs must be provided comparing a) a project configured solely to meet the requirement; b) the proposed project; and c) technically feasible alternatives to the proposed project that meet the same objectives as the proposed project. Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

Despite the benefits of minipad transformers over submersible transformers, some customers are adamant that they do not want an above-ground green box on their lawns. While ENWIN could choose to ignore those customers and place the transformers on public ROW however, ENWIN tries to consider the stated preferences of its Customers and will accommodate such requests if possible. In 2016, 10 submersible transformers were replaced and two of the 10 were with like-for-like submersible transformers. Similarly in 2017, 9 planned replacements were undertaken and two of the 9 were with new stainless steel tank submersibles.

A. General Information on the Project / Program			
Investment Category			System Access
Project Name / Description			
New Customer Connections			
Estimated Cost	Gross $ N/A	Net$1,477,500	Change in O&M $121/year/customer

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	Approximately 600 new customer connections
Load	3 MW
Risks and Risk Mitigation	There are no explicit risks associated with this investment.

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment

Expenditure Information & Timing	New customer connections include costs for subdivision distribution infrastructure, new services and new meters. As well, this investment category includes expenditures for new commercial customers. Expenditures are net of customer contributions and will occur evenly throughout the year. Historical expenditures are shown in Appendix 2-AA. As well, the number of connections rose steadily from a low in 2009 to a high of 670 connections in 2016. Thereafter, the number of connections has dropped each year. Expenditures are variable depending on the nature of the customers connecting in any given year as that affects the relative contribution to the connection that is provided by the customer. Additionally, the provincial government has cancelled the FIT and mFIT programs which will result in fewer connections. Expenditures are estimated in consideration of the forecast number of customer connections for the following year(s). Forecasts are for costs net of customer contributions and are based on history and the current trend in customer connections. The amount of customer contribution to any particular connection varies greatly and consequently, a gross expenditure is not provided. ENWIN does not track incremental System O&M costs against the number of customer connections however, the System O&M costs divided by the number of customers served by the distribution system is $121/customer/year, which is used as the proxy for change in O&M costs noted above.

REG Investment	Yes ☐	No ☒
Leave to Construct Approval	Yes ☐	No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this investment is the state of the local economy which drives new building construction and the demand for new connections, as noted in the description of ENWIN's Asset Management System in section 5.3.1,. Secondary drivers have been the propensity for apartment owners to change from bulk billed to individually metered units, which increases the number of customers connected to ENWIN plant. ENWIN considers new customer connections to be a mandatory element of its distribution license. The performance objectives related to these connections is that they be completed in compliance with the section 7.2.1 of the Distribution System Code which specifies that new services must be connected within 5 days from the date on which all requirements have been met. In 2018 ENWIN filed a report stating that all services were connected within this time frame. Where customers request a connection, ENWIN performs an economic evaluation per Appendix B of the Distribution System Code and charges the customer for connections based on that evaluation. This gives rise to the variability of the amount of the customer contribution as between differing connections, hence, ENWIN forecasts based on net investment amounts.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

Subdivision distribution plant is designed according to ENWIN's design criteria and to ensure that there are at least two supplies into a given area so that in the event of a loss of supply, the customers in that area can be served by an alternate supply. The investment that ENWIN makes in a subdivision or to connect any customer is determined by its economic model as noted in the section above. ENWIN performs system simulations and system planning at the level of the supply stations and feeders. This planning informs the remaining capacity to connect load and generation on each feeder. Where very large loads or generators are requesting to connect, ENWIN will simulate the effect of the connection on the distribution system and other customers and determine whether there are any conditions to be satisfied to effect the connection. Where load, generation or contingency situations develop over time, plans to accommodate those situations are developed as System Service (enhancement) developments. Where a single large connection gives rise to breeches of ENWIN's system design criteria then the proponent of the connection will have costs of remediation assessed against that connection.

(c) Priority

Indicate the priority of the investment relative to others, giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

New customer connections are assigned a top priority amongst investment alternatives. ENWIN's distribution license requires it to connect new customers that meet criteria for connection.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

The scheduling of expenditures is driven by the needs of the customers. ENWIN allows subdivision developers to design and construct the distribution infrastructure according to ENWIN criteria. ENWIN supplies up to a 3MVA transformer for commercial customers. Customers with larger demands provide their own transformation. At current rates, the amount that ENWIN is able to invest

in a subdivision development with single detached homes using an average of 8,320 kWh/year is $1,910. This investment includes the service, meter, transformation, HV cabling and any switches required for the subdivision. This amount is insufficient to construct the subdivision electrical supply so the balance is provided by the subdivision developer. In practise at ENWIN, subdivision developers generally always choose to construct the infrastructure as contestable work.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

New customer connections are designed according to standards which ensure their cost effectiveness and efficiency. Where line extensions and connections need to be upsized more than is required to serve the connecting customer(s), for the benefit of other customers served by the distribution system, ENWIN charges the customer for only the costs needed to serve that customer and charges the balance of the costs as a system enhancement. Where the upsizing is required for future customers and not other distribution system customers, ENWIN tracks the customer's investment for the customer connection horizon provided in the Distribution System Code (DSC) and rebates the contributing Customer an amount determined in accordance with the DSC.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

Customers benefit from the provision of power. A secondary benefit is that as customers are added to the distribution system, ENWIN's cost of providing and maintaining the distribution system per customer is lowered slightly.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

The connection is designed and constructed according to standards which ensure that customers will have a reliable service and frequency and duration of outages is minimized.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

Servicing design alternatives are discussed with customers so that, within the boundaries of good utility practise, the customer can select the servicing option which provides his best service option. This is not necessarily the lowest cost option as the customer will balance his own costs for secondary service lengths, aesthetics, value of the property, expansion plans, etc. to make his optimum decision.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

Design and construction of the new plant is done according to standards which ensures safety. ENWIN reviews generator connections to ensure that any fault current contribution from the generator is within acceptable limits.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

ENWIN's design standards and practises ensure cyber security and customer privacy. Where customers such as generators require ENWIN to be able to monitor and/or control those generators, standard designs ensure cyber security for both ENWIN and the customer. ENWIN is currently evaluating its compliance with the OEB's framework on cyber security. General Plant investment plans, rather than System Access investment plans, include amounts to both achieve and maintain compliance with that framework. Additionally, ENWIN has appointed a senior member of staff to be the Privacy Officer for the company with responsibilities to ensure ENWIN is compliant with all privacy legislation.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or

industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

Generally, most connections do not require coordination with other utilities or regional planning. Loads that are large or situated along service territory borders may be exceptions. In the past, ENWIN has served customers in Hydro One territory that were adjacent to ENWIN plant and distant from Hydro One plant.

New customer connections generally do not enable any future technological functionality and do not address any future operational requirements.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

There are generally no environmental benefits associated with serving new customers.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

Not Applicable.

C. Category-Specific Requirements

System access – projects/programs in this category are driven by statutory, regulatory or other obligations on the part of the distributor to provide customers with access to its distribution system. Most frequently, investments relate to requests by customers for connections or connection modifications, but also include requests from municipal authorities for a distributor to relocate system assets in order to accommodate infrastructure development or modifications. Consequently, investment budgets for this category can vary from one DSP to the next DSP depending on business conditions. In the event that the project involves replacing a distributor's system assets, there may also be asset life-cycle related considerations to the extent that infrastructure is taken out of service prior to the end of its service life and new infrastructure is commissioned. Information on these issues should therefore be included in a distributor's justification of a project/program in this category, including (where applicable) but not restricted to:

Type	Roadwork ☐	Customer Connections ☒	Regulatory ☐	Other ☐

Timing / Priority

Factors affecting the timing/priority of implementing the project

The timing of servicing for new customers is dependent upon the requirements of the customer. Customer connections are always given top priority by ENWIN.

Customer Preferences

Factors relating to customer preferences or input from customers and other third parties

As noted above, ENWIN works with the customer to identify any alternative servicing schemes and allows the customer to choose the solution that is optimal for the customer. In many cases, this is not the least cost alternative.

Cost Control

- Factors affecting the final cost of the project
- How controllable costs have been minimized

Many factors affect the cost of servicing a customer. For residential subdivision development, most developers choose to design and construct the distribution plant, providing a natural means of controlling costs. Where ENWIN constructs the new connection, ENWIN provides the customer with both a fixed price proposal and a variable price proposal (pay true-up). In the fixed price alternative, ENWIN is incented to provide the service at the agreed upon price or otherwise ENWIN is unable to recover the difference from the customer. In the variable price situation ENWIN is incented to construct the connection within the price provided by the customer or will explain reasons for overruns. ENWIN is incented to avoid cost overruns in order to maintain its reputation in the community.

Controllable costs for new customer connections have been minimized first through facilitation of subdivision developers undertaking as much contestable work as possible. In addition to that, materials that ENWIN supplies are obtained through a competitive tender process and in conjunction with buying groups of which ENWIN is a part, such as the GridSmart City utility cooperative. As well,

ENWIN's internal labour rates have been reviewed against other utilities in Ontario and are competitive.

Planning Objectives

Whether other planning objectives are met by the project or have intentionally been combined into the project and if so, which objectives and why

Generally other planning objectives are not built into a customer connection project. In the event other planning objectives are incorporated into the connection project, ENWIN will manage the incremental costs as per "Cost Effectiveness" above.

Alternative Options

- Whether other project design and/or implementation options were considered and if not, why not
- Where such options were considered and project decision support tools and methods described in response to section 5.4.1 were used to help identify the proposed option, distributors must provide a summary of the results of the analysis, including where applicable:

The least cost option: a comparison of the life cycle cost of all options considered (including the proposed project) – over the service life of the proposed project

- The cost efficient option: a comparison of net project benefits and costs over the service life of the proposed project including:
  - A project configured solely to meet the obligation
  - The proposed project and other options to the proposed project that meet the same objectives

Where appropriate, ENWIN offers the customer alternatives as per "Alternatives Considered" above. ENWIN identifies the least cost option to serve a customer. Where a customer chooses to be served by a higher cost option, the difference between the least cost option and the chosen option is charged as a contribution to the connecting customer. The amount of the investment by ENWIN into the connection is determined by ENWIN using the economic model. The capital investment used in the economic model is the least cost capital investment. Where the customer's load is insufficient to support the minimum investment needed to connect the customer, then the difference determined by the economic model is charged to the customer along with any difference between the customer's preferred service option and the least cost service option.

Economic Evaluation

Where applicable, the results of the final economic evaluation carried out as per section 3.2 of the DSC

ENWIN determines the costs for customer connections and then evaluates the costs and loads through its economic model as per section 3.2 of the DSC.

REG Investment System Impacts

Where applicable (e.g. REG investment), information on the nature and magnitude of the system impacts of the project, the costs of any system modifications required to accommodate these impacts and the means by which these costs are to be recovered

To date, ENWIN has not needed any REG investments to connect its generator customers. This is due to the fact that to a large extent, ENWIN's distribution system is built out to most customers that would consider generation and those customers are already served, load customers. ENWIN does not contemplate any REG investments associated with customer connections. Should an REG investment materialize, ENWIN will follow the rules for connection as described in the Distribution System Code.

A. General Information on the Project / Program			
Investment Category			System Access
Project Name / Description			
Other System Access – City Roadwork Relocations, Wholesale Metering			
Estimated Cost	Gross $2,727,000	Net $2,727,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	Customer attachments are not relevant to this investment program
Load	Customer load is not relevant to this investment program
Risks and Risk Mitigation	The quantum of the investment is subject to change due to changes in the City's portfolio of roadwork plans. Changes are equally likely to increase or decrease the quantum of investment. ENWIN attends the City's utility coordinating committee meetings and tries to impress upon the City the importance of good planning and commitment to early commitment to projects. Regardless, City plans change even within the year in which they are planned to be completed. City Councillors have some discretion regarding projects in their wards which can vary, add or subtract, quickly depending upon the Councillor and what they are hearing from their constituents. As well, the City plans projects without having all land issues settled and if they encounter resistant landowners may defer a project at last minute in order to secure property for expansion through expropriation. That process is unpredictable and upon resolution could put a project back on the schedule that was not necessarily planned for a specific year.

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment

Expenditure Information & Timing	This program description is inclusive of general Systems Access projects excluding the connection of new customers. It includes road widening works, wholesale and MIST metering mandated by the IESO and the OEB respectively. The City road widening expenditure is for a specific project (Riverside Vista project) and for other unforeseen projects. The unforeseen projects are budgeted based on historical expenditure levels as described in 5.4.3.1 (a) Capital Expenditure by Category. Where specific projects such as the Gordie Howe International Bridge project are 100% reimbursed by the project, those amounts are not included in the budgeted net expenditure line. City road projects are subject to a capital

	contribution in accordance with the Public Services on Highways Act which provides for a 50% labour and labour saving device contribution from the City. City roadwork and other Systems Access projects may be undertaken throughout the year and are expected to be evenly spread at 25%/quarter. This investment also includes a $477,000 investment for compliance with IESO Chapter 6 Wholesale Metering rules. This project relates to the wholesale metering at the Keith TS. Compliance with these rules for the Keith TS wholesale meters has been deferred for a number of years because the feeder egress' from the Keith TS were needing to be rebuilt because of the Gordie Howe International Bridge being built adjacent to the station. It is expected that relocation work will be completed in 2019 and the meters replaced in early 2020.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main drivers for these investments are compliance with regulations – the Public Services on Highways Act and the IESO Chapter 6 Wholesale Metering Market Rules, as noted in the description of ENWIN's Asset Management System in section 5.3.1. There are no secondary drivers for these investments.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

ENWIN reviews each request for relocation to ensure that the line will continue to be needed and needed in the current location. ENWIN also reviews its future plans to ensure that if an upgrade is warranted for the future, that the relocated line is designed and built for that upgrade. In many cases, ENWIN has identified areas where line upgrades are desired. This list is reviewed and the upgrade work is often deferred until such time as a road widening or a replacement due to condition provides a additional driver for the work.

(c) Priority

Indicate the priority of the investment relative to others, giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

Relocation and compliance work is given top priority as typically ENWIN has an obligation to meet the request. In the case of the IESO compliance rules, each year that the obligation existed and the bridge was not yet constructed, ENWIN applied to the IESO for a variance so that the work could be deferred until the station reconstruction was completed. This was permitted and saved investing in a compliance item that would ultimately need to be replaced when the construction was completed. Since System Access projects are considered mandatory obligations of the utility, these projects are not evaluated in the PROSORT ranking program. Rather, these projects are assigned a PROSORT priority of "1" and are at the top of the project list. There is generally no need to prioritize within the group as there is sufficient resources to meet all such obligations.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

As noted above, ENWIN reviews requests for relocation with a view to confirming need for the plant and the optimum relocation strategy. Subsidies are prescribed by statute however in the case of the Gordie Howe International Bridge construction, a 100% subsidy was able to be obtained. Relocation projects are reviewed from a technical perspective to determine the least cost option for maintaining service to customers during and post construction. Where the requesting authority asks for a higher cost relocation for other reasons, such as aesthetic reasons, then ENWIN negotiates with the requester to have the requester pay the difference between the least cost alternative and the desired alternative. Where the project is conceived as part of a means to effect compliance to a request from a regulating authority, ENWIN seeks the least cost alternative to facilitate that compliance. ENWIN works with requesting authorities to determine the optimal design, schedule, funding and ownership options.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

ENWIN tries to optimize the cost effectiveness of the investments. Since the investments are not strictly driven by ENWIN's needs, there may not be opportunities to be optimally cost effective however through negotiation and forward planning ENWIN is able to minimize stranded investments and minimize costs for compliance. ENWIN seeks the least cost alternatives that provide for the same level of efficiency of operation of the distribution system as currently exists prior to the request so that ENWIN is in the same operational condition after the relocation as before it. In the case of relocation of plant, ENWIN generally has to install new plant in the new location then remove the existing plant in order to maintain service to customers. While ENWIN ends up with new plant that is partially subsidized by the requester, generally ENWIN loses the residual value of the existing plant if it is close to end of life. Poles are generally not recoverable in a useful form. Where transformers are in usable condition they will be returned to service.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

Customers do benefit where relocation of plant is for plant that is near end of life. In cases where the 50% labour subsidy provided by the City exceeds the stranded investment amount, then assets are replaced at a net lower cost than had they been replaced at full cost a short time later.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

Generally, relocated plant is newer than the plant it replaces and as such is more reliable than aging plant.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

As noted above, ENWIN searches for acceptable alternatives when plant requires relocation due to road work. These can include elimination of the plant, replacement in the new location, replacement in an alternate location, upsizing or downsizing and deferment.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

As with reliability, relocated plant is newer than the plant it replaces and will provide a slightly safer system than the older plant it replaces. Relocation does present the opportunity to choose a plant location that may be more protected from traffic risks. New plant will generally not suffer from undiscovered deterioration as might older plant and hence it may be likely to be somewhat safer and more reliable than older plant. In general, while older plant will naturally have a higher risk profile, it should not be unsafe. New plant will have a naturally lower risk profile.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are generally no cyber security or privacy issues with utility relocations.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

Utility relocations are generally coordinated with the City and with other utilities however it would be rare that a regional planning discussion would occur. The plant in a new location would typically be like for like and there would be no future functionality or operational improvements provided unless that was part of the future plans for the lines on the widened section of roadway.

Generally, the relocated plant will not have potential to enable future technological functionality but as noted above, may be designed for future operational requirements.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

Not applicable: there are typically few environmental benefits associated with a line relocation.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

Not applicable.

C. Category-Specific Requirements

System access – projects/programs in this category are driven by statutory, regulatory or other obligations on the part of the distributor to provide customers with access to its distribution system. Most frequently, investments relate to requests by customers for connections or connection modifications, but also include requests from municipal authorities for a distributor to relocate system assets in order to accommodate infrastructure development or modifications. Consequently, investment budgets for this category can vary from one DSP to the next DSP depending on business conditions. In the event that the project involves replacing a distributor's system assets, there may also be asset life-cycle related considerations to the extent that infrastructure is taken out of service prior to the end of its service life and new infrastructure is commissioned. Information on these issues should therefore be included in a distributor's justification of a project/program in this category, including (where applicable) but not restricted to:

Type	Roadwork ☒	Customer Connections ☐	Regulatory ☒	Other ☐

Timing / Priority

Factors affecting the timing/priority of implementing the project

The timing of line relocation or regulatory compliance work is generally dictated by others that initiate the work. As ENWIN has an obligation associated with its distribution license for these relocations, the work is considered top priority.

Customer Preferences

Factors relating to customer preferences or input from customers and other third parties

Where relocation work is performed on a roadway where there are abutting customers, the line will typically be moved closer to those customers. Generally, lines are maintained on existing customer frontages so that a customer that does not have a pole prior to the relocation will not end up with a pole. Discussions are held with customers when there is some flexibility in terms of pole location within the property frontage, so that customer preferences for a location can be discerned and accommodated.

Cost Control

- Factors affecting the final cost of the project
- How controllable costs have been minimized

ENWIN meets frequently with overall project managers so that the progress of work can be managed in a manner that minimizes relocation costs. Factors that may affect the final cost of the project include delays in completing preparatory work by other contractors, constrained available property in which to relocate the plant, adverse weather, adverse traffic conditions, restrictions upon when work

can be undertaken, availability of clear running lines (underground plant), unforeseen underground conflicts, higher than anticipated contract costs, etc. Controllable costs are minimized through coordination and planning with design consultants and contractors and where work is contracted, through competitive process.
Planning Objectives Whether other planning objectives are met by the project or have intentionally been combined into the project and if so, which objectives and why
As noted above, where possible, ENWIN seeks opportunities to satisfy additional planning objectives when asked to relocate a line. These opportunities generally relate to upsizing or downsizing a line. Generally however, line relocations are simply to provide the same functionality as existed prior to the relocation.
Alternative Options • Whether other project design and/or implementation options were considered and if not, why not • Where such options were considered and project decision support tools and methods described in response to section 5.4.1 were used to help identify the proposed option, distributors must provide a summary of the results of the analysis, including where applicable: The least cost option: a comparison of the life cycle cost of all options considered (including the proposed project) – over the service life of the proposed project • The cost efficient option: a comparison of net project benefits and costs over the service life of the proposed project including: □ A project configured solely to meet the obligation □ The proposed project and other options to the proposed project that meet the same objectives
In general, where available and appropriate, ENWIN considers other project design or implementation options. Any options are specific to the individual project. As noted above, ENWIN considers alternative options which may satisfy other planning objectives as well, where possible.
Economic Evaluation Where applicable, the results of the final economic evaluation carried out as per section 3.2 of the DSC
An economic evaluation per section 3.2 of the DSC is not applicable to road relocations.
REG Investment System Impacts Where applicable (e.g. REG investment), information on the nature and magnitude of the system impacts of the project, the costs of any system modifications required to accommodate these impacts and the means by which these costs are to be recovered
Not applicable: Relocation and compliance work generally is not associated with REG investments.

A. General Information on the Project / Program

Investment Category	System Service

Project Name / Description

Conductor Upgrade Project – 23M2 LTP1

Estimated Cost	Gross $350,000	Net $350,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	N/A
Load	N/A

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									NO SAFETY ISSUES
0.25	Reliability	Catastrophic	Rare	51	12.75	Insignificant	Rare	1	0.25	REDUCES RISK OF INABILITY TO SERVE UPON STN LOSS
0.25	Financial	Major	Rare	19	4.75	Insignificant	Rare	1	0.25	REDUCES RISK OF CUSTOMER LOSSES/COSTS UPON STN LOSS
0.2	Sustainability	Moderate	Rare	7	1.4	Insignificant	Rare	1	0.2	REDUCES RISK TO REPUTATION

This project is part of a larger program intended to improve reliability for customers by creating high capacity feeders between Windsor's major supply stations. This section is part of the Malden TS to Crawford TS high capacity connection. The implementation of this high capacity connection requires the installation of new sections of 27.6kV lines and re-conductoring of existing sections along Matchette Road, between Armanda Street and Prince Road. It is planned to happen in conjunction with the replacement of poles at end of life.

Expenditure Information & Timing	ENWIN has budgeted $352,000 for the Conductor Upgrade Project – 23M2 LTP1. Expenditure will be $150k at end of Q2 and $200k at end of Q3.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance

targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this expenditure is to provide an improvement in reliability to ENWIN customers serviced from Crawford TS and Malden TS. This investment will create a high capacity feeder between the two stations with enough capacity to supply one of them in case of loss of the other. The feeder will be constructed with 795 MCM Al conductors and provides 900 A capacity between Crawford TS and Malden TS. Consequently, this feeder will provide an increased level of resilience and reliability to the ENWIN system, as noted in the description of ENWIN's Asset Management System in section 5.3.1. The secondary driver for this project is that the existing poles in this section of line are at end of life and will require replacement. Because the poles are at end of life, some replacement will be required. This project will provide a high capacity feeder replacement to an end of life pole line. This project was informed by a network analysis review of ENWIN's distribution system under various contingency situations. A secondary benefit the feeder may provide in the future is that it can be used to supply locations where electric vehicle charging loads exceed the capacity of a conventional feeder to supply. In that case, the high capacity feeder can be configured to serve part of that incremental load and thereby defer any costs to build new feeders or rebuild existing feeders. While this benefit may be realized in the future, no recognition of this potential future benefit was given in the prioritization of the project.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

The entire ENWIN distribution system is fed by eight transformer stations spread around the City. Given the number of stations, there is a reasonable probability of a given station being unavailable from time to time. Currently, ENWIN is unable to sustain the complete distribution system at peak times if there is a loss of one complete station. In reliability terms, this situation is often referred to as a "loss of critical unit" contingency. For that contingency, at peak times, ENWIN would be forced to institute a rolling blackout of certain sections of the distribution system. If the station is completely destroyed it may take months to rebuild it. It is judged that ENWIN's customers would suffer extreme consequences such as loss of production at commercial accounts, basement flooding due to loss of sump pumps, extreme heat due to lack of air conditioning, etc. This situation is judged to be not tolerable and is a contingency for which a remediation plan should be available.

The Feeder Reliability Improvement program was developed to address the issue of insufficient capacity to support a "loss of critical unit" type loss of one supply station to the Windsor distribution system. The program proposes to build a high capacity ring feeder between Windsor's major supply stations. The ring feeder would be capable of moving sufficient power in the case of a loss of any station so that all feeders would have sufficient supply during peak load times. The plan is to develop two high capacity feeders (using existing feeder trunks) emanating from either side of the station busses to connect adjacent stations. Thereby, the majority of the load can be transferred to adjacent stations through the high capacity line.

The high capacity feeders are proposed to be built as the opportunities to rebuild pre-identified sections of existing feeders arise. Those feeders would be built to a higher capacity standard than normal feeders and could carry the full peak load of one additional feeder or sections of three other feeders. The incremental cost to build high capacity sections with other end of life (EOL) replacement is only around 3% (primarily for material costs for larger conductors). The long term plan is to minimize costs by coordinating the implementation of high capacity feeders with other needs such as other proposed city widening projects, asset EOL replacement, existing conductor replacement and pole replacement projects.

There are additional reasons to construct a high capacity feeder ring around the City to supply transformer stations. This includes the following:

1) The possibility to perform load transfers on a long term basis without affecting distribution quality

and reliability;
2) High capacity feeders increase the reliability of adjacent feeders as they can accept up to three feeder sections of nearby feeders at any time; and
4) High capacity feeders will help future implementation of any self-healing network project by providing a stronger high capacity infrastructure to help with the reconfiguration of the network with fewer switching operations.

(c) Priority

Indicate the priority of the investment relative to others; giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

This project has been prioritized through the PROSORT project evaluation system, obtaining a CRBF rating of $15,338/rating point and is ranked 38th of 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. This project is a system enhancement that customers would find valuable.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

The alternative of like for like replacement was considered and rejected as it does not achieve the goal of addressing the issue of insufficient capacity to support a "loss of critical unit" type loss of one supply station to the Windsor distribution system. The alternative of doing nothing was considered and rejected due to the condition of existing poles and their required replacement. There are no opportunities for scheduling, funding or alternative ownership options for this project.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

The incremental cost to build high capacity sections with other end of life (EOL) replacement is approximately 3% (primarily for material costs for larger conductors). The long term plan is to minimize costs by coordinating the implementation of high capacity feeders with other needs such as proposed city road widening projects, asset EOL replacement, existing conductor replacement and pole replacement projects. When these sections have been built out, they will provide a cost effective means of improving system reliability for customers. Operational efficiency is also gained as when a need arises to move power from one feeder or station to another, that supply can be effected quickly and economically through an express feeder rather than needing to move power from one area to another through a large number of transfers – many of which may require manual switch operations.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

The implementation of the high capacity feeders program provides the following primary benefits to customers:
(1) In the event of total station failure the high capacity lines can provide support to the majority of the load from adjacent stations in minutes;
(2) Under storm recovery the availability of high capacity feeders will enable the re-routing of power enabling ENWIN to restore power to customers more quickly.
(3) This program will eliminate the lack of back up capability for some of feeders, especially on stations that are situated at the edge of the distribution system, such as Malden, Lauzon and Keith TS'; and
(4) This program will help future implementation of any self-healing network project by providing a stronger high capacity infrastructure to help with the reconfiguration of the network with fewer switching operations.

Note: This is a section of the line planned to be constructed between the stations. As this is only a section of the line, the benefits will not accrue until the balance of the line is constructed.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

This project will improve the statistical reliability performance of the grid as the number of customer hours of outages will be lower for outages where the connected stations are affected. It is not possible to estimate the numerical effect on reliability.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

The alternative of like for like replacement was considered and rejected as it does not achieve the goal of addressing the issue of insufficient capacity to support a "loss of critical unit" type loss of one supply station to the Windsor distribution system. Besides, the incremental cost to build high capacity sections with the end of life pole replacement is only around 3% (primarily for material costs for larger conductors). The coordination with the EOL replacement will improve reliability with minimum cost impact.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

Aside from general public safety associated with having things such as streetlights, traffic lights, telephone service working, there are few safety issues related to the electrical distribution plant that are improved as a result of this plan.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are no customer privacy, cyber security nor grid protection issues associated with this project.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

The high capacity feeders program facilitates the operation of the ENWIN grid but has little effect on the grid operations of those utilities outside ENWIN's territory. The investment does not require coordination with utilities, regional planning, 3rd party providers and/or industry. The investment does not enable future technological functionality however it does address future operational requirements as it provides increased flexibility of operations and increased capacity to deal with contingencies.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

The environmental benefits associated with this project are of a secondary nature. If there is a loss of one station and the transfer of supply of all customers to the other station saves basements from flooding then belongings will not be ruined and need to be sent to landfill.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:
- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

Not applicable; there are no conservation or demand management initiatives that are associated with this program.

C. Category-Specific Requirements

System service – projects/programs in this category are driven by the distributor's expectations that evolving customer use of the system may create system capacity constraints or otherwise adversely impact operations and the delivery of quality distribution services. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures. Information used by a distributor to justify projects/programs in this category should include, but need not be restricted to:

Benefits for Customers

An assessment of both the benefits of the project for customers based on achievement of the project objectives and the cost impact to customers of the Investment

The implementation of the high capacity feeders program provides the following primary benefits to customers:
(1) In the event of total station failure the high capacity lines can provide support to the majority of the load from adjacent stations in minutes;
(2) Under storm recovery the availability of high capacity feeders will enable the rerouting of power enabling ENWIN to restore power to customers quickly.
(3) This program will eliminate the lack of back up capability for some feeders, especially on stations that are situated at the edge of the distribution system, such as Malden, Lauzon and Keith TS'; and
(4) This program will help future implementation of any self-healing network project by providing a stronger high capacity infrastructure to help with the reconfiguration of the network with fewer switching operations.
There is no direct cost impact to the customers within the group and the costs of the investment are spread amongst all customers.

Regional Planning

Where applicable, information on regional electricity infrastructure requirements identified in a regional planning process that affected the initiation or final configuration of the project; and on the corresponding distribution of the benefits and responsibility for project costs

There are no requirements in the regional planning process associated with this program.

Advanced Technology

Description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

Advanced technology has not been incorporated into the project and cybersecurity and interoperability are not part of the considerations for this project.

Reliability, Safety, Efficiency

Identification of any reliability, efficiency, safety and coordination benefits or affects the project will have on the distributor's system

This project will improve the statistical reliability performance of grid as the number of customer hours of outage will be lower for outages where the connected stations are affected. The replacement of EOL poles with this project will also ensure the safety of the pole line into the future.

Timing / Priority Factors

Identification and explanation of the factors affecting implementation timing/priority

This project is part of an overall plan to implement high capacity feeders as the opportunities to rebuild pre-identified sections of existing feeders arise. This specific section has poles at end of life and the incremental cost to build a high capacity section is only around 3% (primarily for material costs for larger conductors) and is being coordinated and prioritized together with the EOL pole replacement in this feeder section. The ranking of the project in the PROSORT analysis did not include risk reduction points for the replacement of end of life assets.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing the proposed project to a) doing nothing and b) technically feasible alternatives to the proposed project considered that meet the same objectives as the proposed project.
Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, information should be provided that describes these qualitative factors in relation to the proposed project and all alternatives, including how these factors affected the selection of the proposed project.

The cost of this project is estimated at $350,000. The program will provide benefits to all ENWIN customers through the provision of connectivity to feed them from two stations. The alternative of like for like replacement was considered and rejected as it does not achieve the goal of addressing the issue of insufficient capacity to support a "loss of critical unit" type loss of one supply station to the Windsor distribution system. The alternative of doing nothing was considered and rejected due to the condition of existing poles and their required replacement. The technically feasible alternative of doing a like-for-like replacement of the pole line without increasing the conductor size was considered and rejected as the incremental cost for the additional conductor size is negligible in comparison to the overall project costs.

A. General Information on the Project / Program

Investment Category			System Service
Project Name / Description			
Feeder Reliability Improvement Project – 25M7 Feeder Ring Pilot Project			
Estimated Cost	Gross $380,000	Net $380,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	All customers fed from feeder 25M7 (approximately 4,900 customers)
Load	N/A

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									NO SAFETY ISSUES
0.25	Reliability	Minor	Possible	13	3.25	Insignificant	Possible	5	1.25	IMPROVE RESTORATION TIME FROM MINUTES TO SECONDS
0.25	Financial	Minor	Possible	13	3.25	Insignificant	Possible	5	1.25	MINOR INTERRUPTIONS ELIMINATED
0.2	Sustainability	Insignificant	Unlikely	2	0.4	Insignificant	Rare	1	0.2	UNLIKELY TO HAVE REPUTATIONAL RISK

This is a pilot project to assess the viability of the implementation and the performance of an automated feeder ring system. Feeder 25M7 has approximately 4,900 customers serviced by two open rings and operated from ENWIN's control center. It is also one of the worst performing ENWIN's feeders and has been considered ideal for this pilot project.

Expenditure Information & Timing	ENWIN has budgeted $380,000 for the 25M7 Feeder Ring Pilot Project. Expenditures will be $180k at end of Q2 and $200k at end of Q3.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this pilot project and expenditure is to assess the viability and performance of an automated ring and its expected positive impact in the reliability of one of the worst performing ENWIN's feeder. With the Implementation of this project, when a fault occur, only smaller feeder

sections will be automatically isolated by the protective devices and only customers within the faulted section will be impacted. By design, all the other sections of the feeder should operate without any interruption. Under this configuration customers will experience similar reliability and quality of supply independent of location along the feeder. This project was conceived and informed by ENWIN's analysis of feeder performance in which this feeder was perennially a worst performer, as noted in the description of ENWIN's Asset Management System in section 5.3.1,. The objective of the pilot project is to improve the feeder performance sufficiently so that the feeder falls out of the list of the worst 5 performing feeders. There are no secondary drivers for this project.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

Distribution feeders are usually fed radially from a transformer station. Under this configuration, any fault close to the station interrupts the entire feeder causing outages to all customers serviced from the feeder. This is an unavoidable situation in a typical radial configuration. On the other hand, if a feeder is configured as a closed ring, it is possible to isolate only the faulted section and restore the unaffected areas via the adjacent feeder sections. This way the rest of the feeder is not adversely impacted by faults not located in their section. After the first contingency, the system will automatically isolate the faulted section by opening the ring at one point and maintaining some sections radially fed until the restoration of the faulted section, all this without operator intervention and with restoration time of seconds.

(c) Priority

Indicate the priority of the investment relative to others; giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

This project has been prioritized through the PROSORT project evaluation system obtaining a CRBF rating of $29,921/rating point and is ranked 52nd of the 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

The alternative of doing nothing was considered and rejected as it does not achieve the goal of evaluating a technology that can reduce outage times for customers and consequently improve system reliability and reduce risks and costs for customers when an outage does occur. There are no opportunities for scheduling, funding or alternative ownership options for this project.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

Feeder 25M7 is one of the worst performing ENWIN's feeders. This particular project is a pilot that will require a $380,000 investment that will benefit approximately 4,900 customers. Besides evaluating the technology this pilot will make operation of the feeder more responsive as the switching and fault isolation will be done in a shorter span of time without human interference. That technology has the potential to make a significant improvement in reliability for ENWIN's customers. The 25M7 feeder is already configured as a ring around the north west end of the City and is a natural fit for this type of a pilot and hence is the most cost effective means by which this pilot can be effected.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

This project will benefit customers that are unaffected by a fault on the radial feeder, their section of the feeder will be able to be isolated automatically and then restored in a matter of seconds. This will mean that residential customers may avoid the costs associated with long outages such as basement flooding, loss of perishable foods as well as inconvenience. Apartment dwellers where there are elevators may not be able to enter or leave their homes depending on their mobility or may not be

able to get their cars in an out of an underground parking area. Commercial customers may not be able to complete transactions with their customers and may lose business, some customers may lose product that is in process of fulfillment, businesses may need to send staff home.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

This project shall substantially improve the statistical reliability and performance of the feeder as the number of customer hours of outage will be lower for outages where the connected sections are affected. However, it is a pilot project that is not possible to estimate the numerical effect on reliability but that will be closely monitored to assess the effectiveness of the technology for further implementation in other areas of poor performance of ENWIN's system.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

The alternative of doing nothing was considered and rejected as it does not achieve the goal of evaluating a technology that can reduce outage times for customers and consequently reduce risks and costs for customers when an outage does occur. A conventional approach to feeder segmentation was also considered and rejected as that will also not achieve the learning expected from the pilot. As well, the hardware needed to traditionally segment the feeder is the same as for developing the ring bus feeder architecture. The incremental cost will be the software and communications necessary to operate the system as a ring. There were no secondary drivers for this project.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

Aside from general public safety associated with having things such as streetlights, traffic lights, telephone service working, there are few safety issues related to the electrical distribution plant that are improved as a result of this plan.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

All automated switches proposed under this project will require communications in order to operate and that will be provided through a virtual private network (VPN) cellular service. The VPN service and the firewalls between it and the SCADA server as well as encryption protocols for communications provide a reasonable level of cyber security and grid protection so that unauthorized parties are not able to access it. The control boxes for the devices will be locked and inaccessible to the general public. There are no customer privacy nor cyber security issues related to customer information.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

The automated feeder ring facilitates the operation of the ENWIN grid but has little effect on the grid operations of those utilities outside ENWIN's territory. The investment does not require coordination with utilities, regional planning, 3rd party providers and/or industry. The automated operable switches provide immediate benefits to customers and are also part of a larger plan to make the grid "smart" at some point in time in the future. Part of ENWIN's vision for a smart grid includes remote sensing of grid conditions and rapid system reconfiguration. The rapid system reconfiguration will be undertaken by computer technology and will occur much quicker than can be accomplished by the human operator in the control room. This will reduce Customer's outage time to a few second from a few minutes.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

Not applicable. There are no environmental benefits associated with this project.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

There are no conservation or demand management initiatives that are associated with this program.

C. Category-Specific Requirements

System service – projects/programs in this category are driven by the distributor's expectations that evolving customer use of the system may create system capacity constraints or otherwise adversely impact operations and the delivery of quality distribution services. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures. Information used by a distributor to justify projects/programs in this category should include, but need not be restricted to:

Benefits for Customers

An assessment of both the benefits of the project for customers based on achievement of the project objectives and the cost impact to customers of the Investment

The largest benefit of this project is that for customers that are unaffected by a fault on the radial feeder, their section of the feeder will be able to be isolated and then restored via another automated switch in a matter of seconds. There is no direct cost impact to the customers within the group and the costs of the investment are spread amongst all customers.

Regional Planning

Where applicable, information on regional electricity infrastructure requirements identified in a regional planning process that affected the initiation or final configuration of the project; and on the corresponding distribution of the benefits and responsibility for project costs

There are no requirements in the regional planning process associated with this program.

Advanced Technology

Description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

This project will require equipment to communicate between devices in addition to the protective devices communication to the control room. ENWIN communicates to the unit via its SCADA system which uses common SCADA communications protocols (DNP3). ENWIN has also standardized on a battery back-up supply for the switch and its control panel such that a minimum of a 24 hour back-up supply is available so that in the event of a prolonged outage, ENWIN would still be able to remotely operate the switch

Reliability, Safety, Efficiency

Identification of any reliability, efficiency, safety and coordination benefits or affects the project will have on the distributor's system

This project will improve the statistical reliability performance of the feeder as the number of customer hours of outage will be lower for outages where the connected sections are affected.

Timing / Priority Factors

Identification and explanation of the factors affecting implementation timing/priority

This is a pilot project and first step of ENWIN's vision to make the grid "smart" at some point in time in the future. This vision includes remote sensing of grid conditions and rapid system reconfiguration. The rapid system reconfiguration will be undertaken by computer technology and will occur much quicker than can be accomplished by the human operator in the control room. This newer technology has promise to provide a step change improvement in reliability for ENWIN's customers but conventional technology was providing a step change improvement from the use of manually operated switches first. Consequently, the implementation of this technology was placed near the end of ENWIN's program to automate its grid as it was judged that it was better to deliver the benefits of automation to customers using conventional, tested technology rather than a newer technology. As well, by pushing the pilot later in the process, there would be opportunity for other utilities to work with these technologies first and resolve any issues thereby ensuring a greater likelihood of success for ENWIN's pilot.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing the proposed project to a) doing nothing and b) technically feasible alternatives to the proposed

project considered that meet the same objectives as the proposed project. Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, information should be provided that describes these qualitative factors in relation to the proposed project and all alternatives, including how these factors affected the selection of the proposed project.
The cost of this project is estimated at $380,000. The program will provide direct benefits to approximately 4,900 customers through the provision of automated fault isolation and minimum outage times. The installation an automated ring offers an improvement in restoration time versus remotely operated switches. Alternatives were considered including the “do nothing” alternative and is discussed in section B (d) above. This pilot encompasses the technically feasible conventional means to segment the feeder so regardless of the level of success of the pilot, at least a conventional segmentation will have been achieved. The ranking of this project was not adjusted to account for additional benefits.

A. General Information on the Project / Program

Investment Category			System Service
Project Name / Description			
Feeder Tie: 15M11-55M24 – Grand Marais E. and South Pacific			
Estimated Cost	Gross $115,000	Net $115,000	Change in O&M $60 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	N/A
Load	N/A

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									No risks identified wrt to Safety
0.25	Reliability	Moderate	Almost Certain	68	17	Minor	Unlikely	6	1.5	Risk of feeder out for up to 8 hours without tie.
0.25	Financial	Moderate	Almost Certain	68	17	Insignificant	Unlikely	2	0.5	Risk of 1k-100k in customer costs
0.2	Sustainability	Minor	Almost Certain	25	5	Insignificant	Unlikely	2	0.4	Risk of Reputational Damage through unfavourable media reports.

During the occasion of a feeder fault, a feeder tie will allow the sectionalized portion of the faulted feeder that is not directly affected by the fault to be re-supplied in minutes or less. Without a remote operable feeder tie, the unaffected section would suffer an outage that is typically 1-8 hours or longer, depending on the work required to repair the damaged section and whether or not there are other elements of the system requiring repair at the same time. This would results in costs to commercial customers and inconvenience to all customers. This could result in unfavourable press for ENWIN and damage to its reputation.

Expenditure Information & Timing	This project requires a modest investment which can be accommodated within a short time frame. This investment is expected to be completed within Q3 2020.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this expenditure is to provide an improvement in reliability to ENWIN customers. The pole line along Grand Marais is a double circuit with the 15M11 and 55M24 circuits. There are sectionalizing switches at the third points on the 15M11 circuit and if there is a fault on the first section of the 15M11 feeder then this switch and connection will be used to supply the interrupted but unaffected section of that feeder. This same opportunity applies to the 55M24 feeder as well. This is part of an overall plan to sectionalize feeders in thirds and to provide adequate cross ties between the thirds so that power may be restored to customers that are unaffected by the faulted section of the feeder, as noted in the description of ENWIN's Asset Management System in section 5.3.1.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

The opportunity to build an automated feeder tie arises from ENWIN's prior expenditures on sectionalizing reclosers and switches. The feeder tie also provides ENWIN the opportunity to transfer load quickly in the event of other contingencies such as the need to off-load a feeder for maintenance work or in the event of an issue at the Hydro One supply station. This feeder tie is part of an overall plan for sectionalizing of feeders at third points and providing a feeder tie. This feeder tie is in the first section beyond the station. The feeder tie will provide an alternate feed for approximately 1,000 customers in the event of loss of supply from the section of line that normally supplies the area.

(c) Priority

Indicate the priority of the investment relative to others; giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

This project has been prioritized through the PROSORT project evaluation system obtaining a CRBF rating of $3,063/rating point and is ranked 30rd of the 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. This program is a system enhancement that customers would find valuable.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

The alternative of a manual switch was considered and rejected as it does not provide a significantly shorter time frame for the outage, would need to be operated by field personnel instead of control room staff and that field staff may be busy attending to other outage locations. There are no options for whole or part ownership by or jointly with 3rd parties.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

The switch will make operation of the system more cost effective and responsive as the switching can be done in a relatively short span of time. In cases of both restoration and system reconfiguration it avoids a truck roll. Additionally, operating a manual switch takes between 20-40 minutes, including travel time, set-up, etc. while operating an automated switch takes approximately 4 minutes. If call-in is required, an additional 30-60 minutes is added to the manual switch operation time. All switches

are test operated at least once per year. Automated switches do take longer however, to troubleshoot when an issue arises. ENWIN does not track operating and maintenance costs for switches in a manner that distinguishes between manual and remote operable units.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

The benefits to customers for this feeder tie will be that for customers that are otherwise unaffected by a fault on the feeder, their section of the feeder will be able to be isolated and then restored via the feeder tie in a matter of minutes. This will mean that residential customers may avoid the costs associated with long outages such as basement flooding, loss of perishable foods as well as inconvenience. Apartment dwellers where there are elevators may not be able to enter or leave their homes depending on their mobility or may not be able to get their cars in an out of an underground parking area. Commercial customers may not be able to complete transactions with their customers and may lose business, some customers may lose product that is in process of fulfillment, businesses may need to send staff home.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

The construction of the feeder tie will improve the statistical reliability performance of grid as the number of customer hours of outage will be much lower for outages where the connected sections are affected. It is not possible to estimate the numerical effect on reliability. The feeder tie will also improve the resiliency of the grid as restoration will be much faster with an automated feeder tie than with a manual switch or without a feeder tie at all as is now the case.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

The alternative of doing nothing and using a manual switch were both considered and rejected as they do not achieve the goal of reducing outage times for customers and reducing risks and costs for customers when an outage does occur.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

Aside from general public safety associated with having things such as streetlights, traffic lights, telephone service working, there are few safety issues related to the electrical distribution plant that are improved as a result of this plan. The use of a remotely operable switch means that line staff do not have to manually operate the switches and hence the risk of injury associated with moving a switch is eliminated.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

The automated switch will require communications in order to operate and that will be provided through a virtual private network (VPN) cellular service. The VPN service and the firewalls between it and the SCADA server as well as encryption protocols for communications provide a reasonable level of cyber security so that unauthorized parties are not able to access it. There are no cyber security issues related to customer information. The control box for the device will be locked and mounted so that it is inaccessible to people at ground level.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

The feeder tie facilitates the operation of the ENWIN grid but has little effect on the grid operations of those utilities outside ENWIN's territory. While the remotely operable feeder tie is able to effect

power restoration in a matter of minutes, that restoration must still be initiated by a person in ENWIN's control room. The remotely operable feeder tie provides immediate benefits to customers, it is also part of a larger plan to make the grid "smart" at some point in time in the future. Part of ENWIN's vision for a smart grid includes remote sensing of grid conditions and rapid system reconfiguration. The rapid system reconfiguration will be undertaken by computer technology and will occur much quicker than can be accomplished by the human operator in the control room. This will reduce Customer's outage time to a few second from a few minutes. In order to achieve this degree of automation in the future, the remotely operable devices will need to be constructed and in-service.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

The environmental benefits associated with this project are of a secondary nature. The remotely operable switches save two truck rolls every time they are used. As well, if the operation of the switch saves basements from flooding then belongings will not be ruined and need to be sent to landfill.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:
- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

There are no conservation or demand management initiatives that are associated with this program.

C. Category-Specific Requirements

System service – projects/programs in this category are driven by the distributor's expectations that evolving customer use of the system may create system capacity constraints or otherwise adversely impact operations and the delivery of quality distribution services. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures. Information used by a distributor to justify projects/programs in this category should include, but need not be restricted to:

Benefits for Customers

An assessment of both the benefits of the project for customers based on achievement of the project objectives and the cost impact to customers of the Investment

The largest benefit of the feeder tie program is the maintenance of service where there is loss of supply on the main feeder supplying an area. This is particularly important to Customers during storm situations. Since 2010, Windsor has been hit with 5 storms that were at one time considered to be 100-year storms and which have resulted in widespread flooding across the City. In addition to this, the feeder tie will enable maintenance of supply when work is planned in the area served. There is no direct cost impact to the customers within the group and the costs of the investment are spread amongst all customers within the rate class.

Regional Planning

Where applicable, information on regional electricity infrastructure requirements identified in a regional planning process that affected the initiation or final configuration of the project; and on the corresponding distribution of the benefits and responsibility for project costs

This infrastructure is constructed for the benefit of ENWIN's customers however there are occasions where the infrastructure is used to assist Hydro One to manage issues they have from time to time on the incoming supplies to the City. The transformer stations feeding the City are supplied by either the 230 kV lines from the Bruce Nuclear station or from the 115 kV supply that comes from the 230 kV lines. On a reasonably frequent basis, Hydro One will request that ENWIN transfer their load off of 230 KV supplied stations to 115 kV supplied stations. This may be to accommodate work that Hydro One is planning on the 230 kV lines or station. ENWIN is able to accommodate these requests quickly and efficiently by reconfiguring its feeders so that more of the load is supplied from the 115 kV station than the 230 KV supplied stations. Since ENWIN can do this remotely and quickly, the situation precipitating the request is able to be addressed more quickly, economically and efficiently than other solutions.

Advanced Technology

Description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

The control system for switch operation is a standard control panel provided by the manufacturer. ENWIN communicates to the control panel via its SCADA system which uses common SCADA communications protocols (DNP3). ENWIN has also standardized on a battery back-up supply for the switch and its control panel such that a minimum of a 24 hour back-up supply is available so that in the event of a prolonged outage, ENWIN would still be able to remotely operate the switch. The standardization for the control panel means that ENWIN staff is able to service the unit and training costs are minimized. As well, the work of commissioning the unit and connecting it to the SCADA system is also minimized when standard control units are utilized.

Reliability, Safety, Efficiency

Identification of any reliability, efficiency, safety and coordination benefits or affects the project will have on the distributor's system

The installation of these automated switches will improve the statistical reliability performance of the grid as the number of customer hours of outage will be much lower for outages where the connected sections are affected.

Timing / Priority Factors

Identification and explanation of the factors affecting implementation timing/priority

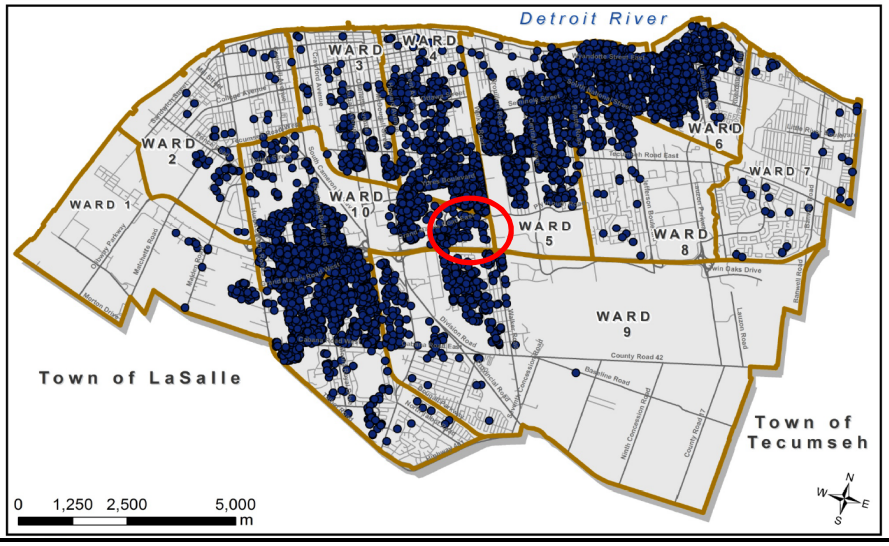
This work is part of an overall plan to provide automation to the ENWIN distribution grid. That plan has been executed over a number of years and is nearly complete. Once the plan is completed, it will be possible for ENWIN to then address the issue of more fully automating its distribution system in order to provide customers with an even more reliable service.

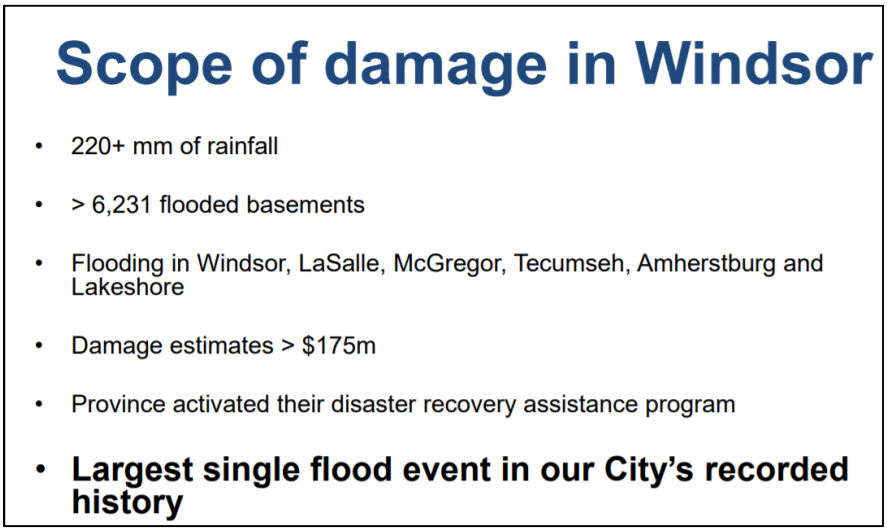
Cost-Benefit Analysis

An analysis of project benefits and costs comparing the proposed project to a) doing nothing and b) technically feasible alternatives to the proposed project considered that meet the same objectives as the proposed project.
Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, information should be provided that describes these qualitative factors in relation to the proposed project and all alternatives, including how these factors affected the selection of the proposed project.

The cost of this project is estimated at $115,000. The project will provide direct benefits to approximately 1000 customers and indirect benefits to all of ENWIN's customers through the provision of additional flexibility to move load on the grid system. The area protected is an area that has been prone to basement flood damage in the recent past.

Storm Flooding (Basement Flooding)
August 2017 Storm Event as of 10am on September 12th





The City has estimated damages from flooding from the last "100-year" storm at $175 million. There have been eight "100-year" storms attack the City since 2010 (June 5, 2010, May14 and 25, 2011, August 18, 2011, November 30, 2011, August 11, 2014, September 29, 2016, August 28, 2017). A Customers have made representations to ENWIN to keep power reliable, especially during storm situations because of this. Because of the frequency of these storms in recent years, many people in Windsor have had their flood insurance cancelled or severely limited. Given a 35 year life for the switch, the incremental cost for this back-up supply for the 1,000 receiving the most direct benefit is approximately $0.25/month. It is judged that most customers in this area, if given the option, would agree that the cost of the additional power supply source is reasonable.

Manual were considered as an alternate to remotely operable switches however manual switches require additional crew/truck time for each switch operation. Also, manual switches would not have the benefit of enabling advanced technology or system awareness. Remotely operable (SCADA) overhead switches offer a dramatic improvement in restoration time versus manual switches as demonstrated regularly in ENWIN's distribution system.

A. General Information on the Project / Program

Investment Category	System Service

Project Name / Description

Feeder Reliability Improvement Project – Prince to Brock

Estimated Cost	Gross $1,200,000	Net $1,200,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	N/A
Load	N/A

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									NO SAFETY RISK MITIGATED
0.25	Reliability	Catastrophic	Unlikely	126	31.5	Minor	Rare	1	0.75	MAINTAIN SUPPLY IN LOSS OF STATION CONTINGENCY
0.25	Financial	Major	Unlikely	46	11.5	Minor	Rare	1	0.75	CUSTOMER COSTS >100k
0.2	Sustainability	Moderate	Unlikely	17	3.4	Insignificant	Rare	1	0.2	LOCAL MEDIA REPORTING – LOSS OF REPUTATION

This project is part of a larger program intended to improve reliability for customers by creating high capacity feeders between Windsor's major supply stations, as noted in the description of ENWIN's Asset Management System in section 5.3.1. This section is part of the Malden TS to Crawford TS high capacity connection. The implementation of this high capacity connection requires the installation of new sections of 27.6kV lines and re-conductoring of existing sections along Prince Road between Matchette Road and Bloomfield Road and along Bloomfield Road between Prince Road and Brock Street. It is planned to happen in conjunction with the replacement of poles at end of life.

Expenditure Information & Timing	ENWIN has budgeted $1,224,000 for the Feeder Reliability Improvement Project – Prince to Brock. Expenditure will be throughout most of the year with estimated $200k at end of Q2, $500k at end of Q3 and $500k at end of Q4.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance

targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this expenditure is to provide an improvement in reliability to ENWIN customers serviced from Crawford TS and Malden TS. This investment will create a high capacity feeder between the two stations with enough capacity to supply one of them in case of loss of the other. The feeder will be constructed with 795 MCM Al conductors and provides 900 A capacity between Crawford TS and Malden TS. Consequently, this feeder will provide an increased level of resilience and reliability to the ENWIN system. The secondary driver for this project is that the existing poles in this section of line are at end of life and will require replacement. Because the poles are at end of life, some replacement will be required. This project will provide a high capacity feeder replacement to an end of life pole line.This project was informed by a network analysis review of ENWIN's distribution system under various contingency situations. A secondary benefit the feeder may provide in the future is that it can be used to supply locations where electric vehicle charging loads exceed the capacity of a conventional feeder to supply. In that case, the high capacity feeder can be configured to serve part of that incremental load and thereby defer any costs to build new feeders or rebuild existing feeders. While this benefit may be realized in the future, no recognition of this potential future benefit was given in the prioritization of the project.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

The entire ENWIN distribution system is fed by eight transformer stations spread around the City. Given the number of stations, there is a reasonable probability of a given station being unavailable from time to time. Currently, ENWIN is unable to sustain the complete distribution system at peak times if there is a loss of one complete station. In reliability terms, this situation is often referred to as a "loss of critical unit" contingency. For that contingency, at peak times, ENWIN would be forced to institute a rolling blackout of certain sections of the distribution system. If the station is completely destroyed it may take months to rebuild it. It is judged that ENWIN's customers would suffer extreme consequences such as loss of production at commercial accounts, basement flooding due to loss of sump pumps, extreme heat due to lack of air conditioning, etc. This situation is judged to be not tolerable and is a contingency for which a remediation plan should be available.

The Feeder Reliability Improvement program was developed to address the issue of insufficient capacity to support a "loss of critical unit" type loss of one supply station to the Windsor distribution system. The program proposes to build a high capacity ring feeder between Windsor's major supply stations. The ring feeder would be capable of moving sufficient power in the case of a loss of any station so that all feeders would have sufficient supply during peak load times. The plan is to develop two high capacity feeders (using existing feeder trunks) emanating from either side of the station busses to connect adjacent stations. Thereby, the majority of the load can be transferred to adjacent stations through the high capacity line.

The high capacity feeders are proposed to be built as the opportunities to rebuild pre-identified sections of existing feeders arise. Those feeders would be built to a higher capacity standard than normal feeders and could carry the full peak load of one additional feeder or sections of three other feeders. The incremental cost to build high capacity sections with other end of life (EOL) replacement is only around 3% (primarily for material costs for larger conductors). The long term plan is to minimize costs by coordinating the implementation of high capacity feeders with other needs such as other proposed city widening projects, asset EOL replacement, existing conductor replacement and pole replacement projects.

There are additional reasons to construct a high capacity feeder ring around the City to supply transformer stations. This includes the following:

1) The possibility to perform load transfers on a long term basis without affecting distribution quality and reliability;

2) High capacity feeders increase the reliability of adjacent feeders as they can accept up to three feeder sections of nearby feeders at any time; and
4) High capacity feeders will help future implementation of any self-healing network project by providing a stronger high capacity infrastructure to help with the reconfiguration of the network with fewer switching operations.

(c) Priority

Indicate the priority of the investment relative to others; giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

This project has been prioritized through the PROSORT project evaluation system, obtaining a CRBF rating of $26,351/rating point and is ranked 51st of 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. This project is a system enhancement that customers would find valuable.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

The alternative of like for like replacement was considered and rejected as it does not achieve the goal of addressing the issue of insufficient capacity to support a "loss of critical unit" type loss of one supply station to the Windsor distribution system. The alternative of doing nothing was considered and rejected due to the condition of existing poles and their required replacement. There are no opportunities for scheduling, funding or alternative ownership options for this project.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

The incremental cost to build high capacity sections with other end of life (EOL) replacement is approximately 3% (primarily for material costs for larger conductors). The long term plan is to minimize costs by coordinating the implementation of high capacity feeders with other needs such as proposed city road widening projects, asset EOL replacement, existing conductor replacement and pole replacement projects.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

The implementation of the high capacity feeders program provides the following primary benefits to customers:
(1) In the event of total station failure the high capacity lines can provide support to the majority of the load from adjacent stations in minutes;
(2) Under storm recovery the availability of high capacity feeders will enable the rerouting of power enabling ENWIN to restore power to customers more quickly.
(3) This program will eliminate the lack of back up capability for some of feeders, especially on stations that are situated at the edge of the distribution system, such as Malden, Lauzon and Keith TS'; and
(4) This program will help future implementation of any self-healing network project by providing a stronger high capacity infrastructure to help with the reconfiguration of the network with fewer switching operations.

Note: This is a section of the line planned to be constructed between the stations. As this is only a section of the line, the benefits will not accrue until the balance of the line is constructed.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

This project will improve the statistical reliability performance of grid as the number of customer hours of outages will be lower for outages where the connected stations are affected. It is not possible to estimate the numerical effect on reliability.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

The alternative of like for like replacement was considered and rejected as it does not achieve the goal of addressing the issue of insufficient capacity to support a "loss of critical unit" type loss of one supply station to the Windsor distribution system. Besides, the incremental cost to build high capacity sections with the end of life pole replacement is only around 3% (primarily for material costs for larger conductors). The coordination with the EOL replacement will improve reliability with minimum cost impact.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

Aside from general public safety associated with having things such as streetlights, traffic lights, telephone service working, there are few safety issues related to the electrical distribution plant that are improved as a result of this plan.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are no customer privacy, cyber security nor grid protection issues associated with this project.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

The high capacity feeders program facilitates the operation of the ENWIN grid but has little effect on the grid operations of those utilities outside ENWIN's territory. The investment does not require coordination with utilities, regional planning, 3rd party providers and/or industry. The investment does not enable future technological functionality however it does address future operational requirements as it provides increased flexibility of operations and increased capacity to deal with contingencies.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

The environmental benefits associated with this project are of a secondary nature. If there is a loss of one station and the transfer of supply of all customers to the other station saves basements from flooding then belongings will not be ruined and need to be sent to landfill.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:
- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

Not applicable; there are no conservation or demand management initiatives that are associated with this program.

C. Category-Specific Requirements

System service – projects/programs in this category are driven by the distributor's expectations that evolving customer use of the system may create system capacity constraints or otherwise adversely impact operations and the delivery of quality distribution services. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures. Information used by a distributor to justify projects/programs in this category should include, but need not be restricted to:

Benefits for Customers

An assessment of both the benefits of the project for customers based on achievement of the project objectives and the cost impact to customers of the Investment

The implementation of the high capacity feeders program provides the following primary benefits to customers:
(1) In the event of total station failure the high capacity lines can provide support to the majority of the load from adjacent stations in minutes;

(2) Under storm recovery the availability of high capacity feeders will enable the rerouting of power enabling ENWIN to restore power to customers quickly.
(3) This program will eliminate the lack of back up capability for some of feeders, especially on stations that are situated at the edge of the distribution system, such as Malden, Lauzon and Keith TS'; and
(4) This program will help future implementation of any self-healing network project by providing a stronger high capacity infrastructure to help with the reconfiguration of the network with fewer switching operations.
There is no direct cost impact to the customers within the group and the costs of the investment are spread amongst all customers.

Regional Planning

Where applicable, information on regional electricity infrastructure requirements identified in a regional planning process that affected the initiation or final configuration of the project; and on the corresponding distribution of the benefits and responsibility for project costs

There are no requirements in the regional planning process associated with this program.

Advanced Technology

Description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

Advanced technology has not been incorporated into the project and cybersecurity and interoperability are not part of the considerations for this project.

Reliability, Safety, Efficiency

Identification of any reliability, efficiency, safety and coordination benefits or affects the project will have on the distributor's system

This project will improve the statistical reliability performance of grid as the number of customer hours of outage will be lower for outages where the connected stations are affected. The replacement of EOL poles with this project will also ensure the safety of the pole line into the future.

Timing / Priority Factors

Identification and explanation of the factors affecting implementation timing/priority

This project is part of an overall plan to implement high capacity feeders as the opportunities to rebuild pre-identified sections of existing feeders arise. This specific section has several poles at end of life and the incremental cost to build a high capacity section is only around 3% (primarily for material costs for larger conductors) and is being coordinated and prioritized together with the EOL pole replacement in this feeder section . The ranking of the project in the PROSORT analysis did not include risk reduction points for the replacement of end of life assets.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing the proposed project to a) doing nothing and b) technically feasible alternatives to the proposed project considered that meet the same objectives as the proposed project.
Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, information should be provided that describes these qualitative factors in relation to the proposed project and all alternatives, including how these factors affected the selection of the proposed project.

The cost of this project is estimated at $1,200,000. The program will provide benefits to all ENWIN customers through the provision of connectivity to feed them from two stations. The alternative of like for like replacement was considered and rejected as it does not achieve the goal of addressing the issue of insufficient capacity to support a "loss of critical unit" type loss of one supply station to the Windsor distribution system. The alternative of doing nothing was considered and rejected due to the condition of existing poles and their required replacement. The technically feasible alternative of doing a like-for-like replacement of the pole line without increasing the conductor size was considered and rejected as the incremental cost for the additional conductor size is negligible in comparison to the overall project costs.

A. General Information on the Project / Program

Investment Category	System Service

Project Name / Description

Radial Branches Backup Project – 23M2 single phase radial section

Estimated Cost	Gross $35,000	Net $35,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	596
Load	N/A

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									NO SAFETY ISSUES
0.25	Reliability	Moderate	Possible	34	8.5	Minor	Unlikely	6	1.5	RISK OF LONGER OUTAGES FOR CUSTOMERS IN THE POCKET THAT IS SINGLY FED
0.25	Financial	Moderate	Possible	34	8.5	Minor	Unlikely	6	1.5	COST ASSOCIATED WITH LONGER OUTAGES >$1K
0.2	Sustainability	Insignificant	Possible	5	1	Insignificant	Unlikely	2	0.4	REPUTATIONAL RISK

This project is part of a number of similar projects intended to improve reliability for customers. A radial branch is a feeder section that does not have connectivity to feed from downstream by another source. As distribution systems expand with the time, it sometimes happens that larger radial sections form due to the addition of more customers. While all customers' services eventually become single ended feeds, the goal is to ensure that large pockets of customers have dual feeds so that in the event of an upset, at least some, if not all, of those customers can be restored quickly. ENWIN's standard is that there should be a maximum of 500 customers on a single ended feed.

Expenditure Information & Timing	ENWIN has budgeted $36,000 for the 23M2 single phase radial section project. Expenditure will be $35k at end of Q1.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this expenditure is to provide a faster power restoration to customers affected by an upset on this feeder section and consequently, as noted in the description of ENWIN's Asset Management System in section 5.3.1, improve the reliability of the system. A secondary benefit is the reduction in labour costs associated with the possibility of maintenance in these feeder sections during normal working hours, that otherwise would have to be performed in overtime hours. This program is also an integral part of an overall plan to improve reliability through automation of the distribution system. The information used to identify these pockets of customers is ENWIN's GIS system maps.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

ENWIN has many programs to increase the reliability of main trunks of 27.6kV feeders by providing additional connectivity to adjacent feeders or sectionalising feeders into smaller sections to isolate the fault and consequently impacting the minimum possible number of customers. When the exact fault location is identified, OH/UG personnel can often further isolate the fault to very a localised area and energise the majority of the affected section. However when this happens in a radial fed section all the downstream customers are impacted until the defective equipment is fully restored. Another major issue with radial sections is when *ENWIN* needs to do maintenance work, such as pole replacement or insulator replacement. In radial fed sections all downstream customers experience extremely long outages. In the past *ENWIN* had to re-schedule work in certain areas to different dates and times, split work into several days and occasionally provide some customers with standby generators.

(c) Priority

Indicate the priority of the investment relative to others; giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

This project has been prioritized through the PROSORT project evaluation system obtaining a CRBF rating of $2,271/rating point and is ranked 28th of 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. This project is a system enhancement that customers would find valuable.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

The alternative of doing nothing was considered and rejected as it does not achieve the goal of reducing outage times for customers and reducing risks and costs for customers when an outage does occur. The 596 customers fed radially by this feeder section will continue to be impacted by unplanned outages and scheduled maintenances if this alternative is not implemented. There are no opportunities for scheduling, funding or alternative ownership options for this project. The design options considered were the "do-nothing" alternative and the least cost means of providing an alternative feed to the area.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

ENWIN is aware that its distribution system has fairly large single phase sections and identified critical radial areas to provide alternative supplies and consequently improve the reliability of supply to these areas. This particular project will require a relatively small investment with direct benefits to more than 500 customers. The installation of a manual switch will make operation of the system more cost effective and responsive as the switching of affected customers to another feeder can be done in a relatively short span of time.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

This project will benefit customers that are unaffected by a fault on the radial feeder, their section of

the feeder will be able to be isolated and then restored via the new switch in a short period of time. This will mean that residential customers may avoid the costs associated with long outages such as basement flooding, loss of perishable foods as well as inconvenience. Apartment dwellers where there are elevators may not be able to enter or leave their homes depending on their mobility or may not be able to get their cars in an out of an underground parking area. Commercial customers may not be able to complete transactions with their customers and may lose business, some customers may lose product that is in process of fulfillment, businesses may need to send staff home.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

This project will improve the statistical reliability performance of the grid as the number of customer hours of outage will be lower for outages where the connected sections are affected. However, it is not possible to estimate the numerical effect on overall system reliability performance due to this single project

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

The alternative of doing nothing was considered and rejected as it does not achieve the goal of reducing outage times for customers and reducing risks and costs for customers when an outage does occur.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

Aside from general public safety associated with having things such as streetlights, traffic lights, telephone service working, there are few safety issues related to the electrical distribution plant that are improved as a result of this plan.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are no customer privacy, cyber security nor grid protection issues associated with this project.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

The switch facilitates the operation of the ENWIN grid but has no effect on the grid operations of those utilities outside ENWIN's territory. The investment does not require coordination with utilities, regional planning, 3rd party providers and/or industry. This investment does not impact any future technological functionality but does address the operational requirement of facilitating restoration of a large block of customers during an upset condition and facilitates replacement of distribution assets within the area without needing to have a large interruption.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

The environmental benefits associated with this project are of a secondary nature. If the operation of the switch saves basements from flooding then belongings will not be ruined and need to be sent to landfill.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:
- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

There are no conservation or demand management initiatives that are associated with this program.

C. Category-Specific Requirements

System service – projects/programs in this category are driven by the distributor's expectations that evolving customer use of the system may create system capacity constraints or otherwise adversely impact operations and the delivery of quality distribution services. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures. Information used by a distributor to justify projects/programs in this category should include, but need not be restricted to:

Benefits for Customers

An assessment of both the benefits of the project for customers based on achievement of the project objectives and the cost impact to customers of the Investment

The largest benefit of this project is that for customers that are unaffected by a fault on the radial feeder, their section of the feeder will be able to be isolated and then restored via the new switch in a shorter period of time. There is no direct cost impact to the customers within the group and the costs of the investment are spread amongst all customers within the rate class (residential).

Regional Planning

Where applicable, information on regional electricity infrastructure requirements identified in a regional planning process that affected the initiation or final configuration of the project; and on the corresponding distribution of the benefits and responsibility for project costs

There are no requirements in the regional planning process associated with this program.

Advanced Technology

Description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

Not applicable

Reliability, Safety, Efficiency

Identification of any reliability, efficiency, safety and coordination benefits or affects the project will have on the distributor's system

This project will improve the statistical reliability performance of grid as the number of customer hours of outage will be lower for outages where the connected sections are affected.

Timing / Priority Factors

Identification and explanation of the factors affecting implementation timing/priority

This project is part of an overall plan to eliminate large radial feeder sections and ensure that these pockets of customers have dual feeds so that in the event of an upset, at least some, if not all, of those customers can be restored quickly. Project priorities and timing are based in the "worst performing feeders" list and on risk/cost benefit analysis established based on customer count, geographical foot print and importance/impact to customers. This plan has been executed over a number of years and is planned to continue

Cost-Benefit Analysis

An analysis of project benefits and costs comparing the proposed project to a) doing nothing and b) technically feasible alternatives to the proposed project considered that meet the same objectives as the proposed project.
Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, information should be provided that describes these qualitative factors in relation to the proposed project and all alternatives, including how these factors affected the selection of the proposed project.

The cost of this project is estimated at $36,000. The program will provide direct benefits to 596 customers through the provision of connectivity to feed them from a downstream source and additional flexibility to isolate faults and minimize outages. The alternative of doing nothing was considered and rejected as it does not achieve the goal of reducing outage times for customers and reducing risks and costs for customers when an outage does occur. The 596 customers fed radially by this feeder section will continue to be impacted by unplanned outages and scheduled maintenances if this alternative is not implemented.

A. General Information on the Project / Program

Investment Category	System Service

Project Name / Description

Radial Branches Backup Project – 55M1 three phase radial section

Estimated Cost	Gross $125,000	Net $125,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	568
Load	N/A

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									NO SAFETY ISSUES
0.25	Reliability	Moderate	Possible	34	8.5	Minor	Unlikely	6	1.5	RISK OF LONGER OUTAGES FOR CUSTOMERS IN THE POCKET THAT IS SINGLY FED
0.25	Financial	Moderate	Possible	34	8.5	Minor	Unlikely	6	1.5	COST ASSOCIATED WITH LONGER OUTAGES >$1K
0.2	Sustainability	Insignificant	Possible	5	1	Insignificant	Unlikely	2	0.4	REPUTATIONAL RISK

This project is part of a number of similar projects intended to improve reliability for customers. A radial branch is a feeder section that does not have connectivity to feed from downstream by another source. As distribution systems expand with the time, it sometimes happens that larger radial sections form due to the addition of more customers. While all customers' services eventually become single ended feeds, the goal is to ensure that large pockets of customers have dual feeds so that in the event of an upset, at least some, if not all, of those customers can be restored quickly. ENWIN's standard is that there should be a maximum of 500 customers on a single ended feed.

Expenditure Information & Timing	ENWIN has budgeted $125,000 for the 55M1 three phase radial section project.Expenditure will be $125k at end of Q2.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this expenditure is to provide a faster power restoration to customers affected by an upset on this feeder section and consequently, as noted in the description of ENWIN's Asset Management System in section 5.3.1, improve the reliability of the system. A secondary benefit is the reduction in labour costs associated with the possibility of maintenance in these feeder sections during normal working hours, that otherwise would have to be performed in overtime hours. This program is also an integral part of an overall plan to improve reliability through automation of the distribution system. The information used to identify these pockets of customers is ENWIN's GIS system maps.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

ENWIN has many programs to increase the reliability of main trunks of 27.6kV feeders by providing additional connectivity to adjacent feeders or sectionalising feeders into smaller sections to isolate the fault and consequently impacting the minimum possible number of customers. When the exact fault location is identified, OH/UG personnel can often further isolate the fault to very a localised area and energise the majority of the affected section. However when this happens in a radial fed section all the downstream customers are impacted until the defective equipment is fully restored. Another major issue with radial sections is when ENWIN needs to do maintenance work, such as pole replacement or insulator replacement. In radial fed sections all downstream customers experience extremely long outages. In the past ENWIN had to re-schedule work in certain areas to different dates and times, split work into several days and occasionally provide some customers with standby generators.

(c) Priority

Indicate the priority of the investment relative to others; giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

This project has been prioritized through the PROSORT project evaluation system obtaining a CRBF rating of $7,886/rating point and is ranked 33rd of 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. This project is a system enhancement that customers would find valuable.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

The alternative of doing nothing was considered and rejected as it does not achieve the goal of reducing outage times for customers and reducing risks and costs for customers when an outage does occur. The 568 customers fed radially by this feeder section will continue to be impacted by unplanned outages and scheduled maintenances if this alternative is not implemented. There are no opportunities for scheduling, funding or alternative ownership options for this project. The design options considered were the "do-nothing" alternative and the least cost means of providing an alternative feed to the area.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

ENWIN is aware that its distribution system has fairly large three phase sections and identified critical radial areas to provide alternative supplies and consequently improve the reliability of supply to these areas. This particular project will require a $125,000 investment with direct benefits to more than 500 customers. The short line extension and installation of an automated switch will make operation of the system more cost effective and responsive as the switching of affected customers can be done in a relatively short span of time. In cases of both restoration and system reconfiguration it avoids a truck roll.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

This project will benefit customers that are unaffected by a fault on the radial feeder, their section of the feeder will be able to be isolated and then restored via the automated switch in a short period of time. This will mean that residential customers may avoid the costs associated with long outages such as basement flooding, loss of perishable foods as well as inconvenience. Apartment dwellers where there are elevators may not be able to enter or leave their homes depending on their mobility or may not be able to get their cars in an out of an underground parking area. Commercial customers may not be able to complete transactions with their customers and may lose business, some customers may lose product that is in process of fulfillment, businesses may need to send staff home.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

This project will improve the statistical reliability performance of the grid as the number of customer hours of outage will be lower for outages where the connected sections are affected. However, it is not possible to estimate the numerical effect on overall system reliability due to this single project.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

The alternative of doing nothing was considered and rejected as it does not achieve the goal of reducing outage times for customers and reducing risks and costs for customers when an outage does occur.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

Aside from general public safety associated with having things such as streetlights, traffic lights, telephone service working, there are few safety issues related to the electrical distribution plant that are improved as a result of this plan. The use of a remotely operable switch as a backup supply means that line staff do not have to manually operate the switches and hence the risk of injury associated with operating a switch is eliminated.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

The automated switch proposed under this project will require communications in order to operate and that will be provided through a virtual private network (VPN) cellular service. The VPN service and the firewalls between it and the SCADA server as well as encryption protocols for communications provide a reasonable level of cyber security or grid protection so that unauthorized parties are not able to access it. The control box for the device will be locked and inaccessible to the general public.There are no customer privacy nor cyber security issues related to customer information.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

The line extension and automated switch facilitates the operation of the ENWIN grid but has little effect on the grid operations of those utilities outside ENWIN's territory. While the remotely operable switch is able to effect power restoration in a matter of minutes, that restoration must still be initiated by a person in ENWIN's control room. The remotely operable switch provides immediate benefits to customers, it is also part of a larger plan to make the grid "smart" at some point in time in the future. Part of ENWIN's vision for a smart grid includes remote sensing of grid conditions and rapid system reconfiguration. The rapid system reconfiguration will be undertaken by computer technology and will occur much quicker than can be accomplished by the human operator in the control room. This will reduce Customer's outage time to a few second from a few minutes. In order to achieve this degree of automation in the future, the remotely operable devices will need to be constructed and in-service. The investment does not require coordination with utilities, regional planning, 3rd party providers

and/or industry. This investment does not impact any future technological functionality but does address the operational requirement of facilitating restoration of a large block of customers during an upset condition and facilitates replacement of distribution assets within the area without needing to have a large interruption.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

The environmental benefits associated with this project are of a secondary nature. The remotely operable switches save two truck rolls every time they are used. As well, if the operation of the switch saves basements from flooding then belongings will not be ruined and need to be sent to landfill.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

There are no conservation or demand management initiatives that are associated with this program.

C. Category-Specific Requirements

System service – projects/programs in this category are driven by the distributor's expectations that evolving customer use of the system may create system capacity constraints or otherwise adversely impact operations and the delivery of quality distribution services. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures. Information used by a distributor to justify projects/programs in this category should include, but need not be restricted to:

Benefits for Customers

An assessment of both the benefits of the project for customers based on achievement of the project objectives and the cost impact to customers of the Investment

The largest benefit of this project is that for customers that are unaffected by a fault on the radial feeder, their section of the feeder will be able to be isolated and then restored via another automated switch in a shorter period of time. There is no direct cost impact to the customers within the group and the costs of the investment are spread amongst all customers within the rate class (residential).

Regional Planning

Where applicable, information on regional electricity infrastructure requirements identified in a regional planning process that affected the initiation or final configuration of the project; and on the corresponding distribution of the benefits and responsibility for project costs

There are no requirements in the regional planning process associated with this program.

Advanced Technology

Description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

The control system for switch operation is a standard control panel provided by the manufacturer. ENWIN communicates to the control panel via its SCADA system which uses common SCADA communications protocols (DNP3). ENWIN has also standardized on a battery back-up supply for the switch and its control panel such that a minimum of a 24 hour back-up supply is available so that in the event of a prolonged outage, ENWIN would still be able to remotely operate the switch. The standardization for the control panel means that ENWIN staff is able to service the unit and training costs are minimized. As well, the work of commissioning the unit and connecting it to the SCADA system is also minimized when standard control units are utilized.

Reliability, Safety, Efficiency

Identification of any reliability, efficiency, safety and coordination benefits or affects the project will have on the distributor's system

This project will improve the statistical reliability performance of grid as the number of customer hours of outage will be lower for outages where the connected sections are affected.

Timing / Priority Factors

Identification and explanation of the factors affecting implementation timing/priority

This project is part of an overall plan to eliminate large radial feeder sections and ensure that these pockets of customers have dual feeds so that in the event of an upset, at least some, if not all, of those customers can be restored quickly. Project priorities and timing are based in the "worst

performing feeders" list and on risk/cost benefit analysis established based on customer count, geographical foot print and importance/impact to customers. This plan has been executed over a number of years and is planned to continue.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing the proposed project to a) doing nothing and b) technically feasible alternatives to the proposed project considered that meet the same objectives as the proposed project.
Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, information should be provided that describes these qualitative factors in relation to the proposed project and all alternatives, including how these factors affected the selection of the proposed project.

The cost of this project is estimated at $125,000. The program will provide direct benefits to 568 customers through the provision of connectivity to feed them from a downstream source and additional flexibility to isolate faults and minimize outages. The installation of a remotely operable (SCADA) overhead switches offers a dramatic improvement in restoration time versus manual switches as demonstrated regularly in ENWIN's distribution system. The alternative of doing nothing was considered and rejected as it does not achieve the goal of reducing outage times for customers and reducing risks and costs for customers when an outage does occur. The 568 customers fed radially by this feeder section will continue to be impacted by unplanned outages and scheduled maintenances if this alternative is not implemented.

A. General Information on the Project / Program

Investment Category	System Service

Project Name / Description

Padmount Switch Automation Program

Estimated Cost	Gross $560,000	Net $560,000	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	N/A
Load	N/A

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety	Moderate	Possible	34	10.2	Moderate	Rare	7	2.1	FLASHOVER EXPERIENCED ON MANUAL SWITCHES
0.25	Reliability	Moderate	Possible	34	8.5	Minor	Unlikely	6	1.5	WITH FEEDER OUT, WILL TAKE 1-HR TO RESTORE VS FEW MINUTES WITH REMOTE SWITCH
0.25	Financial	Moderate	Likely	51	12.75	Insignificant	Unlikely	2	0.5	CUSTOMER COSTS>$1,000
0.2	Sustainability	Minor	Possible	13	2.6	Insignificant	Rare	1	0.2	REPUTATIONAL DAMAGE

The purpose of this program is to automate key padmount switching units (SUs) on the distribution system in order to achieve greater reliability for customers.

The automation of key switches on ENWIN's distribution system is a prerequisite to enable remote isolation of faulted sections and restoration of unfaulted sections. To accomplish this, at a minimum all feeder sectionalizing and tie-point switches will need to be automated. Reclosers, motorized switches and remote operable padmount switching units are considered to be automated feeder sectionalizing/tie devices.

The installation of SCADA FCI's will enable the remote determination of the line section that has experienced a fault. The automation of switches at the isolation points will enable Operators to isolate the fault and restore unaffected sections. This will greatly improve system reliability for customers.

Expenditure Information & Timing	ENWIN has budgeted $560,000 for the automation of 4 (four) padmount switch units in 2020. An example project is the automation of the Traders SU, located at the SE corner of Tecumseh Road and Forest Glade. Expenditures will be $280k at end of Q2 and $280k at end of Q3.
REG Investment	Yes ☐ No ☒

Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for this expenditure is to provide a faster power restoration to customers affected by an upset on a feeder section currently serviced by manual switches and consequently, as noted in the description of ENWIN's Asset Management System in section 5.3.1, improve the reliability of the system. Secondary benefits are the reduction in labour and trucking costs associated with effecting switching. This benefit would accrue not only for restoration of faulted feeder sections but to other planned and unplanned work. This program is an integral part of an overall plan to improve reliability through automation of the distribution system. Another secondary benefit is that the automated switch will be a dead front switch and will replace a live front switch making the installation safer. The automated switch is in a stainless steel cabinet thereby eliminating the issue of corrosion experienced by the live front switches. This project was identified through a network system analysis and review which ENWIN performs from time to time to identify critical points on the network for which automation will provide an improvement in reliability for customers.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

This program provides the Operators with the capability to remotely isolate a faulted feeder section and pick up the unfaulted sections from adjacent feeders through automated sectionalizing and tie switches. The ability to know where the fault is and to sectionalize feeders is critical to being able to quickly restore service to customers upon a feeder upset. It is intended that ultimately all sectionalizing and tie switches will be automated. This decreases the restoration time for customers and will increase the service level to customers.

(c) Priority

Indicate the priority of the investment relative to others; giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

Padmount switching units replacements under this program have been prioritized through the PROSORT project evaluation system obtaining a CRBF rating of $3,378/rating point and is ranked 31 of the 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. This program is a system enhancement that customers would find valuable.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

The alternative of maintaining manual switches was considered and rejected as it does not provide a significantly shorter time frame for outage restoration, would need to be operated by field personnel instead of control room staff and that field staff may be busy attending to other outage locations. There are no options for whole or part ownership by or jointly with 3rd parties.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

The switches will make operation of the system more cost effective and responsive as the switching can be done in a relatively short span of time. In cases of both restoration and system reconfiguration it avoids a truck roll. Additionally, live front switches are dry ice blast cleaned every 3

years and the automated switches are sealed units which do not require this cleaning thereby saving operating costs. Additionally, operating a manual switch takes between 20-40 minutes, including travel time, set-up, etc. while operating an automated switch takes approximately 4 minutes. If call-in is required, an additional 30-60 minutes is added to the manual switch operation time. All switches are test operated at least once per year. Automated switches do take longer however, to troubleshoot when an issue arises. ENWIN does not track operating and maintenance costs for switches in a manner that distinguishes between manual and remote operable units.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

The switches will benefit customers that are unaffected by a fault on the feeder, their section of the feeder will be able to be isolated and then restored via another automated switch in a matter of minutes. This will mean that residential customers may avoid the costs associated with long outages such as basement flooding, loss of perishable foods as well as inconvenience. Apartment dwellers where there are elevators may not be able to enter or leave their homes depending on their mobility or may not be able to get their cars in an out of an underground parking area. Commercial customers may not be able to complete transactions with their customers and may lose business, some customers may lose product that is in process of fulfillment, businesses may need to send staff home.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

The installation of these automated switches will improve the statistical reliability performance of the grid as the number of customer hours of outage will be much lower for outages where the connected sections are affected. However, it is not possible to estimate the numerical effect on overall system reliability due to this single project. Additionally, since the operating elements of the remote operable switching units is sealed, there is no issues with flashover and other live front failure modes. This improves reliability as the replacement of a switching unit invariably results in complicated switching orders and lengthy outages for customers.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

The alternative of doing nothing and maintaining the manual switches was considered and rejected as it does not achieve the goal of reducing outage times for customers and reducing risks and costs for customers when an outage does occur.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

Aside from general public safety associated with having things such as streetlights, traffic lights, telephone service working, there are few safety issues related to the electrical distribution plant that are improved as a result of this plan. The use of a remotely operable switch means that line staff do not have to manually operate the switches and hence the risk of injury associated with operating a switch is eliminated. As noted above, flashover failures that were a problem with live front switching units are eliminated by the sealed design of the dead front automated switches.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

The automated switch will require communications in order to operate and that will be provided through a virtual private network (VPN) cellular service. The VPN service and the firewalls between it and the SCADA server as well as encryption protocols for communications provide a reasonable level of cyber security and grid protection so that unauthorized parties are not able to access it. The control box for the device will be locked and inaccessible to the general public. There are no customer privacy nor cyber security issues related to customer information.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

The padmount automated switches facilitates the operation of the ENWIN grid but has little effect on the grid operations of those utilities outside ENWIN's territory. While the remotely operable switch is able to effect power restoration in a matter of minutes, that restoration must still be initiated by a person in ENWIN's control room. The remotely operable switch provides immediate benefits to customers, it is also part of a larger plan to make the grid "smart" at some point in time in the future. Part of ENWIN's vision for a smart grid includes remote sensing of grid conditions and rapid system reconfiguration. The rapid system reconfiguration will be undertaken by computer technology and will occur much quicker than can be accomplished by the human operator in the control room. This will reduce Customer's outage time to a few seconds from a few minutes. In order to achieve this degree of automation in the future, the remotely operable devices will need to be constructed and in-service. The investment does not require coordination with utilities, regional planning, 3rd party providers and/or industry.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

The environmental benefits associated with this project are of a secondary nature. The remotely operable switches save two truck rolls every time they are used. As well, if the operation of the switch saves basements from flooding then belongings will not be ruined and need to be sent to landfill.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

There are no conservation or demand management initiatives that are associated with this program.

C. Category-Specific Requirements

System service – projects/programs in this category are driven by the distributor's expectations that evolving customer use of the system may create system capacity constraints or otherwise adversely impact operations and the delivery of quality distribution services. Distributor discretion in relation to investments in this category can be relatively high in terms of both initiating a project and determining the priority and timing of project-related expenditures. Information used by a distributor to justify projects/programs in this category should include, but need not be restricted to:

Benefits for Customers

An assessment of both the benefits of the project for customers based on achievement of the project objectives and the cost impact to customers of the Investment

The largest benefit of the padmount switch automation program is that for customers that are unaffected by a fault on the feeder, their section of the feeder will be able to be isolated and then restored via another automated switch in a matter of minutes. There is no direct cost impact to the customers within the group and the costs of the investment are spread amongst all customers within the rate class (residential).

Regional Planning

Where applicable, information on regional electricity infrastructure requirements identified in a regional planning process that affected the initiation or final configuration of the project; and on the corresponding distribution of the benefits and responsibility for project costs

There are no requirements in the regional planning process associated with this program.

Advanced Technology

Description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

The control system for switch operation is a standard control panel provided by the manufacturer. ENWIN communicates to the control panel via its SCADA system which uses common SCADA communications protocols (DNP3). The SCADA system has cyber security measures to ensure that minimum requirements for security are met. ENWIN has also standardized on a battery back-up supply for the switch and its control panel such that a minimum of a 24 hour back-up supply is

available so that in the event of a prolonged outage, ENWIN would still be able to remotely operate the switch. The standardization for the control panel means that ENWIN staff is able to service the unit and training costs are minimized. As well, the work of commissioning the unit and connecting it to the SCADA system is also minimized when standard control units are utilized.

Reliability, Safety, Efficiency

Identification of any reliability, efficiency, safety and coordination benefits or affects the project will have on the distributor's system

The installation of these automated switches will improve the statistical reliability performance of the grid as the number of customer hours of outage will be much lower for outages where the connected sections are affected.

Timing / Priority Factors

Identification and explanation of the factors affecting implementation timing/priority

This work is part of an overall plan to provide automation to the ENWIN distribution grid. That plan has been executed over a number of years and is nearly complete. Once the plan is completed, it will be possible for ENWIN to then address the issue of more fully automating its distribution system in order to provide customers with an even more reliable service. The priority of the work is described in section B (c) above. The timing of switch automation projects is generally to coincide with locations where the existing manual switch is nearing end of life but is in sufficient condition to be refurbished and reused. Additionally, locations are generally chosen in pairs so that both ends of a feed are able to be operated remotely as a unit (i.e. close one and open the other) otherwise the advantage of automation is not fully achieved.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing the proposed project to a) doing nothing and b) technically feasible alternatives to the proposed project considered that meet the same objectives as the proposed project.
Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, information should be provided that describes these qualitative factors in relation to the proposed project and all alternatives, including how these factors affected the selection of the proposed project.

The cost of this program is estimated at $560,000 for 2020. The program will provide direct benefits to customers through the provision of additional flexibility to isolate faults and minimize outages. The maintenance of manual switches was considered as an alternate to remotely operable switches however manual switches require additional crew/truck time for each switch operation. Also, manual switches would not have the benefit of enabling advanced technology or system awareness. Remotely operable (SCADA) switches offer a dramatic improvement in restoration time versus manual switches as demonstrated regularly in ENWIN's distribution system. The "do nothing" alternative will not achieve the improved response to outages and customers will not then benefit from shorter outage times. There were no technically feasible alternatives known or considered.

A. General Information on the Project / Program

Investment Category	System Renewal

Project Name / Description

Subdivision Cable Replacement Program – 2020 Projects: Polonia Park Place – housing project

Estimated Cost	Gross $511k	Net $511k	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	Varies
Load	Varies

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety									NO SAFETY RELATED RISK IDENTIFIED
0.25	Reliability	Major	Likely	139	34.75	Moderate	rare	7	1.75	CABLE FAILURES MEAN CUSTOMERS OUT > 8 HOURS
0.25	Financial	Moderate	Possible	34	8.5	Moderate	rare	7	1.75	CUSTOMER COSTS $1K - $100K
0.2	Sustainability	Minor	Unlikely	6	1.2	Insignificant	rare	1	0.2	REPUTATION DAMAGE

Cable replacement projects are intended to reduce the risks associated with underground cable failures and the consequent impact on customers. Primary cable faults can be difficult to locate and repair and consequently usually result in lengthy outages for customers. Primary cables in subdivisions were originally installed as direct buried cable which makes an expedient replacement impossible. Replacement cables are installed in duct so that cable replacement in the future is easier. The Polonia Park housing project infrastructure was built in 1980 and in 2020 will be 40 years old and 15 years beyond its 25 year life expectancy for direct buried cable. The cable serves submersible transformers which are also beyond expected end of life and which will also be replaced.

Expenditure Information & Timing	The project will begin in the early spring and extend until fall. Expenditures will be $125k at end of Q2, $125k at end of Q3 and $261k at end of Q4.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

The main driver for cable replacement is to provide reliable service to customers, as noted in the description of ENWIN's Asset Management System in section 5.3.1,. Cable failures typically result in long outages. ENWIN's oldest cable is direct buried and cannot be replaced upon failure and typically the cable is spliced and put back in service. When cable insulation degrades and faults, the fault current further stresses the insulation on the rest of the cable. This leads to repeated failures of the cable and a progressively deteriorating reliability of service to customers. ENWIN's sustainment philosophy for cable is to proactively remediate the cable (injection or replacement) before the cable reaches the point where it experiences repeated and increasingly frequent faults. The main driver for the Polonia Park subdivision cable replacement is reliability due to the age of the cable and the fact that it is 15 years beyond its life expectancy.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

While ENWIN continually reviews and evaluates the option to inject cable as a means of remediating deteriorated cable however, to date, ENWIN has not found that cable injection would be the most advantageous cable mitigation compared to replacement. When ENWIN replaces direct buried cable it installs the new cable in duct so that future replacements will be much simpler. As well, future faults may be remediated through cable replacement rather than splicing. Direct buried non-tree retardant cable is at least 35 years old and the transformers in subdivisions will also be 35 years old. When cable replacement occurs, ENWIN will typically replace the transformers at the same time so that customers will be supplied from a system that will not be expected to be at end of life for another 30+ years.

(c) Priority

Indicate the priority of the investment relative to others, giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

Cable replacement projects will typically have a risk score reduction of 40.75 plus a benefit score of 10.9 and the cost per risk point reduced is $9,910. This places cable replacements at a high priority for ENWIN's capital investment program. The priority for this project is 35th of 65 capital line items considered for the test year. This rating has been obtained based on the risk reduction per unit cost ratio with the projects which provide the highest risk reduction per unit cost ranked highest, as described in the Project Prioritization section of 5.4.1. The ranking was determined with the PROSORT tool and was based on reducing risks for extended outages due to cable faults, difficulty in finding and repairing the cable faults on private housing project property and cost to customers for being out of power. Additionally, the submersible transformers are also to be replaced at the same time.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

This investment project will have a negligible effect on overall system reliability however the subdivision cable program will have a significant but undeterminable effect on overall system reliability. The investment will have a significant effect on the reliability for the customers served directly by the infrastructure. The housing project is large and many customers are affected by the cables in this development. Once the project is complete, the customers can expect to enjoy the reliability levels of the overall distribution system for another 40+ years.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

Cable replacements in duct are the most cost effective remediation for failing underground cable.

The replacement of the cable in duct ensures that any future cable failures are able to be readily dealt with. Cable replacement is done with existing cable in service while cable injection is done with the primary cable out of service thus cable replacement results in lower outage times for customers during construction. Cable replacement reduces overtime/callout and remediation costs associated with finding and repairing cable faults. Where cable faults occur under driveways or other pavements or in heavily rooted areas, repair times are often exceedingly long.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

Customers benefit from more reliable electrical service which leads to reduced costs for outages for the customer and reduced inconvenience due to power outages. As well, customer's lawns are disturbed one time for cable replacement instead of a series of excavations needed for cable repairs.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

Cable replacement will significantly improve reliability for customers served from the end-of-life cable.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

ENWIN considers cable injection as an alternate to cable replacement however no cable injection has been yet performed. Cable replacement is viewed as a preferable option and for the locations where cables have reached end-of-life, the cost to replace the cables has been the same as for injection. There may be locations however that due to impediments to excavation, it would be more advantageous to inject the cable rather than replace the cable and ENWIN reviews each situation to determine if injection would be a better option. There are no run-to-failure options. Generally, the cables that ENWIN plans for replacement have already experienced a number of failures that have been repaired. It is the avoidance of increasingly frequent failures that incents replacement.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

The safety improvement offered by new cable in comparison to end-of-life cable is marginal.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are no cyber security nor privacy issues related to cable replacement projects.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

This project has no opportunities for coordination with utilities, regional planning, 3rd party providers or industry. Cable replacement in duct provides for ease of future cable replacement. As well, should there be a cable fault in the future, it should be simpler to pull the offending cable from the duct and replace it than find the fault, excavate and splice the faulted piece and then backfill and restore the surface. This will avoid disturbance to the Customer's landscaping and will minimize outage time. The work will be done in conjunction with transformer replacements as the transformers are also at end of life. This will eliminate duplication of efforts should this be done at separate times.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

There are no environmental benefits associated with cable replacements. In past cable replacements, ENWIN has removed lead cable from the environment, where it was able to, and tested and disposed of any lead cable that contained PCB's. ENWIN does not have any more lead cable in service.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

• Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
• The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
• A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

There are no conservation and demand management initiatives that would affect cable replacement. projects.

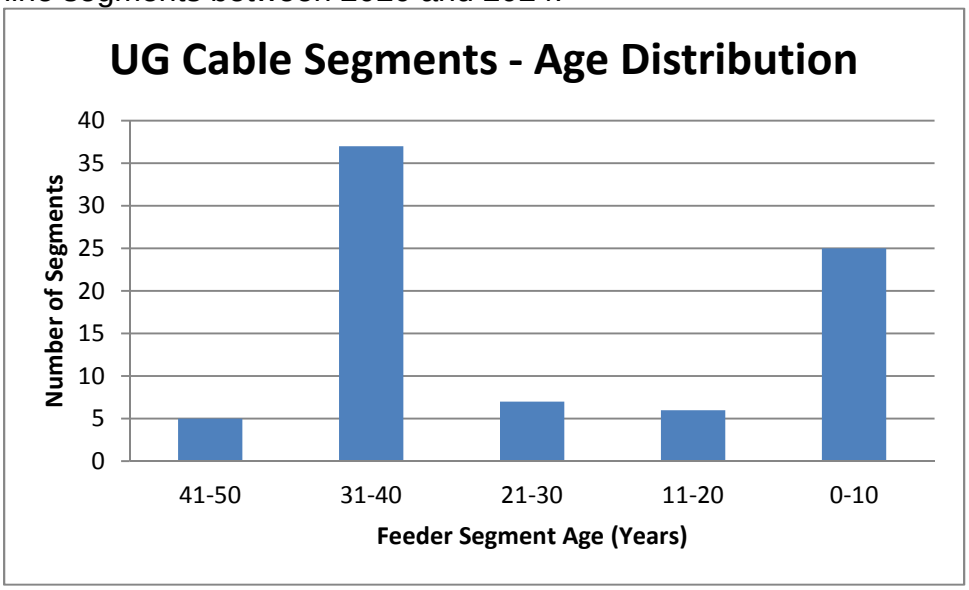
C. Category-Specific Requirements

System renewal – projects/programs in this category are driven by the relationship between the ability of an asset or asset system to continue to perform at an acceptable standard on a predictable basis and the consequences for customers served by the asset(s) of a deterioration of this ability (i.e. failure). A distributor's discretion over the timing and priority of projects in this category may lessen over time, such as where assets with high consequence of failure are consistently operating outside applicable operating limits. On the other hand, a distributor may have considerable discretion over timing and priority where deteriorating asset condition has little or no impact on performance and the consequences of an asset failure on customers and the system are relatively low.
A distributor's justification of each sustainment project/program must discuss these issues including (where applicable) but not restricted to:

Asset Performance-Related Targets

A description of the relationship between the characteristics of the assets targeted by a project and the consequences of asset performance deterioration or failure, referring to:
• The distributor's asset performance-related operational targets and asset lifecycle optimization policies and practices (i.e. filings in relation to sections 5.2.3 and 5.3.3)

The Kinectrics Asset Life study identified that direct buried, tree-retardant cross-linked polyethylene cable (TR-XLPE) had a useful life of 30 years and ducted TR-XLPE a life of 40 years. ENWIN switched to tree retardant cable in 1985 but direct buried cable until approximately 1990. ENWIN has 21 line segments that are pre-1985 and are non-TR and beyond their useful life. ENWIN also has 16 line segments that are post 1985 but pre-1990 and are also beyond their useful life. In accordance with risk management objectives noted in section 5.3.3 of this DSP, ENWIN plans to remediate these line segments between 2020 and 2024.



As noted in section 5.2.3 of this DSP, ENWIN's reliability performance target is to provide the degree of electricity service reliability that customers have come to expect, which is reflected by the 5-year average reliability statistics of SAIDI and SAIFI. The consequence of failure of this class of assets is that this reliability target will not be met.

Project Impacts

• The number of customers in each customer class potentially affected by a failure of the assets included in the project o Quantitative customer impacts (e.g. frequency or duration of interruptions or number of customers affected) with associated risk level(s)
• Qualitative customer impacts (e.g. customer satisfaction, customer migration) with associated risk level(s)
• The value of customer impact (e.g. high, medium, low) considering the characteristics of customers potentially affected by asset failure and the cost of failure

The customers affected by these projects will be primarily residential customers with some small commercial customers. In the 37 segments at end-of-life over the 2020-2024 period, there are approximately 3,100 customers. Cable failures in residential areas can be lengthy but are not necessarily associated with storm conditions. Provided the outage does not occur during storm conditions, when customers need sump pumps to work, the outage generally causes inconvenience. As outage times extend, the impact on customers increase. Generally, cable faults can be located, excavated and repaired inside of 12 hours which limits outage costs to customers. Once a cable has faulted however, that high fault current stresses the rest of the cable and further damages the already weak cable. It is a common experience that when a cable has experienced a number of faults, it can be damaged to the point where it will continue to fault despite repairs and will have to be replaced on a reactive, immediate basis. While customers are tolerant of an occasional outage, repeated outages and an inability to restore power in a reasonable time frame presents a high level of frustration to customers with ENWIN suffering reputational damage as customers conclude that ENWIN is not competent to maintain their power. Repeated cable repairs also result in repeated lawn and landscape damage, which customers find unacceptable.

Project Timing

Other factors that may affect the timing of the proposed project such as the pacing of investments and the priority relative to other projects

Project timing is predicated generally by the age of the segments, with oldest targeted first. However, the quantum of work is adjusted so that yearly expenditures are balanced so that affects on rates are minimized. For the Polonia Park project, there will be public meeting in late winter for an early spring start. Work should be finalized in time to obtain sod for restoration and to have it survive the winter, which generally means restoration by mid-October. This timing would be typical for most subdivision cable replacement projects.

O&M Cost Duplications

The consequences for system O&M costs, including the implications for system O&M of not implementing the project

Cable failures drive significant O&M cost as cables must be repaired as soon as possible in order to get customers' service restored and avoid costs to customers. In the long term, cables cannot be repaired indefinitely. As noted above, every cable fault further stresses the cable and contributes to a subsequent fault. The cable will reach a point where repairs will need to be done so frequently as to result in intolerable reliability for customers. Cable repairs are considered O&M expenses rather than capital investments. Where cables are deteriorated to the point where they suffer repeated and frequent faults, this increases O&M costs. These costs are sunk costs that do not decrease the inevitable capital replacement costs. If the project is not undertaken, ENWIN will be forced to continue to put increasing resources into maintaining service from these aging cables.

Reliability / Safety

The impact on reliability and safety factors

The replacement of the end-of-life cables will have a positive effect on reliability for customers served by those cables. There are generally no safety issues associated with cable failures.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing alternatives to the timing of the proposed project, highlighting the trade-offs between rate of expenditure and mitigation of the consequences of asset performance deterioration. Where the ranking of the proposed project relative to the alternatives has been adjusted to account for significant benefits and costs, the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

ENWIN tries to pace its cable replacement plans so that within a reasonable envelope of time, expenditures can be adjusted so that budgets are reasonably balanced. While customers are tolerant of occasional outages, they are not tolerant of increasingly frequent outages. Customers do make representations when they feel that the reliability of their electrical service is compromised. An alternative is to spread the work over 2 years to minimize rate impact. The actual rate impact however of spreading the work over 2 years is negligible and it would place the customers in the position of being subject to significant civil works and the associated inconvenience for two years rather than one. It is judged that customers would prefer to have the work completed within a one year time frame. Other benefits have been attributed to the project impact and these included the

avoidance of in-service failures and the associated inconvenience to customers and high level of O&M cost, as well as the opportunity to replace submersible transformers which are at end of life and have generally resulted in in-service failures wherever they have been used. ENWIN's policy is to try to replace submersible transformers with minipad transformers wherever possible. This too will be done as the design is finalized. Minipad transformers are easier to service and replace in the future and have been the standard for construction for many years. Where minipad transformers are not able to be used, ENWIN has changed its specification for submersible transformers to include a stainless steel tank to help limit corrosion. It is the corrosion of the existing mild steel transformer tanks that has resulted in premature in-service failures of many submersible transformers.

Additional Factors

Where the proposed project is a 'like for like' renewal but has been configured at extra cost to address other distributor planning objectives, an analysis of project benefits and costs must be provided comparing a) a project configured solely to meet the requirement; b) the proposed project; and c) technically feasible alternatives to the proposed project that meet the same objectives as the proposed project. Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

Generally, when cables are at end of life, the transformers are also close to end of life and are replaced at the same time. New TR-XLPE cable in duct will have approximately the same life expectancy as the transformers. Subdivision cable replacement projects are generally "like-for-like" replacement projects and generally do not offer the opportunity to effect any additional synergies for the distribution system. For the Polonia Park project, the goal is to simply replace the existing system with a system that will provide reliable service for the next 40 years.

A. General Information on the Project / Program

Investment Category			System Renewal
Project Name / Description			
Pole Sustainment Program			
Estimated Cost	Gross $3.3 M	Net $3.3 M	Change in O&M $0 /year

The following information is to be provided for any material project to support the quantum of the expenditure, timing, and contingencies associated with the project
- Total capital and, where applicable, (non-capitalized) O&M costs proposed for recovery in rates
- Any capital contributions made or forecast to be made to a transmitter with respect to a Connection and Cost Recovery Agreement. Details to be provided include: initial forecast used to calculate contribution, amount of contribution (if any), true-up dates and potential true-up payments.
- Related customer attachments and load, as applicable
- Start date, in-service date and expenditure timing over the planning horizon
- The risks to the completion of the project or program as planned and the manner in which such risks will be mitigated
- If not evident from Chapter 2 Appendix 2-AA, comparative information on expenditures for equivalent projects/programs over the historical period, where available
- Information on total capital and OM&A costs associated with REG investment, if any, included in a project/program; and a description of how the REG investment is expected to improve the system's ability to accommodate the connection of REG facilities.
- Where a proposed project within the five year forecast period requires Leave to Construct approval under Section 92 of the OEB Act, the applicant must provide a summary of the evidence, to the extent that it is available, for that project consistent with the requirements set out in Chapter 4 of these Filing Requirements (sections 4.3 and 4.4 in particular).

Start Date	2020-01-01
In-Service Date	2020-12-31
Customer Attachments	Varies
Load	Varies

Risks and Risk Mitigation

Assessment of Impact of Investment to Business Values

Business Values		Before				After				
		Consequence	Likelihood	Score	TRS	Consequence	Likelihood	Score	TRS	Comment
0.3	Safety	Moderate	Possible	34	10.2	Moderate	Rare	7	2.1	RISK OF HARM TO PEOPLE/PROPERTY UPON FAILURE
0.25	Reliability	Moderate	Possible	34	8.5	Moderate	Rare	7	1.75	RISK OF FEEDER OUT FOR 1-8 HOURS
0.25	Financial	Moderate	Possible	34	8.5	Moderate	Rare	7	1.75	RISK OF COSTS TO CUSTOMER/UTILITY <$100K
0.2	Sustainability	Moderate	Unlikely	17	3.4	Moderate	Rare	7	1.4	RISK OF ENVIRONMENTAL ISSUE - Tx OIL SPILL

CRBF Score is $155/ Risk Point Reduction

Expenditure Information & Timing	This program involves the replacement of EOL poles. Expenditures are spread evenly throughout the year with 25% of the planned investment completed quarterly.
REG Investment	Yes ☐ No ☒
Leave to Construct Approval	Yes ☐ No ☒

B. Evaluation Criteria and Information

The OEB evaluates material investments based on the outcomes set out in section 5.0.2. Efficiency, customer value, reliability and safety are the primary criteria for evaluating any material investment. The OEB's investment evaluation criteria and the qualitative or quantitative evidence that a distributor can use to demonstrate that an investment is consistent with these criteria are set out below.

Efficiency, Customer Value, Reliability

(a) Main Drivers

Identify the main driver (trigger) of the project/program, and where applicable any secondary drivers. Identify related objectives and/or performance targets, and by reference to the distributor's asset management process (section 5.3.1), the source and nature of the information used to justify the investment.

ENWIN is primarily an overhead distribution utility and it relies on its overhead infrastructure to deliver value to its customers. In order to reliably deliver value to its customers ENWIN replaces its end-of-life (EOL) poles. ENWIN has a pole inspection program whereby it annually tests 1/3 of its poles to determine their fitness to remain in service, as noted in the description of ENWIN's Asset Management System in section 5.3.1. As per current industry practise, when the remaining strength of a pole is determined to be 80% or less, that pole is flagged for action and is put on a list of poles that are nearing EOL and are candidates for replacement within the next 5 years. The drivers of this program address customer preferences for safety and reliability and reduce customer's costs associated with outages. The proactive replacement of end of life poles is intended to eliminate in-service failure of poles because of deteriorating condition.

ENWIN conducts regular inspections of its poles for condition and fitness to remain in-service. These inspections are analyzed and inform the development of plans to ensure the safe and reliable distribution of power to customers.

(b) Planning for Performance

Demonstrate good utility practice in reliability planning through designing a resilient distribution system that addresses existing reliability performance concerns and is capable of adapting to future challenges (e.g. grid modernization and climate change)

Poles are the primary structures upon which the ENWIN electrical distribution system is constructed. The in-service failure of a pole presents both a safety hazard to the public and a disruption of service to customers. Without sound poles, the reliability of the distribution system is compromised. In order to maintain the reliability with which ENWIN's customers have become accustomed and with which they have stated, during ENWIN's customer engagement sessions, their need and desire to maintain, ENWIN must ensure the ongoing health of the poles supporting the distribution system. In planning for replacement of poles, ENWIN determines whether there are poles in the vicinity of the pole under review to determine whether or not there are opportunities to perform the replacement in a more efficient fashion. It is common that when a street if first constructed, all the poles are installed at the same time and if a few poles on the street are in poor condition, it is likely that the other poles may be very close to that condition. In those cases, it is more cost effective and less disruptive for customers to replace all the poles on the street at the same time. Similarly, if the pole in consideration is in a location that was prior identified for another project (i.e. road widening, capacity upgrade, etc.) it may be more cost effective to delay that pole replace for a few years until the replacement can be done and satisfy another purpose.

(c) Priority

Indicate the priority of the investment relative to others, giving reasons for assigning this priority that clearly reflect the distributor's approach to identifying, selecting, prioritizing and pacing projects in each investment category described in response to section 5.4.1.

At present, ENWIN has over 2,500 poles that have been flagged for action within its pole database. In order to determine what poles should be replaced and when, a number of considerations are used to rank the general order in which the poles should be considered for replacement. Initially, poles are rank ordered in relation to their inspection asset health scores with the poles in the poorest shape planned for first replacements. Any poles identified as "dangerous poles" – at high risk of failing in service within a year, are given top priority. Thereafter, poles are considered in their rank order per their health indexes. Remaining poles are plotted on a GIS map that is annotated to show locations of other projects that may influence the priority of the pole replacement. Poles that are observed to be in a location earmarked for another project are prioritized to be replaced in conjunction with that other project. Poles that are near to other poles that are also flagged for action are field checked against nearby poles to determine if other poles on the street or in the neighbourhood are also very close to EOL. If so, a "project" is conceived so that all the poles on a street or other boundary are replaced at the same time so that the work may be done less expensively and with less customer disruption. The Kinectrics Asset Condition Assessment study suggests that ENWIN should replace approximately 600 – 700 poles per year to ensure that reliability of the distribution system remains at the same level currently demanded by ENWIN customers. Allowing for poles that may be replaced for other reasons, ENWIN ranks approximately the next 500-600 poles in accordance with their risk profile.

With a similar health score, it is assumed that these poles have approximately the same likelihood of failure. Thereafter the consequence of pole failure is considered. Poles close to the station that fail will have a higher impact on customers than the last pole on the circuit. Poles that support more than one feeder have higher consequences of failure as do poles with attached equipment on them such as transformers and switches. Once these poles are rank ordered, then engineering work begins to create designs and work orders for the replacement work. ENWIN budgets at a high level to complete approximately 500-600 poles per year. When the work order estimates reach those levels, then any remaining poles are deferred to the following annual work identification cycle. ENWIN monitors the number of poles that become flagged for action each year in order to determine whether or not the quantum of replacement is keeping pace with the rate of deterioration of the poles. If the flagged for action pole numbers are increasing then ENWIN will consider allocating a larger portion of its renewal budget to pole replacement and if it's decreasing, may consider shifting budget allocation away from poles to another asset category that requires attention.

ENWIN quantified the benefit of risk avoidance in its use of the PROSORT tool to rank investments as described in section 5.4.1 (b) of this DSP. A total of 23.6 risk points were assigned for risk reduction in the areas of safety, reliability, customer outage cost avoidance and sustainability. Additionally, 15.1 points were assigned for avoidance of in-service failures and for the creation of synergies with other projects, for a total of 38.7 and a CRBF of $155/point. This places the pole replacement program at the top of the non-mandatory priority list in the PROSORT ranking.

(d) Quantitative / Qualitative Analyses

For each project and project alternative provide the following quantitative and/or qualitative analyses on the design, scheduling, funding and/or ownership options (e.g. whole or part ownership solely by or jointly with 3rd parties):

ENWIN has budgeted $3.35 M in 2020 and each year thereafter for pole replacement, including $50k for reactive pole replacement. ENWIN judges this amount to be sufficient to sustain the current level of health of its pole infrastructure. Where ENWIN has infrastructure on Bell poles, ENWIN inspects those poles and if in ENWIN's judgment, the determination of the pole's remaining strength is below 80% then ENWIN will advise Bell that the pole should be replaced. Bell will undertake the pole replacement in accordance with the Joint Use Agreement between ENWIN and Bell.

Cost Effectiveness

The effect of the investment on system operation efficiency and cost effectiveness

ENWIN cannot operate its distribution system without poles that are capable of fulfilling their function and providing value to customers. When poles fail in service there is a risk of harm to the public which is considered unacceptable. As well, when a pole fails in service it is always much more costly to effect its replacement on an emergency basis than for a planned project. Additionally, poles will not generally fail in service on "blue sky" days but will withstand normal service loads for a number of years. However, if poles are allowed to deteriorate and be replaced upon failure, it is likely that when a significant weather event occurs, many poles with fail at once. In that type of a situation, ENWIN's customers will potentially be without power not for hours, but for days while limited crew resources try to cope with multiple failure locations. Additionally, if pole replacements are not planned with a view to taking advantage of synergies then replacement costs will ultimately be higher.

Net Customer Benefits

The net benefits accruing to customers as a result of the investment

Poles are critical infrastructure elements upon which the reliability of the distribution system is founded. Poles are key to delivering value to customers. Planning for pole replacement not only maximizes that value but minimizes the cost and reduces the effect on rates which pole replacement has. Additionally, when pole replacements are planned, not only can outage time be minimized (generally to the time to move services to the new poles) but customers can plan for the outage time that will be necessary to effect the replacement and thus minimize the inconvenience of the outage to the customer.

Impact On Reliability

The impact of the investment on reliability performance including on the frequency and duration of outages

As prior noted, capable poles are key to the reliability of the distribution system. ENWIN does not keep statistics on how many outages are caused by in-service pole failures or what precipitated those in-service failures. Anecdotally, it is known that newer, stronger poles are better able to withstand severe stressors such as ice loading, wind loading, and heavy tree contacts. Consequently, healthy poles will reduce the frequency and duration of outages for customers thus satisfying customer's stated preferences for safety and reliability.

Alternatives Considered

Where alternatives have been considered and the ranking of a proposed project relative to alternatives has been affected by the assessment of benefits and costs, these benefits and costs should be described and explained in relation to the proposed project and alternatives.
Where a distributor's choices for technical design, component characteristics, how the work is carried out, etc., have been affected by a decision to configure a project to meet both a trigger driver and secondary drivers, the effect on costs and benefits must be explained.

ENWIN considered a run-to-failure alternative and rejected it for the reasons mentioned above – that it is much more likely to have multiple failures at the same time if poles are allowed to deteriorate and there is a higher likelihood of a cascading failure where the failure of one pole in a line pulls down the next pole and the next pole until many poles in a line have all failed. ENWIN also considered the use of pole trusses as a means of effecting a semi-permanent repair of poles decayed at the ground line. This alternative is noted by the manufacturer to be most cost effective on poles that are 60' and taller while most of ENWIN's poles are 55' or less. As well, the pole truss' cost approximately 1/3 the cost of a pole replacement – which would be required in any event. The pole truss also transfers load to the part of the pole which is below ground line and buried. Pole truss technology assumes that the balance of the buried part of the pole is sound however there is neither testing nor guarantee that is the case. ENWIN judges that it is more cost effective to replace deteriorated EOL poles than use pole trusses.

Safety

Provide information on the effect of the investment on health and safety protections and performance for both the utility and the public.

In-service failures of poles present significant risk of harm to people and property. Poles are generally located beside roadways and a pole falling into a roadway where traffic moving at speed may contact the pole or be hit by the pole is a significant risk. Poles weigh thousands of pounds and are able to do significant harm. Poles in alleys are typically surrounded by sheds and other customer constructions which would suffer significant damage upon an in-service pole failure. Not only does the falling of the pole present a risk of harm but also the electrical infrastructure which is attached to the pole will fall as well. This infrastructure will be live when it falls and will present an electrical hazard to everything it touches. While protections will minimize the risk, there will be a reclosing of the protection in order to try to restore the circuit and the reclosing re-presents the risk of harm. Additionally, where an oil-filled transformer is on the pole there is a high likelihood that the transformer will rupture and an oil spill will ensue. Where poles are adjacent to roadways, there is then a likelihood that the oil in the transformer will find its way to a storm sewer and present an environmental contamination event.

Cyber Security, Privacy

Where applicable, provide information showing that the investment conforms to all applicable laws, standards and good utility practices pertaining to customer privacy, cyber security and grid protection. Cyber security is expected to be incorporated into the distributor's risk management decision making and investment planning to form part of its business plans and DSP.

There are no cyber security nor privacy issues related to pole sustainment.

Coordination, Interoperability

a) Where applicable, explain how the investment reflects co-ordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. b) Describe how the investment potentially enables future technological functionality and/or addresses future operational requirements.

As noted earlier, where opportunities present, ENWIN will try to coordinate its pole replacements with another purpose so that costs are reduced and benefits maximized. Generally, pole replacement projects do not present opportunities for coordination with utilities, regional planning, and/or links with 3rd party providers and/or industry. Pole replacement represents a like-for-like replacement of end of life poles and does not present opportunity to enable future technologies nor address future operational requirements. ENWIN does conduct reviews during the design process to identify any

opportunities to allow for any future requirements for additional capacity through perhaps adding height to accommodate another feeder or increasing conductor size. Additionally, ENWIN occasionally finds locations where requirements and/or configuration has changed and will eliminate rather than replace a section of line. Where possible, ENWIN will try to accommodate a customer request to locate a replacement pole in a different location near or on their property than originally set. Finally, where a pole line is replaced, ENWIN will review operational requirements to determine if additional switches are warranted on the section to be replaced.

Environmental Benefits

Where applicable, describe the effect of the investment on the use of clean technology, conservation and more efficient use of existing technologies.

ENWIN uses both wood and concrete poles in specific applications. ENWINs wood poles are treated with the newest wood preservatives that are less harmful to the environment than the poles that they replace, which are generally treated with creosote. When ENWIN removes concrete poles the poles are broken up and the aggregate recycled.

Conservation and Demand Management

Where applicable, describe incremental conservation initiatives, over and above those established in cooperation with the IESO, to defer or avoid future infrastructure projects. For proposed distribution rate funded CDM programs the following details are required:

- Where measurable, an assessment of the benefits of the project for customers in terms of cost impacts to customers
- The number of years the proposed CDM program would be in place and the number of years that the required infrastructure would be deferred
- A description of how advanced technology has been incorporated into the project (if applicable), including how standards relating to interoperability and cybersecurity have been met

When poles are replaced, it is common to replace the equipment on the poles at the same time. In the case of transformers, if the transformers are also at or near EOL they will be replaced at the same time as the pole. This presents the opportunity to replace the transformer with a more efficient transformer and potentially a smaller capacity transformer if the customer's demand warrants a downsize of the transformer. These items have the potential to reduce losses on the distribution system.

C. Category-Specific Requirements

System renewal – projects/programs in this category are driven by the relationship between the ability of an asset or asset system to continue to perform at an acceptable standard on a predictable basis and the consequences for customers served by the asset(s) of a deterioration of this ability (i.e. failure). A distributor's discretion over the timing and priority of projects in this category may lessen over time, such as where assets with high consequence of failure are consistently operating outside applicable operating limits. On the other hand, a distributor may have considerable discretion over timing and priority where deteriorating asset condition has little or no impact on performance and the consequences of an asset failure on customers and the system are relatively low.

A distributor's justification of each sustainment project/program must discuss these issues including (where applicable) but not restricted to:

Asset Performance-Related Targets

A description of the relationship between the characteristics of the assets targeted by a project and the consequences of asset performance deterioration or failure, referring to:

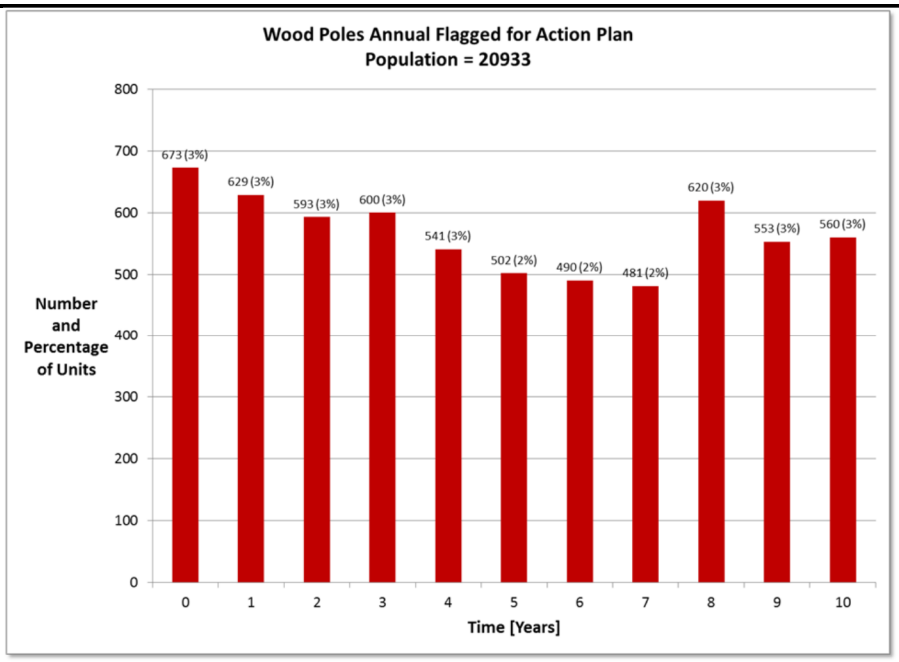
- The distributor's asset performance-related operational targets and asset lifecycle optimization policies and practices (i.e. filings in relation to sections 5.2.3 and 5.3.3)

ENWIN's pole sustainment program is targeted at poles near EOL. The intention of the program is to enable ENWIN to maintain the level of reliability with which its customers have come to expect and have stated that they need and desire. As per section 5.3.3 of this DSP, ENWIN's pole sustainment philosophy is to pro-actively maintain poles and avoid in-service failures. It does this through a combination of O&M activities to inspect poles and re-apply wood preservatives to the interior of the pole and replacement of poles at the optimum point in their life cycle. This enables ENWIN to meet the reliability goals desired by its customers and as described in section 5.2.3 of this DSP.

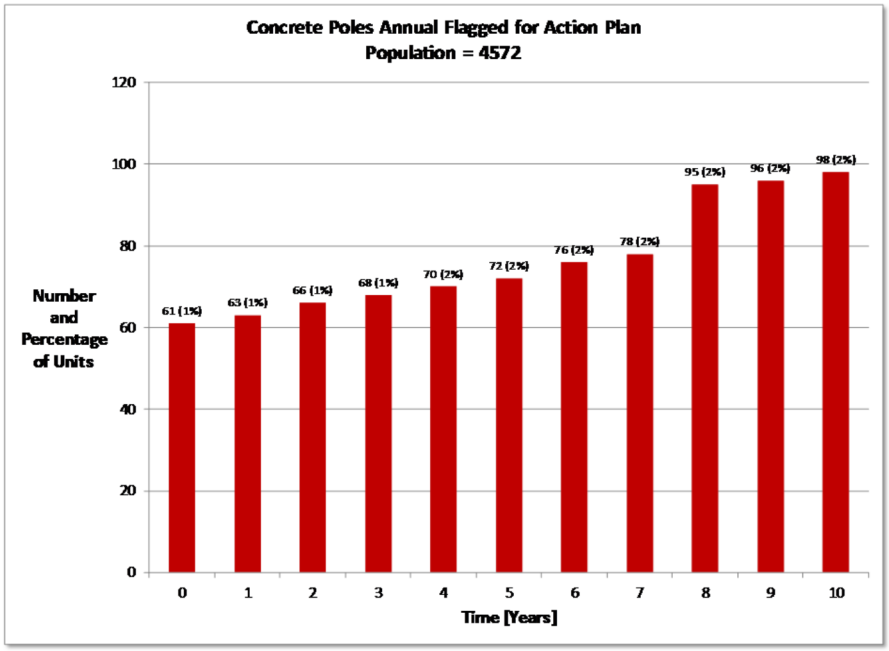
Condition of Assets

Information on the condition of the assets relative to the typical life-cycle and performance record of the assets targeted by the project

Kinectrics assessed the condition of ENWIN's wood poles and identified the following in terms of assets flagged for action:



For concrete poles, Kinectrics identified the following for action:



In Kinectric's report to the OEB on the expected life of assets, the life expectancy for poles was 45 years for wood poles and 60 years for the typical useful life of concrete poles. In ENWIN's territory, concrete poles are generally only used on arterial roadways which are heavily salted during the winter time. This caused premature deterioration of the concrete in the poles and consequently concrete pole life is closer to that of wood poles. ENWIN has identified some treatments which appear promising with respect to their ability to penetrate the concrete, bond with the reinforcing steel and prevent it from corroding and spalling the concrete.

Project Impacts

• The number of customers in each customer class potentially affected by a failure of the assets included in the project o Quantitative customer impacts (e.g. frequency or duration of interruptions or number of customers affected) with associated risk level(s)
• Qualitative customer impacts (e.g. customer satisfaction, customer migration) with associated risk level(s)
• The value of customer impact (e.g. high, medium, low) considering the characteristics of customers potentially affected by asset failure and the cost of failure

The number of customers affected by an in-service failure depends upon the number of customers downstream of the pole. At the highest, ENWINs 56M8 carries 7,000 customers while at the lower end, a pole could be used on a road crossing service and serve a single customer. Poles serve all customers and the impact of a failure could be negligible for a single residential customer to very impactful for a large group of residential customers whose sump pumps stop working during a storm. Impacts of failure/outage for commercial customers is generally greater and could be very significant for ENWIN's industrial base. ENWIN's service territory includes a higher proportion of manufacturing based customers than other utilities and those customers are extremely sensitive to power interruptions. For those commercial customers, service interruptions are very costly. Some industrial customers regularly call to complain whenever there is any sort of interruption, including a momentary on their supply as reliable power is critical to the operation of their plant. Once an interruption occurs, regardless that it may last less than a second, the plant is shut down and it takes hours to reinstate production. These customers place a high value on service reliability. Occasionally commercial customers have threatened to move their businesses outside the ENWIN territory to the adjacent rural county service territories however the level of service reliability is generally worse than that available at ENWIN.

Project Timing

Other factors that may affect the timing of the proposed project such as the pacing of investments and the priority relative to other projects

The poles sustainment program was evaluated using the PROSORT tool from the perspective of doing the "next pole". The program scores very highly with a CRBF score of $155/risk point reduction. This is an expected result as the poles are critical infrastructure to a utility and it is expected that a high score would result. Project timing is affected only insofar as projects that are identified as beneficial to proceed with a project that will satisfy an additional intent may be accelerated or delayed in order to achieve the outcome of the additional intent and hence save costs.

O&M Cost Duplications

The consequences for system O&M costs, including the implications for system O&M of not implementing the project

There is generally little change in O&M costs with pole renewal. Most of the O&M costs associated with poles is related to their inspection and testing and this continues with new poles.

Reliability / Safety

The impact on reliability and safety factors

An EOL pole presents a significant safety hazard as compared to a new pole. Additionally, an in-service failure of a pole creates a significant impact on reliability for customers served by that pole. As noted earlier and in accordance with good utility practise, ENWIN flags for action any pole whose remaining strength has been determined at 80% of original strength or less and flags for action in the current year any pole with a remaining strength of 67% or less.

Cost-Benefit Analysis

An analysis of project benefits and costs comparing alternatives to the timing of the proposed project, highlighting the trade-offs between rate of expenditure and mitigation of the consequences of asset performance deterioration. Where the ranking of the proposed project relative to the alternatives has been adjusted to account for significant benefits and costs, the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

Occasionally a pole line with some poles that are in a somewhat deteriorated condition will have the replacement of those poles delayed so that the remaining poles in the line get to the point where the majority of them reach end of life. This would be considered where that pole line has been identified to be replaced with a high capacity feeder. In that case, replacing single poles may not facilitate the eventual conversion of the feeder to a high capacity feeder. If the sustainment work is delayed somewhat so that the majority of the poles are at end of life, then upgrading the capacity of the whole pole line can proceed with a minimal cost associated with the increased capacity. This opportunity to

create synergies with other drivers increases the PROSORT risk model points for a specific project.

Another trade-offs between rate of expenditure and mitigation of the consequences of asset performance deterioration ENWIN makes is with regard to its efforts to extend the full useful life of its pole assets. In 2017 ENWIN began drilling its poles at age 20 and injecting additional preservative into the core of the pole across the most vulnerable ground line point in order to extend pole life. In the past, this was only done when there was evidence of core rot already present. In addition, ENWIN has piloted several concrete pole patch offerings and is applying a topical reinforcing rod anti-corrosion treatment to extend concrete pole life. By extending the useful life of its poles, ENWIN anticipates long term cost reductions for its customers with no reduction in levels of safety or reliability.

Additional Factors

Where the proposed project is a 'like for like' renewal but has been configured at extra cost to address other distributor planning objectives, an analysis of project benefits and costs must be provided comparing a) a project configured solely to meet the requirement; b) the proposed project; and c) technically feasible alternatives to the proposed project that meet the same objectives as the proposed project. Where the ranking of the proposed project relative to alternatives has been adjusted to account for significant benefits and costs the value of which cannot readily be quantified, these should be described and explained in relation to the proposed project and all alternatives.

The project benefits associated with upgrading the capacity of a pole line in conjunction with a line renewal are manifold and described in other sections of this DSP. In the majority of instances of pole replacements, the replacement is configured as a like-for-like replacement.

ATTACHMENT 2 – B

Fixed Asset Continuity Schedules, Board Appendix 2-BA

File Number:	EB-2019-0032
Exhibit:	29/01/2019
Tab:	kc
Schedule:	
Page:	
Date:	29/03/2019

Appendix 2-BA

Fixed Asset Continuity Schedule [1]

Accounting Standard CGAAP
Year **2009**

			Cost				Accumulated Depreciation				
CCA Class [2]	**OEB Account [3]**	**Description [3]**	**Opening Balance**	**Additions [4]**	**Disposals [6]**	**Closing Balance**	**Opening Balance**	**Additions**	**Disposals [6]**	**Closing Balance**	**Net Book Value**
	1609	Capital Contributions Paid				$ -				$ -	$ -
12	1611	Computer Software (Formally known as Account 1925)	$ 13,196,363	$ 26,205	-$ 20,780	$ 13,201,788	-$ 11,801,258	-$ 364,156	-$ 243,974	-$ 12,409,388	$ 792,400
CEC	1612	Land Rights (Formally known as Account 1906)	$ 30,889	$ -	$ -	$ 30,889	$ -	$ -	$ -	$ -	$ 30,889
N/A	1805	Land	$ 103,435	$ -	-$ 2,915	$ 100,519	$ -	$ -	$ -	$ -	$ 100,519
47	1808	Buildings	$ 63,857	$ -	$ 25,416	$ 89,273	-$ 14,567	-$ 6,934	-$ 29,409	-$ 50,910	$ 38,363
13	1810	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1815	Transformer Station Equipment >50 kV	$ 30,250,671	$ 477,099	-$ 409,878	$ 30,317,891	-$ 5,623,100	-$ 818,269	$ 136,232	-$ 6,305,136	$ 24,012,755
47	1820	Distribution Station Equipment <50 kV	$ 2,334,680	$ -	-$ 1,148	$ 2,333,532	-$ 1,040,287	-$ 81,120	$ 482	-$ 1,120,925	$ 1,212,607
47	1825	Storage Battery Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1830	Poles, Towers & Fixtures	$ 74,752,831	$ 3,712,103	-$ 28,865	$ 78,436,069	-$ 24,082,924	-$ 3,381,411	$ 71,290	-$ 27,393,045	$ 51,043,025
47	1835	Overhead Conductors & Devices	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1840	Underground Conduit	$ 67,493,417	$ 1,319,183	-$ 38,514	$ 68,774,086	-$ 26,543,622	-$ 3,165,847	$ 10,947	-$ 29,698,523	$ 39,075,563
47	1845	Underground Conductors & Devices	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1850	Line Transformers	$ 50,686,043	$ 2,288,695	$ 391,734	$ 53,366,473	-$ 17,809,323	-$ 2,638,467	$ 4,516	-$ 20,443,274	$ 32,923,199
47	1855	Services (Overhead & Underground)	$ 851,996	$ 1,169,832	$ -	$ 2,021,827	-$ 17,217	-$ 51,386		-$ 68,602	$ 1,953,225
47	1860	Meters	$ 8,340,339	$ 208,940	-$ 2,259	$ 8,547,019	-$ 3,219,210	-$ 404,743	$ 42,043	-$ 3,581,910	$ 4,965,109
47	1860	Meters (Smart Meters)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
N/A	1905	Land	$ 1,322,514	$ -	$ -	$ 1,322,514	$ -	$ -	$ -	$ -	$ 1,322,514
47	1908	Buildings & Fixtures	$ 21,307,844	$ 114,614	$ 38,896	$ 21,461,354	-$ 3,661,867	-$ 446,383	-$ 11,780	-$ 4,120,031	$ 17,341,323
13	1910	Leasehold Improvements	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1915	Office Furniture & Equipment (10 years)	$ 1,344,042	$ 91,672	-$ 5,898	$ 1,429,816	-$ 924,841	-$ 90,676	$ 5,668	-$ 1,009,850	$ 419,966
8	1915	Office Furniture & Equipment (5 years)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	1920	Computer Equipment - Hardware	$ 1,245,407	$ -	$ -	$ 1,245,407	-$ 1,245,407	$ -	$ -	-$ 1,245,407	$ -
45	1920	Computer Equip.-Hardware(Post Mar. 22/04)	$ 789,719	$ -	$ -	$ 789,719	-$ 619,167	-$ 71,206	$ -	-$ 690,373	$ 99,347
45.1	1920	Computer Equip.-Hardware(Post Mar. 19/07)	$ 934,403	$ 424,464	-$ 5,187	$ 1,353,680	-$ 725,411	-$ 182,925	$ 271,053	-$ 637,283	$ 716,397
10	1930	Transportation Equipment	$ 2,621,735	$ 501,853	$ 5,997	$ 3,129,585	-$ 1,779,944	-$ 144,078	-$ 6,461	-$ 1,930,482	$ 1,199,103
8	1935	Stores Equipment	$ 24,072	$ -	-$ 2,653	$ 21,420	-$ 18,671	-$ 1,039	$ 2,653	-$ 17,058	$ 4,362
8	1940	Tools, Shop & Garage Equipment	$ 476,553	$ 10,975	-$ 25,061	$ 462,467	-$ 372,190	-$ 28,924	$ 24,483	-$ 376,630	$ 85,837
8	1945	Measurement & Testing Equipment	$ 362,110	$ -	-$ 9,819	$ 352,291	-$ 319,769	-$ 10,535	$ 9,725	-$ 320,579	$ 31,712
8	1950	Power Operated Equipment	$ 15,143	$ -	-$ 2,503	$ 12,639	-$ 14,720	-$ 124	$ 2,503	-$ 12,340	$ 299
8	1955	Communications Equipment	$ 116,840	$ 196,768	-$ 84,173	$ 229,434	-$ 84,146	-$ 9,179	$ 79,157	-$ 14,168	$ 215,267
8	1955	Communication Equipment (Smart Meters)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	1960	Miscellaneous Equipment	$ 2,301,626	$ 165,589	-$ 22,519	$ 2,444,695	-$ 1,084,622	-$ 211,321	$ 23,342	-$ 1,272,600	$ 1,172,095
47	1970	Load Management Controls Customer Premises	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

47	1975	Load Management Controls Utility Premises	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1980	System Supervisor Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1985	Miscellaneous Fixed Assets	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1990	Other Tangible Property	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
47	1995	Contributions & Grants	-$ 11,399,979	-$ 551,053	$ -	-$ 11,951,032	$ 1,797,038	$ 462,612	$ -	$ 2,259,650	-$ 9,691,382
47	2440	Deferred Revenue[5]	$ 192,381	$ -	$ -	$ 192,381	-$ 126,652	-$ 40,077	$ -	-$ 166,729	$ 25,651
			0	0	0	$ -				$ -	$ -
		Sub-Total	**$ 269,758,929**	**$ 10,156,939**	**-$ 200,130**	**$ 279,715,738**	**-$ 99,331,879**	**-$ 11,686,185**	**$ 392,471**	**-$ 110,625,593**	**$ 169,090,145**
		Less Socialized Renewable Energy Generation Investments (input as negative)				$ -				$ -	$ -
		Less Other Non Rate-Regulated Utility Assets (input as negative)				$ -				$ -	$ -
		Total PP&E	**$ 269,758,929**	**$ 10,156,939**	**-$ 200,130**	**$ 279,715,738**	**-$ 99,331,879**	**-$ 11,686,185**	**$ 392,471**	**-$ 110,625,593**	**$ 169,090,145**
		Depreciation Expense adj. from gain or loss on the retirement of assets (pool of like assets), if applicable[6]									
		Total						**-$ 11,686,185**			

10		Transportation
8		Stores Equipment

Less: *Fully Allocated Depreciation*	
Transportation	-$ 144,078
Stores Equipment	-$ 1,039
Net Depreciation	-$ 11,541,069

Notes:

1 Tables in the format outlined above covering all fixed asset accounts should be submitted for the Test Year, Bridge Year and all relevant historical years. At a minimum , the applicant must provide data for the earlier of: 1) all historical years back to its last rebasing; or 2) at least three years of historical actuals, in addition to Bridge Year and Test Year forecasts.

2 The "CCA Class" for fixed assets should agree with the CCA Class used for tax purposes in Tax Returns. Fixed Assets sub-components may be used where the underlying asset components are classified under multiple CCA Classes for tax purposes. If an applicant uses any different classes from those shown in the table, an explanation should be provided. (also see note 3).

3 The table may need to be customized for a utility's asset categories or for any new asset accounts announced or authorized by the Board.

4 The additions in column (E) must not include construction work in progress (CWIP).

5 Effective on the date of IFRS adoption, customer contributions will no longer be recorded in Account 1995 Contributions & Grants, but will be recorded in Account 2440, Deferred Revenues.

6 The applicant must ensure that all asset disposals have been clearly identified in the Chapter 2 Appendices for all historic, bridge and test years. Where a distributor for general financial reporting purposes under IFRS has accounted for the amount of gain or loss on the retirement of assets in a pool of like assets as a charge or credit to income, for reporting and rate application filings, the distributor shall reclassify such gains and losses as depreciation expense, and disclose the amount separately.

ATTACHMENT 2 – C

Capital Expenditure Summary, Board Appendix 2-AB

File Number:	EB-2019-0032
Exhibit:	12/04/2019
Tab:	kc
Schedule:	
Page:	
Date:	15/04/2019

TO BE UPDATED AT THE DRAFT RATE ORDER STAGE

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

First year of Forecast Period:
2020

CATEGORY	Historical Period (previous plan[1] & actual)																															Forecast Period (planned)				
	2009			2010			2011			2012			2013			2014			2015			2016			2017			2018			2019			2020	2021	2022	2023	2024
	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Forecast	Var	Plan	Forecast	Var					
	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000				
System Access	2,876	1,608	-44.1%	15,061	8,443	-43.9%	5,187	5,099	-1.7%	5,097	5,870	15.2%	3,079	4,903	59.2%	6,638	4,363	-34.3%	6,258	2,762	-55.9%	3,638	3,946	8.5%	3,325	3,963	19.2%	5,269	3,310	-37.2%	7,267	7,267	0.0%	6,205	3,476	3,526	3,577	3,628
System Renewal	6,789	7,848	15.6%	6,380	6,921	8.5%	8,874	8,133	-8.4%	9,483	7,569	-20.2%	10,766	8,126	-24.5%	8,109	6,952	-14.3%	6,719	8,221	22.4%	5,501	5,475	-0.5%	6,883	5,456	-20.7%	6,482	5,586	-13.8%	7,289	7,289	0.0%	8,440	8,009	7,605	7,850	7,366
System Service	604	253	-58.1%	173	26	-85.0%	910	727	-20.1%	904	983	8.7%	1,645	1,304	-20.7%	2,643	2,594	-1.9%	6,363	6,433	1.1%	5,196	2,931	-43.6%	5,979	3,976	-33.5%	6,135	4,427	-27.8%	4,221	4,221	0.0%	3,537	3,622	3,610	3,986	3,623
General Plant	8,965	8,067	-10.0%	12,635	9,453	-25.2%	17,123	3,725	-78.2%	3,698	2,660	-28.1%	8,985	4,680	-47.9%	6,387	4,885	-23.5%	3,273	3,499	6.9%	5,369	2,253	-58.0%	4,652	2,058	-55.8%	2,399	3,098	29.1%	7,507	7,507	0.0%	5,021	4,283	3,856	4,174	4,213
TOTAL EXPENDITURE	19,234	17,776	-7.6%	34,249	24,843	-27.5%	32,094	17,684	-44.9%	19,182	17,082	-10.9%	24,475	19,013	-22.3%	23,777	18,794	-21.0%	22,613	20,915	-7.5%	19,704	14,605	-25.9%	20,839	15,453	-25.8%	20,285	16,421	-19.0%	26,284	26,284	0.0%	23,203	19,390	18,597	19,587	18,830
Capital Contributions	-	- 520	--	-	- 224	--	-	- 321	--	-	- 1,496	--	-	- 757	--	- 3,131	- 2,403	-23.3%	- 3,485	- 4,322	24.0%	- 1,874	- 412	-78.0%	- 1,234	- 2,217	79.7%	- 2,921	- 1,889	-35.3%	- 4,898	- 4,897	0.0%	- 3,252	- 813	- 823	- 834	- 844
Net Capital Expenditures	19,234	17,255	-10.3%	34,249	24,619	-28.1%	32,094	17,362	-45.9%	19,182	15,587	-18.7%	24,475	18,257	-25.4%	20,646	16,391	-20.6%	19,128	16,592	-13.3%	17,830	14,194	-20.4%	19,605	13,236	-32.5%	17,364	14,533	-16.3%	21,386	21,387	0.0%	19,951	18,577	17,774	18,753	17,986
System O&M	$ 5,309	$ 4,956	-6.6%	$ 5,515	$ 4,754	-13.8%	$ 5,134	$ 4,252	-17.2%	$ 4,434	$ 4,157	-6.2%	$ 4,729	$ 4,229	-10.6%	$ 4,332	$ 4,460	3.0%	$ 4,518	$ 4,398	-2.7%	$ 4,764	$ 4,631	-2.8%	$ 8,813	$ 9,757	10.7%	$ 9,488	$ 9,825	3.6%	$ 10,942	$ 10,943	0.0%	$ 10,904	$ 11,049	$ 11,068	$ 11,102	$ 11,096

Notes to the Table:
1. Historical "previous plan" data is not required unless a plan has previously been filed. However, use the last Board-approved, at least on a Total (Capital) Expenditure basis for the last cost of service rebasing year, and the applicant should include their planned budget in each subsequent historical year up to and including the Bridge Year.

2. Indicate the number of months of 'actual' data included in the last year of the Historical Period (normally a 'bridge' year):

Explanatory Notes on Variances (complete only if applicable)

Notes on shifts in forecast vs. historical budgets by category

Notes on year over year Plan vs. Actual variances for Total Expenditures

Notes on Plan vs. Actual variance trends for individual expenditure categories

ATTACHMENT 2 – D

Capital Projects Table, Board Appendix 2-AA

File Number:	EB-2019-0032
Exhibit:	23/10/2018
Tab:	kc
Schedule:	
Page:	
Date:	29/03/2019

Appendix 2-AA
Capital Projects Table

Projects	2009	2010	2011	2011	2012	2013	2014	2015	2016	2017	2018	2019 Bridge Year	2020 Test Year
Reporting Basis	**CGAAP**	**CGAAP**	**CGAAP**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**	**MIFRS**
System Access													
Overhead customer connections	517,019	536,232	475,238	475,238	358,751	561,507	738,242	859,451	881,637	464,048	515,000	525,000	535,500
Underground customer connections	317,524	219,646	318,004	318,004	543,922	943,511	322,463	682,178	1,107,193	1,269,433	1,100,000	750,000	525,000
Bridge Plaza	-	-	-	-	-	-	-	128,336	1,067,769	1,050,168	550,000	1,700,000	1,000,000
Windsor-Essex Parkway	-	-	599,974	599,974	1,307,485	2,252,949	2,504,867	706,675	- 9,320	-	-	-	-
City driven road work	532,355	867,290	86,393	86,393	2,318,762	214,793	1,338	7,098	438,733	598,995	675,000	3,886,000	3,250,000
Wholesale metering: Keith TS feeders	-	-	-	-	-	-	-	-	-	-	-	-	477,000
Meter work - new customers	118,560	236,541	206,121	206,121	588,110	743,474	795,630	337,035	459,611	580,797	470,000	406,000	417,000
Smart meters	96,704	6,199,730	3,211,161	3,211,161	192,910	-	-	-	-	-	-	-	-
Wholesale meters	25,458	383,717	201,840	201,840	560,208	187,071	-	41,343	-	-	-	-	-
Sub-Total	1,607,620	8,443,156	5,098,731	5,098,731	5,870,148	4,903,306	4,362,540	2,762,116	3,945,623	3,963,441	3,310,000	7,267,000	6,204,500
System Renewal													
4 kV Conversion	5,239,546	5,283,768	5,453,919	4,973,310	3,920,134	3,612,272	2,258,878	210,618	25,896	-	-	-	-
27.6 kV Pole replacements	556,477	660,866	1,218,716	1,111,321	1,389,392	1,435,487	2,548,352	3,740,967	2,659,646	2,350,615	2,200,000	2,950,000	3,300,000
Planned cable replacements	912,191	5,711	328,115	299,201	743,404	691,288	91,439	-	-	41,908	215,077	120,000	512,000
Planned & reactive transformers	372,857	208,109	342,797	312,589	280,604	769,849	788,478	815,514	701,444	1,104,211	1,265,000	1,350,000	1,325,000
Reactive pole replacements	89,524	222,613	131,549	119,957	294,596	192,482	295,675	276,518	394,601	315,268	150,000	100,000	100,000
Reactive equipment replacements	13,233	4,057	78,565	71,642	33,982	46,978	97,628	597,796	282,855	194,262	115,218	280,000	280,000
Reactive conductor replacements	24,039	98,699	326,584	297,805	67,733	112,051	5,943	11,247	69,635	190,110	30,000	90,000	90,000
Manhole rebuilds	262,874	318,772	252,696	230,428	678,724	819,375	29,912	138,412	25,448	100,103	160,000	150,000	150,000
Switching units	37,824	118,712	-	-	160,639	338,501	622,781	666,285	498,466	271,844	340,000	825,000	1,025,000
Station equipment	251,015	-	-	-	-	-	-	782,628	1,573	463,166	2,658	-	-
Other renewal	88,732	-	-	-	-	108,065	212,907	981,119	815,322	424,201	1,108,250	1,424,000	1,658,000
Sub-Total	7,848,312	6,921,307	8,132,941	7,416,253	7,569,208	8,126,349	6,951,993	8,221,104	5,474,883	5,455,688	5,586,203	7,289,000	8,440,000
System Service													
Conductor upgrades	-	-	-	-	225,054	554,407	1,308,605	1,382,704	147,390	713,201	741,000	712,000	200,000
Feeder reliability improvement	-	-	43,372	39,550	-	-	13,763	3,105,249	209,817	864,033	1,600,000	1,250,000	1,224,000
New switches and sectionalizers	40,423	-	-	-	2,620	467,266	783,537	701,799	658,423	478,149	594,517	504,000	144,000
New tie connections	-	-	231,106	210,741	2,213	125,765	163,316	611,084	218,062	254,112	92,316	155,000	169,000
Padmounted SU automation	191,058	-	-	-	269,623	43,971	-	-	1,060,073	524,898	703,167	550,000	550,000
Radial branch back-ups	-	-	-	-	-	-	250,583	6,745	12,293	467,674	355,715	400,000	400,000
SCADA improvements	112,704	25,783	452,155	412,310	210,970	79,363	74,411	207,683	194,254	446,853	240,000	595,000	265,000
Transformer station upgrades	-	-	-	-	-	7,870	-	409,733	380,335	177,558	100,000	50,000	200,000
Other	- 91,182	-	-	-	272,458	25,621	-	7,892	50,524	49,089	180	5,000	385,000
Sub-Total	253,003	25,783	726,633	662,601	982,938	1,304,262	2,594,215	6,432,888	2,931,171	3,975,568	4,426,895	4,221,000	3,537,000
General Plant													
Building	515,522	581,138	470,405	470,405	504,553	194,885	574,788	357,412	191,140	351,588	354,000	2,592,330	1,521,000
Information Technology	786,130	659,743	326,625	326,625	741,602	650,970	2,434,000	1,055,463	704,337	888,462	-	-	-
Fleet & Welding	213,097	25,900	41,157	41,157	56,098	32,204	40,909	30,102	81,999	87,479	87,500	70,500	74,500
Tools	202,244	105,287	150,221	150,221	141,802	242,892	144,424	119,993	135,286	231,272	90,000	187,000	102,000
GIS	-	479,432	196,492	196,492	23,880	-	-	1,935,870	774,857	-	1,733,000	2,005,400	1,719,000
ERP	6,349,583	7,601,892	2,539,787	2,539,787	- 4,203	-	-	-	365,793	498,746	-	-	-
CIS	-	-	-	-	1,196,656	3,558,982	1,691,004	-	-	-	-	-	-
Sub-Total	8,066,576	9,453,392	3,724,687	3,724,687	2,660,388	4,679,933	4,885,125	3,498,840	2,253,412	2,057,547	2,264,500	4,855,230	3,416,500
Miscellaneous													
Total	**17,775,511**	**24,843,638**	**17,682,992**	**16,902,271**	**17,082,682**	**19,013,849**	**18,793,873**	**20,914,948**	**14,605,089**	**15,452,244**	**15,587,598**	**23,632,230**	**21,598,000**
Less Renewable Generation Facility Assets and Other Non-Rate-Regulated Utility Assets *(input as negative)*													
Vehicles	-	-	-	-	-	-	-	-	-	-	833,547	2,652,178	1,604,576
Customer Contributions	- 520,301	- 224,159	- 321,196	- 321,196	- 1,495,683	- 757,276	- 2,403,163	- 4,322,469	- 411,579	- 2,216,539	- 1,888,586	- 4,898,000	- 3,251,860
Total	**17,255,209**	**24,619,479**	**17,361,796**	**16,581,075**	**15,586,999**	**18,256,573**	**16,390,710**	**16,592,479**	**14,193,510**	**13,235,705**	**14,532,559**	**21,386,408**	**19,950,716**

Notes:

1 Please provide a breakdown of the major components of each capital project undertaken in each year. Please ensure that all projects below the materiality threshold are included in the miscellaneous line. Add more projects as required.
2 The applicant should group projects appropriately and avoid presentations that result in classification of significant components of the capital budget in the miscellaneous category.

ATTACHMENT 2 – E

ENWIN Utilities Ltd. Capitalization Policy

	ENWIN Utilities Ltd. POLICY	Policy No.:	
Issuing Department:	Finance	Approval Date:	
Subject:	Capitalization Policy	Approved By:	
ID#		Effective Date:	March 1, 2019
Location of Document:		Page 1 of 5	

1.0 Purpose

1.1 The purpose of this policy is to provide specific criteria and general guidelines in order to appropriately recognize property, plant and equipment (PP&E) and intangible assets.

1.2 This policy is intended to be in compliance with International Financial Reporting Standards (IFRS) along with other regulatory guidance where any conflict or differences are noted, the IFRS and/or regulatory standards will apply.

2.0 Scope

2.1 This policy applies to the capitalization of assets for the ENWIN Group of Companies including Windsor Utilities Commission.

2.2 Individual expenditures greater than or equal to $2,000 are eligible for capitalization. Transactions that do not meet this threshold should be charged to an expense account and not capitalized.

The exception to the capitalization dollar limit is meters and desktop/laptops. Those assets may have individual costs including labour and setup costs below the $2,000 threshold however their useful life and future economic benefit support that they are capital assets.

3.0 Definitions

Betterment – an expenditure that is incurred to enhance the service potential (useful life or capacity) of the PP&E or intangible asset. A betterment typically will result in:

i) An increase in the physical output or service capacity of the asset;
ii) Significantly lower associated operating costs;
iii) Extend the life of the asset;
iv) Improve the quality of the output.

Borrowing costs – interest costs as a result of borrowing funds.

Capitalization – recording of an asset, either in the Asset Under Construction or specific PP&E or intangible asset account, on the balance sheet.

ENWIN Group of Companies – includes ENWIN Utilities Ltd., ENWIN Energy Ltd. and Windsor Canada Utilities Ltd.

Expenditure – a cash outflow from the entity.

Intangible assets – are assets that lack physical substance, such as computer software and capital contributions paid.

Property, plant and equipment (PP&E) – an asset that is purchased, constructed, developed or otherwise acquired and has the following characteristics:

1) It is held for the production or supply of goods/services or delivery of service;
2) It has a useful life extending beyond one fiscal year and is intended to be used on a continuing basis;
3) It is not intended for resale in the ordinary course of operations.

Tangible assets – assets that have a physical substance.

Useful life – the period over which as asset is expected to be available for use and/or in service.

4.0 Authority and Responsibilities

4.1 The Director, Finance or designate is responsible to:

4.1.1 Ensure this policy is in compliance with IFRS and any regulatory guidelines;

4.1.2 Review overall PP&E and intangible asset reporting.

4.2 The Controller or designate is responsible for:

4.2.1 Assessing the PP&E and intangible assets for completeness, accuracy and adherence to this policy, IFRS and regulatory guidelines;

4.2.2 Maintain proper internal controls and records that are auditable and sufficiently supported with appropriate documentation.

5.0 Procedural Requirements

Recognition

5.1 Expenditures must be accounted for and reported as a PP&E or an intangible asset when:

1) It is probable that the future economic benefits associated with the expenditure will flow to the entity;

2) The value of the expenditure exceeds the threshold limit of $2,000;
3) The estimated useful life of the amount involved extends beyond one year, and;
4) The cost of the item can be measured reliably.

5.2 Expenditures that qualify as PP&E or an intangible asset should be recorded as an Asset Under Construction (AUC) and costs accumulated in that account on the balance sheet until the entire asset is put into service. At that time, the asset should be moved into a PP&E or intangible asset account and depreciation should begin once the asset is put into service and operating as intended by management.

Initial Costs

5.3 Expenditures that are eligible for capitalization include the original purchase price, any costs directly attributable to bring the asset to its intended state and any estimated dismantling costs for removing the item in the future.

5.4 Directly attributable costs include direct labour, materials, vehicle costs, third party costs along with certain overhead or burdened costs.

5.4.1 For internally generated software, any costs incurred during the research phase of the project, which is when the conceptual formulation, evaluation of alternatives and selection of alternatives should all be expensed. The development phase of the project is eligible for capitalization with the exception of training costs.

Only time on what would be deemed to be a large project would internal labour be considered to be capital otherwise the labour costs associated with the implementation and development of small projects should also be expensed.

5.5 The following burden rates are eligible for capitalization:

5.5.1 Labour Burden – a rate may be applied to the standard labour rate of an employee to account for directly attributable supervision, benefit and other labour costs.

5.5.2 Material Burden – a rate may be applied to the material cost of an item for the directly attributable warehousing and purchasing costs associated with procuring and storing materials.

5.5.3 Vehicle Burden – a burden rate may be applied for time spent by vehicles on work. Directly attributable costs associated with operating and maintaining the vehicles are eligible to be capitalized.

Burden rates may also be applied to non-capital work as well.

5.6 Borrowing costs are eligible for capitalization if the borrowing costs are directly attributable to the asset and those borrowing costs would have been avoided if the asset had not been purchased, developed or built.

Componentization

5.7 When parts or components of an item of PP&E and/or intangible assets have different useful lives, the parts or components need to be accounted for as separate assets.

5.8 Each component should be segregated and depreciated over the identified useful life.

5.9 Combining individual assets into a larger purchase to exceed the $2,000 threshold does not qualify as a capital purchase. The individual cost of the asset is considered when determining if that threshold is met.

Betterment

5.10 A betterment provides future economic benefit and therefore should be capitalized.

5.11 Maintenance associated with PP&E or intangible asset is considered a repair and should be expensed within the current operating period.

Spare assets

5.12 Spare assets defined under IFRS or regulatory guidance are accounted for as PP&E since they form an integral part of the

reliability program for a distribution system. They are not intended for resale and cannot be classified as inventory in accordance with IFRS.

Disposals

5.13 All assets that are removed from service, replaced or disposed of should be disposed of from PP&E or intangible assets.

Depreciation

5.14 Once an asset has been capitalized, depreciation should begin.

5.15 Depreciation will be calculated on a straight line basis and an appropriate useful life shall be used based on the asset classes established within the system.

6.0 Flowcharts

n/a

7.0 References & Related Documents

This policy should be in compliance with IFRS and any regulatory guidelines.

8.0 Attachments

n/a

9.0 Policy History & Approval

This policy was originally approved on: n/a

This version was approved on: February 20, 2019

This version takes effect from: March 1, 2019

This policy will be reviewed by: January 1, 2022

10.0 Contact Person(s)

Director, Finance or designate

ATTACHMENT 2 – F

Overhead Expense, Board Appendix 2-D

File Number:	EB-2019-0032
Exhibit:	09/04/2019
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Appendix 2-D
Overhead Expense

Applicants are to provide a breakdown of OM&A before capitalization in the below table. OM&A before capitalization may be broken down by cost center, program, drivers or another format best suited to focus on capitalized vs. uncapitalized OM&A.

OM&A Before Capitalization	2009 Historical Year	2010 Historical Year	2011 Historical Year	2012 Historical Year	2013 Historical Year	2014 Historical Year	2015 Historical Year	2016 Historical Year	2017 Historical Year	2018 Forecast	2019 Bridge Year	2020 Test Year
Operational Costs	$ 2,428,126	$ 2,179,670	$ 2,168,958	$ 2,215,696	$ 2,241,488	$ 2,446,148	$ 2,648,198	$ 2,602,508	$ 7,269,859	$ 6,882,531	$ 7,698,671	$ 7,729,065
Maintenance Costs	$ 2,527,893	$ 2,574,239	$ 2,083,371	$ 1,941,200	$ 1,987,679	$ 2,014,312	$ 1,750,044	$ 2,028,985	$ 2,487,236	$ 2,942,835	$ 3,243,162	$ 3,174,613
Billing and Collecting	$ 1,265,826	$ 648,427	$ 1,277,901	$ 1,382,908	$ 1,215,699	$ 1,559,075	$ 1,347,818	$ 1,618,089	$ 2,472,105	$ 2,829,545	$ 3,049,494	$ 3,122,687
Community Relations	$ 39,117	$ 53,370	$ 106,603	$ 39,925	$ 48,192	$ 61,327	$ 48,725	$ 55,286	$ 132,385	$ 175,829	$ 182,709	$ 147,723
Administrative and General	$ 13,687,876	$ 16,002,774	$ 17,142,682	$ 20,836,210	$ 17,520,813	$ 18,998,119	$ 19,598,340	$ 19,803,284	$ 14,396,981	$ 14,692,318	$ 14,599,324	$ 15,173,728
Labour Burden	$ 1,668,877	$ 1,884,372	$ 1,938,645	$ 1,157,453	$ 1,417,734	$ 1,476,562	$ 1,518,077	$ 1,437,068	$ 1,300,197	$ 1,937,368	$ 1,800,921	$ 1,970,480
Material Burden	$ 1,025,693	$ 1,315,541	$ 459,896	$ 239,109	$ 260,269	$ 282,964	$ 424,417	$ 218,397	$ 281,605	$ 295,264	$ 555,474	$ 489,393
Trucking Burden	$ 813,026	$ 782,640	$ 768,389	$ 464,714	$ 457,416	$ 556,541	$ 577,048	$ 513,171	$ 510,484	$ 580,048	$ 520,000	$ 569,684
Total OM&A Before Capitalization (B)	$ 23,456,434	$ 25,441,033	$ 25,946,444	$ 28,277,215	$ 25,149,291	$ 27,395,049	$ 27,912,667	$ 28,276,788	$ 28,850,851	$ 30,335,737	$ 31,649,755	$ 32,377,372

Applicants are to provide a breakdown of capitalized OM&A in the below table. Capitalized OM&A may be broken down using the categories listed in the table below if possible. Otherwise, applicants are to provide its own break down of capitalized OM&A.

Capitalized OM&A	2009 Historical Year	2010 Historical Year	2011 Historical Year	2012 Historical Year	2013 Historical Year	2014 Historical Year	2015 Historical Year	2016 Historical Year	2017 Historical Year	2018 Historical Year	2019 Bridge Year	2020 Test Year	Directly Attributable? (Yes/No)	Explanation for Change in Overhead Capitalized
employee benefits														
costs of site preparation														
initial delivery and handling costs														
costs of testing whether the asset is functioning properly														
professional fees														
costs of opening a new facility														
costs of introducing a new product or service (including costs of advertising and promotional activities)														
costs of conducting business in a new location or with a new class of customer (including costs of staff training)														
administration and other general overhead costs														
Labour Burden	$ 1,668,877	$ 1,884,372	$ 1,938,645	$ 1,157,453	$ 1,417,734	$ 1,476,562	$ 1,518,077	$ 1,437,068	$ 1,300,197	$ 1,937,368	$ 1,800,921	$ 1,970,480	Yes	Change from CGAAP to IFRS in 2012. Removed all indirect costs
Material Burden	$ 1,025,693	$ 1,315,541	$ 459,896	$ 239,109	$ 260,269	$ 282,964	$ 424,417	$ 218,397	$ 281,605	$ 295,264	$ 555,474	$ 489,393	Yes	Change from CGAAP to IFRS in 2012. Removed all indirect costs
Trucking Burden	$ 813,026	$ 782,640	$ 768,389	$ 464,714	$ 457,416	$ 556,541	$ 577,048	$ 513,171	$ 510,484	$ 580,048	$ 520,000	$ 569,684	Yes	Change from CGAAP to IFRS in 2012. Removed all indirect costs
Total Capitalized OM&A (A)	$ 3,507,596	$ 3,982,553	$ 3,166,929	$ 1,861,276	$ 2,135,420	$ 2,316,068	$ 2,519,542	$ 2,168,635	$ 2,092,285	$ 2,812,679	$ 2,876,394	$ 3,029,557		
% of Capitalized OM&A (=A/B)	15%	16%	12%	7%	8%	8%	9%	8%	7%	9%	9%	9%		

ATTACHMENT 2 – G

Service Reliability Indicators, Board Appendix 2-G

File Number:	EB-2019-0032
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Appendix 2-G
Service Reliability and Quality Indicators
2013 - 2017

Service Reliability

Index	Including outages caused by loss of supply					Excluding outages caused by loss of supply					Excluding Major Event Days				
	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
SAIDI	1.019	0.813	1.066	0.968	0.730	0.942	0.808	1.061	0.645	0.724	0.881	0.813	1.066	0.802	0.730
SAIFI	2.428	1.911	1.996	2.119	1.751	2.292	1.849	1.878	1.470	1.697	2.198	1.911	1.996	1.882	1.751

	5 Year Historical Average				
SAIDI		0.919		0.836	0.858
SAIFI		2.041		1.837	1.948

SAIDI = System Average Interruption Duration Index
SAIFI = System Average Interruption Frequency Index

Service Quality

Indicator	OEB Minimum Standard	2013	2014	2015	2016	2017
Low Voltage Connections	90.0%	99.7%	100.0%	99.1%	100.0%	100.0%
High Voltage Connections	90.0%	N/A	100.0%	N/A	N/A	N/A
Telephone Accessibility	65.0%	82.2%	86.8%	75.5%	70.7%	78.2%
Appointments Met	90.0%	100.0%	100.0%	100.0%	100.0%	99.8%
Written Response to Enquires	80.0%	99.9%	99.2%	100.0%	100.0%	100.0%
Emergency Urban Response	80.0%	98.0%	98.0%	100.0%	100.0%	100.0%
Emergency Rural Response	80.0%	N/A	N/A	N/A	N/A	N/A
Telephone Call Abandon Rate	10.0%	2.1%	1.3%	2.8%	3.8%	3.9%
Appointment Scheduling	90.0%	100.0%	100.0%	100.0%	100.0%	98.5%
Rescheduling a Missed Appointment	100.0%	100.0%	N/A	100.0%	N/A	100.0%
Reconnection Performance Standard	85.0%	100.0%	100.0%	100.0%	100.0%	100.0%

ATTACHMENT 2 – H

Service Life Comparison, Board Appendix 2-BB

File Number:	EB-2019-0032
Exhibit:	03/10/2018
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Appendix 2-BB
Service Life Comparison
Table F-1 from Kinetrics Report[1]

Parent*	#	Asset Details: Category| Component | Type			Useful Life: MIN UL	TUL	MAX UL	USoA Account Number	USoA Account Description	Current: Years	Current: Rate	Proposed: Years	Proposed: Rate	Outside Range of Min, Max TUL?: Below Min TUL	Above Max TUL
OH	1	Fully Dressed Wood Poles	Overall		35	45	75	1830	Poles, Towers and Fixtures	45	2%	45	2%	No	No
			Cross Arm	Wood	20	40	55								
				Steel	30	70	95								
	2	Fully Dressed Concrete Poles	Overall		50	60	80	1830	Poles, Towers and Fixtures	50	2%	50	2%	No	No
			Cross Arm	Wood	20	40	55								
				Steel	30	70	95								
	3	Fully Dressed Steel Poles	Overall		60	60	80								
			Cross Arm	Wood	20	40	55								
				Steel	30	70	95								
		Fully Dressed Composite Poles	Overall		-	-	-	1830	Poles, Towers and Fixtures	80	1%	80	1%	N/A	N/A
	4	OH Line Switch			30	45	55	1830	Poles, Towers and Fixtures	45	2%	45	2%	No	No
	5	OH Line Switch Motor			15	25	25								
	6	OH Line Switch RTU			15	20	20								
	7	OH Integral Switches			35	45	60								
	8	OH Conductors			50	60	75	1830	Poles, Towers and Fixtures	60	2%	60	2%	No	No
								1855	Services	60	2%	60	2%	No	No
	9	OH Transformers & Voltage Regulators			30	40	60								
	10	OH Shunt Capacitor Banks			25	30	40								
	11	Reclosers			25	40	55								
TS & MS	12	Power Transformers	Overall		30	45	60	1815	Trans. Station Equip-Norm Pri. > 50 kV	45	2%	45	2%	No	No
								1820	Dist. Station Equip-Norm Pri.< 50 kV	45	2%	45	2%	No	No
								1850	Line Transformers	40	3%	40	3%	No	No
			Bushing		10	20	30								
			Tap Changer		20	30	60								
	13	Station Service Transformer			30	45	55								
	14	Station Grounding Transformer			30	40	40								
	15	Station DC System	Overall		10	20	30								
			Battery Bank		10	15	15	1815	Trans. Station Equip-Norm Pri. > 50 kV	8	13%	8	13%	Yes	No
								1820	Dist. Station Equip-Norm Pri.< 50 kV	8	13%	8	13%	Yes	No
			Charger		20	20	30								
	16	Station Metal Clad Switchgear	Overall		30	40	60								
			Removable Breaker		25	40	60								
	17	Station Independent Breakers			35	45	65								
	18	Station Switch			30	50	60								
	19	Electromechanical Relays			25	35	50								
	20	Solid State Relays			10	30	45								
	21	Digital & Numeric Relays			15	20	20	1815	Trans. Station Equip-Norm Pri. > 50 kV	20	5%	20	5%	No	No
	22	Rigid Busbars			30	55	60								
	23	Steel Structure			35	50	90								
UG	24	Primary Paper Insulated Lead Covered (PILC) Cables			60	65	75								
	25	Primary Ethylene-Propylene Rubber (EPR) Cables			20	25	25								
	26	Primary Non-Tree Retardant (TR) Cross Linked Polyethylene (XLPE) Cables Direct Buried			20	25	30								
	27	Primary Non-TR XLPE Cables in Duct			20	25	30								
	29	Primary TR XLPE Cables in Duct			35	40	55	1840	Underground Conduit	40	3%	40	3%	No	No
	30	Secondary PILC Cables			70	75	80								
	31	Secondary Cables Direct Buried			25	35	40	1855	Services	35	3%	35	3%	No	No
	32	Secondary Cables in Duct			35	40	60								
	33	Network Tranformers	Overall		20	35	50								
			Protector		20	35	40								
	34	Pad-Mounted Transformers			25	40	45	1850	Line Transformers	40	3%	40	3%	No	No
	35	Submersible/Vault Transformers			25	35	45	1850	Line Transformers	35	3%	35	3%	No	No
	36	UG Foundation			35	55	70								
	37	UG Vaults	Overall		40	60	80								
			Roof		20	30	45								
	38	UG Vault Switches			20	35	50	1840	Underground Conduit	30	3%	30	3%	No	No
	39	Pad-Mounted Switchgear			20	30	45								
	40	Ducts			30	50	85								
	41	Concrete Encased Duct Banks			35	55	80								
	42	Cable Chambers			50	60	80	1840	Underground Conduit	50	2%	50	2%	No	No
S	43	Remote SCADA			15	20	30	1945	Measurement and Testing Equipment	15	7%	15	7%	No	No

Table F-2 from Kinetrics Report[1]

#	Asset Details: Category| Component | Type		Useful Life Range		USoA Account Number	USoA Account Description	Current: Years	Current: Rate	Proposed: Years	Proposed: Rate	Outside Range of Min, Max TUL?: Below Min Range	Above Max Range
1	Office Equipment		5	15	1915	Office Furniture and Equipment	10	10%	10	10%	No	No
2	Vehicles	Trucks & Buckets	5	15	1930	Transportation Equipment - Class 6	7	14%	7	14%	No	No
					1930	Transportation Equipment - Class 8	10	10%	10	10%	No	No
					1930	Transportation Equipment - Backhoes	6	17%	6	17%	No	No
					1930	Transportation Equipment - Class 7	9	11%	9	11%	No	No
		Trailers	5	20	1930	Transportation Equipment - Class 9	15	7%	15	7%	No	No
		Vans	5	10	1930	Transportation Equipment - Class 4 & 5	7	14%	7	14%	No	No
3	Administrative Buildings		50	75	1908	Buildings and Fixtures	50	2%	50	2%	No	No
4	Leasehold Improvements		Lease dependent		1910	Leasehold Improvements	20	5%	20	5%	No	No
					1910	Leasehold Improvements	10	10%	10	10%	No	No
5	Station Buildings	Station Buildings	50	75	1808	Buildings and Fixtures	50	2%	50	2%	No	No
		Parking	25	30								
		Fence	25	60								
		Roof	20	30	1808	Buildings and Fixtures	20	5%	20	5%	No	No
					1908	Buildings and Fixtures	20	5%	20	5%	No	No
6	Computer Equipment	Hardware	3	5	1920	Computer Hardware - 5 years	5	20%	5	20%	No	No
					1920	Computer Hardware - 10 year	10	10%	10	10%	No	Yes
		Software	2	5	1611	Computer Software - 5 years	5	20%	5	20%	No	No
					1611	Computer Software - 10 years	10	10%	10	10%	No	Yes
7	Equipment	Power Operated	5	10	1950	Power Operated Equipment	10	10%	10	10%	No	No
		Stores	5	10	1935	Stores Equipment	10	10%	10	10%	No	No
		Tools, Shop, Garage Equipment	5	10	1930	Transportation Equipment	20	5%	20	5%	No	Yes
					1940	Tools, Shop and Garage Equipment	10	10%	10	10%	No	No
					1960	Miscellaneous Equipment	10	10%	10	10%	No	No
		Measurement & Testing Equipment	5	10	1945	Measurement and Testing Equipment	10	10%	10	10%	No	No
8	Communication	Towers	60	70								
		Wireless	2	10	1955	Communication Equipment	8	13%	8	13%	No	No
9	Residential Energy Meters		25	35	1860	Meters	25	4%	25	4%	No	No
10	Industrial/Commercial Energy Meters		25	35	1860	Meters	25	4%	25	4%	No	No
11	Wholesale Energy Meters		15	30	1860	Meters	15	7%	15	7%	No	No
12	Current & Potential Transformer (CT & PT)		35	50								
13	Smart Meters		5	15	1860	Meters	15	7%	15	7%	No	No
14	Repeaters - Smart Metering		10	15								
15	Data Collectors - Smart Metering		15	20								

*** TS & MS = Transformer and Municipal Stations UG = Underground Systems S = Monitoring and Control Systems**

Note 1: Tables F-1 and F-2 above are to be used as a reference in order to complete columns J, K, L and N.
See pages 17-19 of Kinetrics Report

ATTACHMENT 2 – I

Commodity Expense, Board Appendix 2-Z

In the green shaded cell (row 18-26) enter the most recent 12-month actual data. If there is a material difference between actual and forecasted consumption data, use forecasted data and provide an explanation

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Commodity Expense

Step 1: **Allocation of Commodity**

2017 Historical Actuals

Customer Class Name		**Last Actual kWh's**	**Class A kWh**	**Class B kWh**	**non-RPP non GA mod**	**non-RPP GA mod**	**non-RPP Total**	**RPP**	**Proportions (by Class) non-RPP**	**Proportions (by Class) RPP**	
									%	**%**	
Residential		583,235,038	-	583,235,038	-	20,775,543	20,775,543	562,459,495	*3.56%*	*96.44%*	
General Service < 50 kW		199,305,813	-	199,305,813	-	30,270,481	30,270,481	169,035,332	*15.19%*	*84.81%*	
General Service 50 to 4999 kW		923,584,587	115,794,666	807,789,921	587,790,269	41,162,312	628,952,581	178,837,339	*68.10%*	*19.36%*	
General Service 3000-4999 kW		44,136,954	38,071,189	6,065,765	6,065,765	-	6,065,765	-0	*13.74%*	*0.00%*	
Unmetered Scattered Load		2,368,616	-	2,368,616	2,172,398	-	2,172,398	196,218	*91.72%*	*8.28%*	
Sentinel Lighting		797,644	-	797,644	-	44,091	44,091	753,553	*5.53%*	*94.47%*	
Street Lighting		6,962,744	-	6,962,744	6,944,435	-	6,944,435	18,309	*99.74%*	*0.26%*	
Large Use - Regular		189,732,833	167,657,931	22,074,902	22,074,903	-	22,074,903	-2	*11.63%*	*0.00%*	
Large Use - 3TS		174,153,374	174,153,377	- 3			-	-3	*0.00%*	*0.00%*	
TOTAL		**2,124,277,603**	**495,677,164**	**1,628,600,439**	**625,047,771**	**92,252,428**	**717,300,198**	**911,300,240**			
%		*100.00%*		*100.00%*	*38.38%*	*5.66%*		*55.96%*	*44.04%*	*55.96%*	*100.00%*

Step 2: **2019 Forecasted Commodity Prices**

Step 2a: **GA Modifier** ($/MWh) — non-RPP: $ (44.38) Source: Table 1: RPP Prices and GA Modifier: May 1, 2018 to April 30, 2019*

Step 2b: **Forecasted Commodity Prices** Table 1: Average RPP Supply Cost Summary**

			non-RPP non GA mod	**non-RPP GA mod**	**RPP**
HOEP ($/MWh)	Load Weighted Price for RPP Consumers		$21.57	$21.57	
Global Adjustment ($/MWh)	Impact of the Global Adjustment		$103.80	$59.42	
Adjustments ($/MWh)			$1.00	$1.00	
TOTAL ($/MWh)	Average Supply Cost for RPP Consumers		**$126.37**	**$81.99**	**$81.99**
$/kWh			***$0.12637***	***$0.08199***	***$0.08199***
Percentage shares (%)	non-RPP (GA mod/non-GA mod), RPP		38.38%	5.66%	55.96%
WEIGHTED AVERAGE PRICE ($/kW	**(Sum of I43, J43 and L43)**	$ 0.0990	**$0.0485**	**$0.0046**	**$0.0459**

Step 3: **Commodity Expense**

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

Class A

Customer		**Revenue**	**Expense**	**2019 kWh Volume**	**2019 kW Volume**	**2019 HOEP Rate/kWh**	**2019 Avg GA/kW**	**2019 Amount**	**2020 kWh Volume**	**2020 kW Volume**	**2020 HOEP Rate/kWh**	**2020 Avg GA/kW**	**2020 Amount**
General Service 50 to 4999 kW		4035	4705	254,777,319	564,367	0.02157	36.01501627	$25,821,228	244,990,181	560,011	0.02157	36.01501627	$25,453,252
General Service 3000-4999 kW		4015	4705	28,405,832	126,556	0.02157	36.01501627	$5,170,632	27,059,384	125,396	0.02157	36.01501627	$5,099,825
Large Use - Regular		4020	4705	279,265,293	454,420	0.02157	36.01501627	$22,389,713	250,203,683	439,294	0.02157	36.01501627	$21,218,084
Large Use - 3TS		4020	4705	241,793,036	475,523	0.02157	36.01501627	$22,341,442	238,624,714	463,625	0.02157	36.01501627	$21,844,588
				804,241,479	1,620,866			$75,723,015					$73,615,748

Class B

Customer		**Revenue**	**Expense**	**2019**				**2020**				
Class Name	UoM	USA #	USA #	Volume	rate ($/kWh):		Amount	Volume	rate ($/kWh):			Amount
Residential	kWh	4006	4705	583,496,333	0.099022797		$57,779,439	573,182,636	$0.0990			$56,758,148
General Service < 50 kW	kWh	4010	4705	205,597,336	0.099022797		$20,358,823	201,528,025	$0.0990			$19,955,869
General Service 50 to 4999 kW	kWh	4035	4705	693,760,726	0.099022797		$68,698,127	667,110,270	$0.0990			$66,059,125
General Service 3000-4999 kW	kWh	4015	4705	0	0.099022797		$0	0	$0.0990			$0
Unmetered Scattered Load	kWh	4010	4705	2,314,844	0.099022797		$229,222	2,290,933	$0.0990			$226,855
Sentinel Lighting	kWh	4030	4705	783,454	0.099022797		$77,580	758,146	$0.0990			$75,074
Street Lighting	kWh	4025	4705	6,657,045	0.099022797		$659,199	6,618,490	$0.0990			$655,381
Large Use - Regular	kWh	4020	4705	36,752,918	0.099022797		$3,639,377	32,928,243	$0.0990			$3,260,647
Large Use - 3TS	kWh	4020	4705		0.099022797		$0		$0.0990			$0
TOTAL				**1,529,362,656**			**$151,441,767**	**1,484,416,743**				**$146,991,099**

Total

Customer		**Revenue**	**Expense**	**2019**				**2020**				
Class Name	UoM	USA #	USA #	Volume	avg rate ($/kWh):		Amount	Volume	avg rate ($/kWh):			Amount
Residential	kWh	4006	4705	583,496,333	0.099022797		$57,779,439	573,182,636	0.0990			$56,758,148
General Service < 50 kW	kWh	4010	4705	205,597,336	0.099022797		$20,358,823	201,528,025	0.0990			$19,955,869
General Service 50 to 4999 kW	kWh	4035	4705	948,538,045	0.0996		$94,519,355	912,100,451	0.1003			$91,512,377
General Service 3000-4999 kW	kWh	4015	4705	28,405,832	0.1820		$5,170,632	27,059,384	0.1885			$5,099,825
Unmetered Scattered Load	kWh	4010	4705	2,314,844	0.099022797		$229,222	2,290,933	0.0990			$226,855
Sentinel Lighting	kWh	4030	4705	783,454	0.099022797		$77,580	758,146	0.0990			$75,074
Street Lighting	kWh	4025	4705	6,657,045	0.099022797		$659,199	6,618,490	0.0990			$655,381
Large Use - Regular	kWh	4020	4705	316,018,211	0		$26,029,090	283,131,926	0.0000			$24,478,731
Large Use - 3TS	kWh	4020	4705	241,793,036	0		$22,341,442	238,624,714	0.0000			$21,844,588
TOTAL				**2,333,604,135**			**$227,164,782**	**2,245,294,704**				**$220,606,847**

**Regulated Price Plan Prices and the Global Adjustment Modifier for the Period May 1, 2018 – April 30, 2019*

*** Regulated Price Plan Cost Suppy Report May 1, 2018 - April 30, 2019*