EB-2016-0105

Thunder Bay Hydro Electricity Distribution Inc.

Application for electricity distribution rates beginning May 1, 2017.

AMPCO Compendium

Results of Customer Input

- Our Customers Support:
  - investments to enhance reliability reflected in asset reinvestment and grid modernization plans
  - reasonable rate increases to undertake activities applied for
- **Application attempts to balance customers' desire for low rates with need to make responsible investments to ensure health of electricity system in the long term**

THUNDER BAY HYDRO

Need for Rate Increases

- We need this increase to pay for:
  - Past and Future Investments in end of life infrastructure
    - $2.8M or 68% of total increase
  - New targeted maintenance programs and increased forestry activity
    - $250K or 6.4% of total increase
  - Required move to monthly customer billing
    - $234K or 5.6% of total increase
  - Increased regulatory expenses
    - $168K or 4.1% of total increase
  - Other inflationary cost increases

THUNDER BAY HYDRO

Interrogatory Response Reference:
2.0-VECC-8 2.0-VECC– IR2
2.0-VECC-9 IR1
**Table was cut off at 2015 in the response.

File Number: EB-2016-0105
Exhibit: 2
Tab:
Attachment: 2-C
Page:

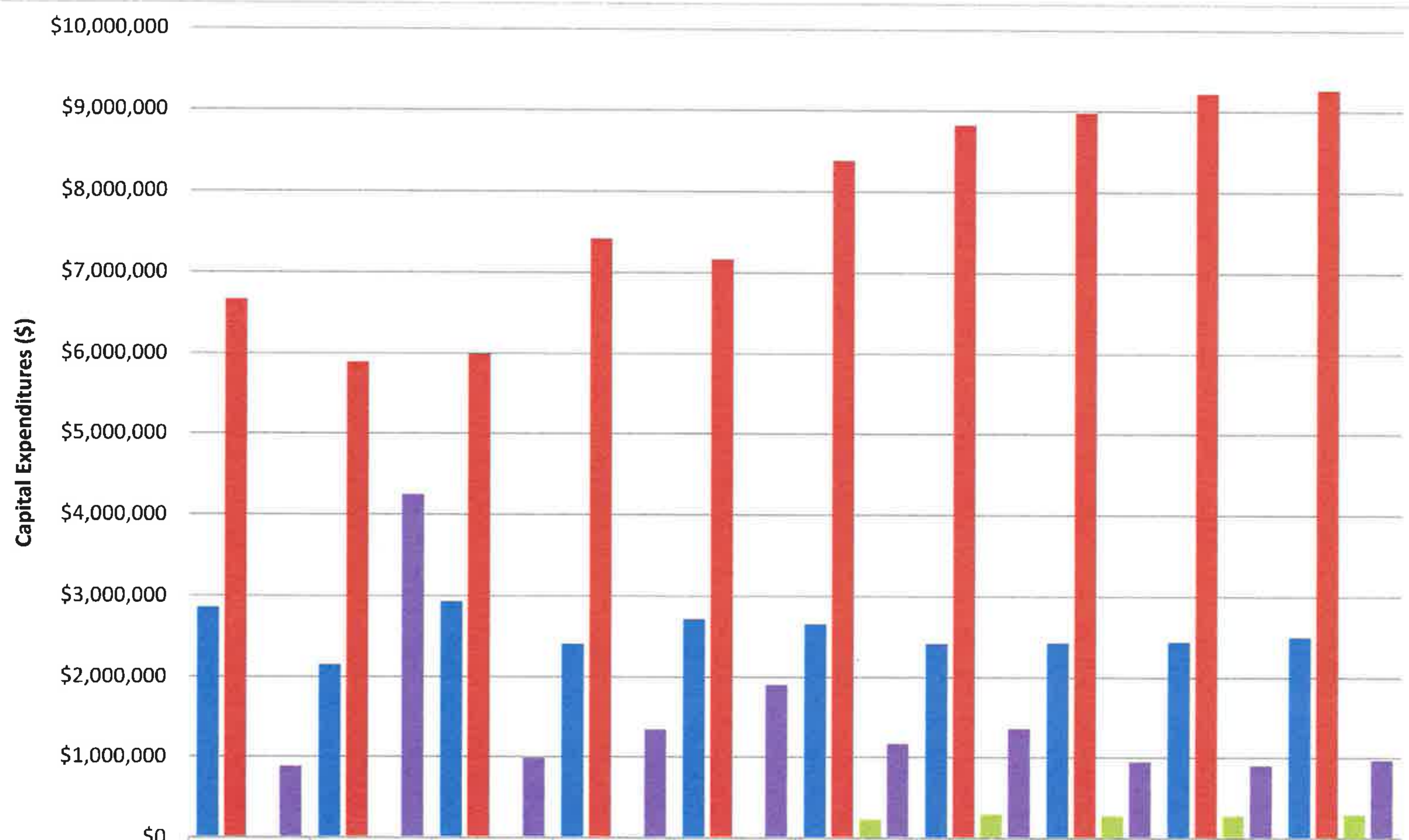
Date: 30-Jan-17

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

year of Forecast Period: *2017*

CATEGORY	Historical Period (previous plan[1] & actual)															Forecast Period (planned)				
	2012			2013			2014			2015			2016							
	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Actual	Var	Plan	Revised Capital Projection as at January 2017	Var	2017	2018	2019	2020	2021
	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000		%	$ '000				
System Access	2,032	$2,864	40.9%	1,963	$2,154	9.7%	3,556	$2,937	-17.4%	3,812	$2,412	-36.7%	2,795	2,398	-14.2%	2,662	2,422	2,432	2,445	2,505
System Renewal	7,118	$6,664	-6.4%	6,596	$5,888	-10.7%	6,402	$5,994	-6.4%	6,770	$7,413	9.5%	7,090	7,388	4.2%	8,380	8,818	8,976	9,217	9,261
System Service	-	$0	--	-	$0	--	-	$0	--	-	$0	--	-	1	--	230	300	280	280	300
General Plant	1,097	$877	-20.0%	4,443	$4,246	-4.4%	1,199	$989	-17.5%	1,357	$1,345	-0.9%	2,059	1,664	-19.2%	1,253	1,360	946	901	969
TOTAL EXPENDITURE	$ 10,247	$10,405	1.5%	$ 13,003	$12,287	-5.5%	$ 11,157	$9,920	-11.1%	$ 11,938	$11,171	-6.4%	$ 11,944	$11,451	-4.1%	$12,526	$12,900	$12,634	$12,842	$13,036
System O&M	6,594	6,998	6.1%	$ 7,064	$6,803	-3.7%	$ 6,959	$7,316	5.1%	$ 7,229	$7,441	2.9%	$ 7,675	$8,034	4.7%	$8,026	$8,187	$8,350	$8,592	$8,842

2



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
System Access	$2,863,931	$2,153,655	$2,936,881	$2,412,277	$2,722,077	$2,662,432	$2,422,273	$2,432,053	$2,444,765	$2,505,497
System Renewal	$6,664,243	$5,887,628	$5,994,452	$7,413,468	$7,164,703	$8,379,758	$8,818,369	$8,975,721	$9,216,828	$9,261,478
System Service	$0	$0	$0	$0	$0	$230,375	$300,000	$280,000	$280,000	$300,000
General Plant	$876,685	$4,245,878	$988,614	$1,344,970	$1,905,805	$1,167,500	$1,359,760	$946,131	$900,514	$969,308

Figure 5.4.4-1 Investment by Category for 2012 to 2021

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Interrogatory Response Reference:
2.0-VECC-7 IR1 / 2.0-VECC-7 IR2
2.0-VECC-9

File Number: EB-2016-0105
Exhibit: 2
Tab:
Attachment: 2-D
Page:

Date: 30-Jan-17

Appendix 2-AA
Capital Projects Table

Projects	2012	2013	2014	2015	2016 Bridge Year	2017 Test Year
Reporting Basis						
	Actuals	Actuals	Actuals	Actuals	Revised Projection as at January 2017	Forecast
SYSTEM ACCESS						
PCB Transformer Replacements (A 01)	143,287	120,061	217,974		113,711	118,655
02)	-	221,636	509,842	859,513	755,267	281,092
Customer Driven System Expansions (A 11)		197,649		181,267	127,256	209,034
Residential Service Connections (A 12)	459,350	296,842	302,465	282,378	345,931	445,213
General Service Connections (A 13)	627,181	578,080	580,813	461,209	332,213	926,898
New courthouse - Miles @ Brodie (WF0376329)	323,741	391,726				
Expansions for Residential Subdivisions (A 14)			335,496	118,498		230,530
System Relocations (A 15)	447,447		428,303	176,094	465,012	164,881
Golf Links Road Widening Stage 2 (WF0482298)			285,169			
Meter Installations (A 21)		189,544	175,260	192,854	201,262	286,129
Generator Driven Expansions (A 32)	666,826					
Miscellaneous	**196,098**	**158,117**	**101,558**	**140,464**	**57,745**	**-**
Sub-Total System Access	**$ 2,863,931**	**$ 2,153,655**	**$ 2,936,881**	**$ 2,412,277**	**$ 2,398,398**	**$ 2,662,432**
SYSTEM SERVICE						
Grid Modernization (A 35)	-	-	-	-	-	230,375
Miscellaneous	-	-	-	-	**887**	-
Sub-Total System Service	**$ -**	**$ -**	**$ -**	**$ -**	**$ 887**	**$ 230,375**
SYSTEM RENEWAL						
Line Voltage Conversions (B 12)						
Brock-Ford Rebuild	1,476,051					
Georgina-Francis Conversion	940,824					
Brown-Isabella Rebuild	1,637,599					
Churchill-Edward 25kV Area Rebuild	-	223,674	247,555			
Ogden-McMurray Area Rebuild	1,075,188	1,624,654				
McKenzie-Dease Area Design			171,815	204,139		
Clayte-Burriss Design			1,979,501			
Huron-Otto Rebuild		196,143	1,327,820			
Dawson-Rockwood Area Rebuild				1,239,672		
Balsam-Minot Area Rebuild			619,344	1,225,645		
Eliott-Leslie Area Rebuild		664,836				
Durban-Brodie Area Conversion		593,882				
Mary-Heath Area Conversion/Rebuild		1,032,388				
Black Bay-Dewe Rebuild					619,148	1,174,110
Dewe-Rita Rebuild					643,613	1,489,302
Donald-Mountdale						310,256
Dacre-Leslie				586,778	1,225,286	
Bruswick-Legion				411,866		
Isabella-James				362,893	857,844	
MacDougall-Court						789,716
Victoria /James					1,764,925	
FW TS Exit Cable Replacement						376,868
Finlayson - Brodie Conversion						893,725
Cumming - Brodie Street						580,677
25kV Pole Replacements						584,384
System Improvements (B 13)						
10M8 Reconfiguration				372,317		
U/G Installations/Replacements (B 14)	213,160					
Industrial Park - U/G Express Reinforcement				280,312		
Main St Connection 10M3 to 17M1			116,412			

Transformer
Switchgear
Switch

Small Pole Replacements (A 16)	160,400			130,406	557,464	342,512
Northwood - 10M9 Pole Line (WF0469253)		236,494				
2M5 Pole Line Rebuild (WF0484290)			159,795	126,926		
Main St and Hammond (WF0508762)			116,798	198,919		
Lane South of Arthur between Edward and Ford Rebuild (WF0517942)				138,764		
Edward between Aurthur and Mary Rebuild (WF052223)				171,493		
Edward and Churchill Rebuild (WF0525234)				261,792		
Lines Safety Reports (A 17)	468,445	625,723	567,743	495,879	571,492	761,834
18)	123,691	345,416	215,210	932,264	886,511	756,484
Hector Dougall Way (WF 0474031)			119,529			
(WF0484290)			209,732			
Operations Safety Reports (A 22)						
Miscellaneous	**568,886**	**344,417**	**143,199**	**273,402**	**261,771**	**319,888**
Sub-Total System Renewal	**$ 6,664,243**	**$ 5,887,628**	**$ 5,994,452**	**$ 7,413,468**	**$ 7,388,054**	**$ 8,379,756**
GENERAL PLANT						
2012 Terex Digger Derrick		220,340				
2013 Material Handler		291,262				
2014 Freight liner Double Bucket			364,664			
2015 Feight Liner Double Bucket				282,464		
2016 Digger Derrick					255,160	
2016 Double Bucket						410,670
2016 Single Bucket					190,016	
2017 Mini Bucket					128,522	
2017 Double Bucket (purchase began in 2016)						125,000
Fleet Garage		3,277,070			-	-
IT (Software and Hardware)	231,506		136,189	194,052	138,457	211,000
Power Operated Equipment				196,682		
Communications			160,587	158,841	124,602	206,500
Fleet - Rolling Stock	437,900	249,002	257,949	202,974	278,384	160,000
SCADA					437,540	
Miscellaneous	**207,279**	**208,204**	**69,225**	**309,957**	**110,843**	**140,000**
Sub-Total General Plant	**$ 876,685**	**$ 4,245,878**	**$ 988,614**	**$ 1,344,970**	**$ 1,663,524**	**$ 1,253,170**
Total	**10,404,860**	**12,287,160**	**9,919,947**	**11,170,715**	**11,450,863**	**12,525,733**
Less Renewable Generation Facility Assets and Other Non-Rate-Regulated Utility Assets (input as						
Total	**10,404,860**	**12,287,160**	**9,919,947**	**11,170,715**	**11,450,863**	**12,525,733**

SYSTEM RENEWAL	2012	2013	2014	2015	2016	2017
Line Voltage Conversions (B 12)						
Brock-Ford Rebuild	1,476,051					
Georgina-Francis Conversion	940,824					
Brown-Isabella Rebuild	1,637,599					
Churchill-Edward 25kV Area Rebuild	-	223,674	247,555			
Ogden-McMurray Area Rebuild	1,075,188	1,624,654				
McKenzie-Dease Area Design			171,815	204,139		
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Balsam-Minot Area Rebuild			619,344	1,225,645		
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Mary-Heath Area Conversion/Rebuild		1,032,388				
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MacDougall-Court						789,716
Victoria /James					1,764,925	
FW TS Exit Cable Replacement						376,868
Finlayson - Brodie Conversion						893,725
Cumming - Brodie Street						580,677
	5,129622	4,448279	4346034	4,070,956	5,110,816	5,614,654

↑

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2-AMPCO-1

Ref: Appendix 2-B DSP

a) Please provide Thunder Bay Hydro Electricity Distribution Inc's asset replacement rate for the years 2012 to 2016 and forecast for the years 2017 to 2021 and show the calculation.

b) Please provide Thunder Bay Hydro Electricity Distribution Inc 's assumptions in the capital budget regarding project contingencies.

c) Please provide the percentage of capital work undertaken by external contractors for the years 2012 to 2016 and forecast for 2017 to 2021.

d) Please provide the ratio of unplanned work to planned work for the years 2012 to 2016.

Thunder Bay Hydro Response:

a) The asset replacement rate as a percentage of total assets for Thunder Bay Hydro is not available. The asset replacement rate has not been computed on a historical (2012-2015) or forecast basis (2016). The forecast asset replacement rate for the four year period from 2017 – 2021 has not been determined as yet. In effort to provide a quick analysis of the asset replacement rate as a percentage of total capital projects, and as percentage of total fixed assets for 2013- 2016 actuals, and the updated 2017projectiong. The table below with calculations has been provided. Thunder Bay Hydro has chosen to use system renewal as the measurement of replacement capital.

	2013 Actual	2014 Actual	2015 Actual	2016 Actual	2017 Projected
System Renewal Category	5,887,628	5,994,452	7,413,468	7,388,053	8,379,756
Total Capital Projects	12,287,160	9,919,947	11,170,715	11,171,982	12,547,136
% of System Renewal(Replacement) over Total Capital Projects	47.92%	60.43%	66.37%	66.13%	66.79%
Total Gross Assets	196,415,652	204,719,323	214,568,904	224,723,713	234,862,121
% of System Renewal over Total Asset	3.00%	2.93%	3.46%	3.29%	3.57%

b) Thunder Bay Hydro assumes that contingences account for any unknowns with respect to boring, rock boring, weather delays, and remediation efforts, as well as increases in contractor and material prices and requirements to take outages on premium time to accommodate commercial customers.

c) The following table provides capital work undertaken by external contractors.

Percentage of Capital Work Undertaken by External Contractors									
2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
12%	13%	19%	24%	20%	28%	29%	30%	31%	32%

d) The ratio of unplanned work to planned work is as provided in the following table:

	Percentage of Unplanned vs Planned Work				
	2012	**2013**	**2014**	**2015**	**2016**
Unplanned	10%	15%	16%	25%	18%
Planned	90%	85%	84%	75%	82%

Thunder Bay Hydro assumes that "unplanned work" is work that has been discovered and completed in the same calendar year.

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SUMMARY

In 2015 Thunder Bay Hydro Electricity Distribution Inc. (TBH) determined a need to perform a condition assessment of its key distribution assets. This would result in a quantifiable evaluation of asset condition, aid in prioritizing and allocating sustainment resources, and facilitate the development of a Distribution System Plan.

The asset groups included in the 2015 asset condition assessment (ACA) were as follows: substation transformers, breakers, wood poles, distribution transformers, overhead line switches, underground switches, and underground cables. For each asset category, the Health Index distribution was determined and a condition-based Flagged for Action plan was developed.

In terms of quantities of assets that need to be addressed, 25 kV wood poles require the most attention. Although only 3% of the population needs to be looked at this year, this amounts to over 450 poles. Approximately 9% of 4 kV wood poles were also flagged for action this year. Because of the considerably smaller population, however, this equates to just over 230 poles. Approximately 19% of pole mounted transformers were classified under the very poor category. As such, 170 transformers need to be addressed.

Many asset groups (i.e. distribution transformers, overhead switches, and underground cables) had only age data available. Data gaps for these and all other asset categories were identified. It is recommended that TBH begin collecting information to fill these data gaps and to use such information for future assessments.

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 TBH's Distribution System Plan.

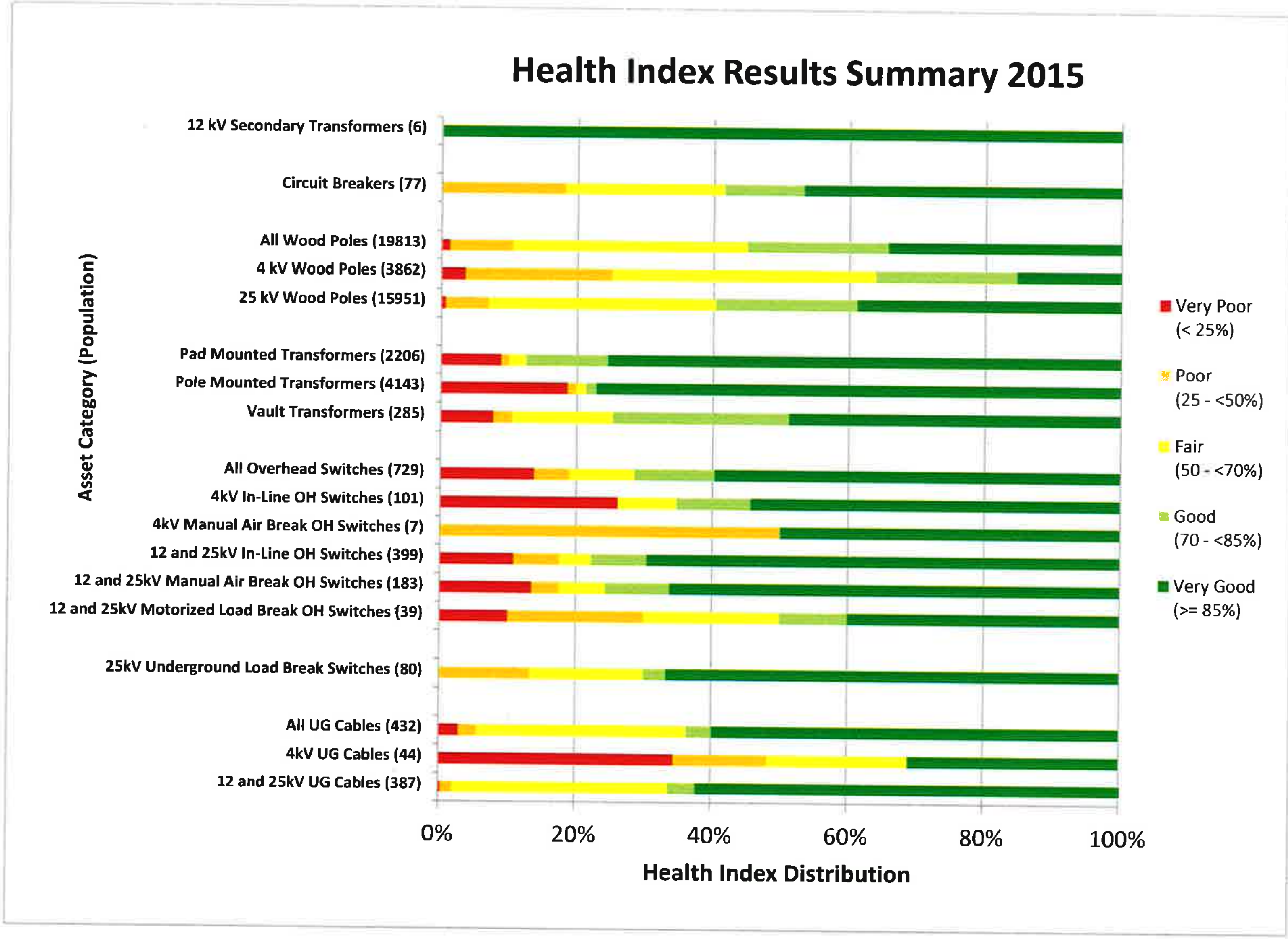

Figure 5.3.1-2 Health Index Results Summary 2015

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Table III-1 Health Index Results Summary

Asset Category		Population	Sample Size	Average Health Index	Health Index Distribution					Average Age
					Very Poor (< 25%)	Poor (25 - <50%)	Fair (50 - <70%)	Good (70 - <85%)	Very Good (>= 85%)	
Station Transformers	All	23	23	88%	0%	4%	9%	4%	83%	52
	4 kV	17	17	86%	0%	6%	6%	12%	76%	54
	12 kV	6	6	94%	0%	0%	0%	0%	100%	47
Breakers	Breakers	77	77	72%	0%	18%	23%	12%	47%	56
Wood Poles	All	19813	19813	75%	1%	9%	34%	21%	34%	28
	4 kV	3862	3862	63%	4%	22%	39%	21%	15%	36
	25 kV	15951	15951	77%	< 1%	6%	33%	21%	39%	27
Distribution Transformers	Pad Mounted Transformers	2206	2206	87%	9%	1%	2%	12%	75%	25
	Pole Mounted Transformers	4143	4141	81%	19%	1%	1%	1%	77%	29
	Vault Transformers	285	285	78%	8%	3%	15%	26%	49%	33
OH Switches	All	729	305	76%	14%	5%	10%	12%	60%	32
	4kV In-Line	101	46	71%	26%	0%	9%	11%	54%	32
	4kV Manual Air Break	7	2	70%	0%	50%	0%	0%	50%	32
	12 and 25kV In-Line	399	148	80%	11%	7%	5%	8%	70%	31
	12 and 25kV Manual Air Break	183	74	78%	14%	4%	7%	9%	66%	33
	25kV Motorized Load Break	39	10	67%	10%	20%	20%	10%	40%	39
Underground Switches	25kV Underground Load Break Switches	80	30	81%	0%	13%	17%	3%	67%	31
Underground Cables*	All	432	374	80%	3%	3%	31%	4%	60%	29
	4kV	44	29	44%	34%	14%	21%	0%	31%	43
	12 and 25kV	387	344	84%	< 1%	2%	32%	4%	63%	28

* data is in conductor-km

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Table III-2 Total Year 1 and 10-Year Total Flagged for Action Plan

Asset Category		10 Year Unlevelized Flagged for Action Total				10 Year LEVELIZED Flagged for Action Total				Replacement Strategy
		First Year		10 Year		First Year		10 Year		
		Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	
Substation Transformers	4 kV Secondary Transformers	0	0%	3	18%	0	0%	3	18%	proactive
	12 kV Secondary Transformers	0	0%	0	0%	0	0%	0	0%	proactive
Circuit Breakers	Circuit Breakers	0	0%	14	18%	0	0%	14	18%	proactive
Wood Poles	4 kV Wood Poles	364	9%	1636	42%	232	6%	1636	42%	proactive
	25 kV Wood Poles	544	3%	3964	25%	460	3%	3964	25%	proactive
Distribution Transformers	Pad Mounted Transformers	204	9%	240	11%	44	2%	240	11%	proactive
	Pole Mounted Transformers	625	15%	974	24%	171	4%	974	24%	reactive
	Vault Transformers	14	5%	93	33%	10	4%	93	33%	reactive
Overhead Switches	4kV In-Line OH Switches	3	3%	36	36%	3	3%	36	36%	reactive
	4kV Manual Air Break OH Switches	0	0%	4	57%	0	0%	4	57%	reactive

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Asset Category		10 Year Unlevelized Flagged for Action Total				10 Year LEVELIZED Flagged for Action Total				Replacement Strategy
		First Year		10 Year		First Year		10 Year		
		Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	
	12 and 25kV In-Line OH Switches	30	8%	92	23%	15	4%	92	23%	reactive
	12 and 25kV Manual Air Break OH Switches	20	11%	36	20%	5	3%	36	20%	reactive
	12 and 25kV Motorized Load Break OH Switches	0	0%	16	41%	2	5%	16	41%	reactive
Underground Switches	25kV Underground Load Break Switches	0	0%	13	16%	1	1%	13	16%	reactive
Underground Cables*	4kV UG Cables	2	5%	4	9%	1	2%	4	9%	reactive
	12 and 25kV UG Cables	4	1%	59	15%	6	2%	59	15%	reactive

* data is in conductor-km

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Table III-3 Ten Year Flagged for Action Plan

Replacement Year	Type (L = Levelized; Blank = Unlevelized)	Substation Transformers		Circuit Breakers	Wood Poles		Distribution Transformers			Overhead Switches					Underground Switches	Underground Cables*	
		4 kV Secondary Transformers	12 kV Secondary Transformers	Circuit Breakers	4 kV Wood Poles	25 kV Wood Poles	Pad Mounted Transformers	Pole Mounted Transformers	Vault Transformers	4kV In-Line OH Switches	4kV Manual Air Break OH Switches	12 and 25kV In-Line OH Switches	12 and 25kV Manual Air Break OH Switches	25kV Motorized Load Break OH Switches	25kV Underground Load Break Switches	4kV UG Cables	12 and 25kV UG Cables
0	L	0	0	0	232	460	44	171	10	3	0	15	5	2	1	1	6
		0	0	0	364	544	204	625	14	3	0	30	20	0	0	2	4
1	L	0	0	0	177	375	44	171	8	3	0	15	5	2	1	1	5
		0	0	0	253	473	7	130	9	2	0	13	5	0	5	0	4
2	L	0	0	0	176	381	44	171	9	3	0	15	5	3	1	1	6
		0	0	0	210	447	3	42	10	7	0	8	2	4	0	1	6
3	L	1	0	14	176	387	44	171	9	3	0	15	5	2	1	1	6
		1	0	14	182	424	2	30	8	3	0	22	0	8	1	0	7
4	L	0	0	0	176	394	44	171	10	4	1	15	5	2	1	1	6
		0	0	0	153	412	2	28	10	2	0	0	0	0	0	0	7
5	L	0	0	0	176	400	5	26	10	3	1	4	2	2	2	1	7
		0	0	0	132	409	5	28	9	2	0	8	5	0	1	0	8
6	L	0	0	0	176	403	6	28	10	4	1	4	2	2	2	1	7
		0	0	0	119	411	6	27	12	7	0	3	2	4	3	0	8
7	L	2	0	0	176	402	6	31	11	3	1	4	3	2	2	1	7
		2	0	0	112	416	5	32	10	3	0	5	2	0	2	0	8
8	L	0	0	0	116	395	7	33	11	4	1	4	2	2	2	1	7
		0	0	0	111	428	6	32	11	7	4	3	0	0	1	1	7
9	L	1	0	0	117	397	8	36	11	4	1	4	3	2	2	1	7
		1	0	0	114	425	5	36	11	2	0	3	5	0	1	0	9
10	L	0	0	0	117	396	10	39	11	3	1	4	2	1	2	1	7
		0	0	0	115	418	9	39	12	3	0	0	0	0	1	1	7

* data is in conductor-km

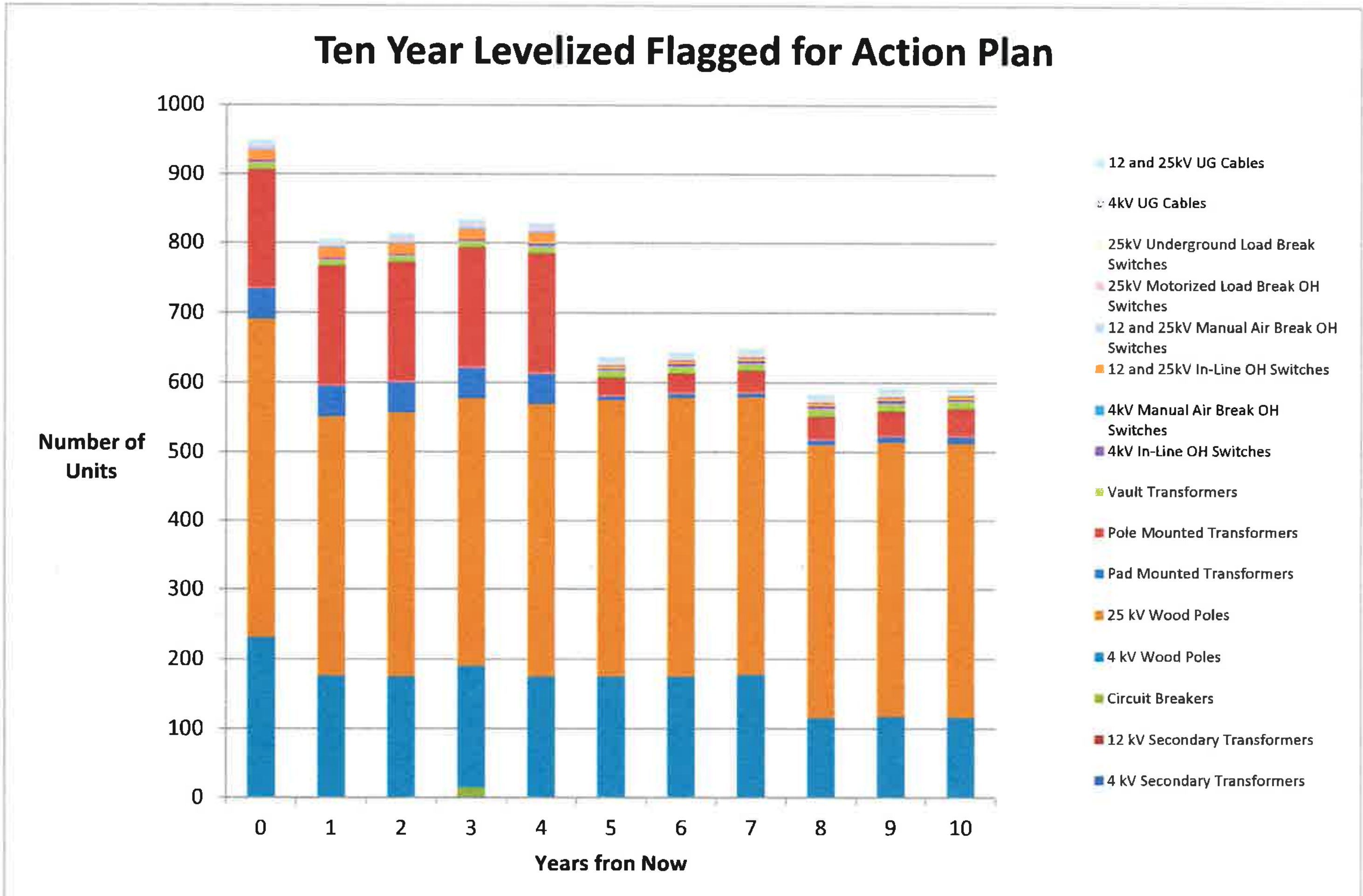


Figure III-7 Ten Year Levelized Flagged for Action Plan (Graphical)

IV CONCLUSIONS AND RECOMMENDATIONS

1. An Asset Condition Assessment was conducted for TBH's key distribution assets, namely substation transformers, breakers, wood poles, distribution transformers, overhead line switches, underground switches, and underground cables. For each asset category, the Health Index distribution was determined and a condition-based replacement plan was developed.

2. Of all the asset groups, 4kV underground cables were found, on average, to be in the worst condition. A total of 48% were found to be in poor or very poor condition. However, because of the small population, this is not a significant cause for concern.

3. A large percentage of overhead switches, 14%, were classified as very poor; another 5% were found to be in poor condition. Because the population of switches is relatively small, the number of assets flagged for action is not significant.

4. Approximately 19% of pole mounted transformers were classified under the very poor category. Per the levelized flagged for action plan over 170 transformers require action in the first year.

5. In terms of quantities of assets that need to be addressed, 25 kV wood poles require the most attention. Although only 3% of the population needs to be looked at in the first year, this amounts to over 450 poles.

   Approximately 6% of 4 kV wood poles were also flagged for action in the first year. Because of the considerably smaller population than the 25 kV poles, however, this equates to just over 230 poles.

6. Age and inspection information were available for substation transformers, breakers, wood poles, and pad-mounted transformers. Additionally substation transformers had loading and oil tests. Only age was available for pole-mounted transformers, vault transformers, overhead and underground switches, and underground cables. Further, the age was only available for less than half of the switches and cables.

7. It is recommended that the data availability indicator (DAI) for each asset category be brought to 100% and maintained at that level. i.e. Data for all condition parameters used in the HI formulas should be collected for all assets. The low DAIs of switches and cables are of particular concern.

8. Data gaps were identified for each asset category, prioritized in the order of importance, in the Appendix of this report. It is recommended that the data be gathered in prioritized manner. Data may be gathered from inspections or corrective maintenance records. Additional sources of data would come from testing (e.g. pole strength testing or cable testing).

9. Because only limited failure statistics was available at this time, an exponentially increasing failure rate and corresponding probability of failure model were assumed in this study. It is

recommended that TBH begin collecting failure information so failure models can be developed and used in future assessments.

10. It is important to note that the replacement plan presented in this study is based solely on asset condition and that there are numerous other considerations that may influence TBH's Asset Management Plan.

2-AMPCO-15

Ref: Appendix 2-B DSP, Appendix C: Kinetrics Asset Condition Assessment, Page 14 Table III-1 Health Index Results Summary

a) Please recast Table III to provide the numerical number of assets for each asset category that are in very poor, poor, fair, good and very good condition.

b) Please provide the asset quantities planned for replacement by asset category in each of the years 2017 to 2021 under all programs.

c) Please provide the asset quantities replaced by asset category in each of the years 2012 to 2016 under all programs.

d) Please provide the number of assets in each asset category planned for replacement in 2017 that were identified by Kinetrics as being in very poor or poor condition.

Thunder Bay Hydro Response:

a) See below for a recast of Table III which provides a numerical number of assets for each asset category which are in very poor, poor, fair, good and very good condition.

Table III-1 Health Index Results Summary

Asset Category		Population	Sample Size	Average Health Index	Average Age	Health Index Distribution					Average Age
						Very Poor (< 25%)	Poor (25 - <50%)	Fair (50 - <70%)	Good (70 - <85%)	Very Good (>= 85%)	
Station Transformers	All	23	23	88%	52	0	1	2	1	19	52
	4 kV	17	17	86%	54	0	1	1	2	13	54
	12 kV	6	6	94%	47	0	0	0	0	6	47
Breakers	Breakers	77	77	72%	56	0	14	18	9	36	56
Wood Poles	All	19813	19813	75%	28	238	1846	6816	4121	6792	28
	4 kV	3862	3862	63%	36	136	832	1499	802	593	36
	25 kV	15951	15951	77%	27	83	925	5207	3392	6345	27
Distribution Transformers	Pad Mounted Transformers	2206	2206	87%	25	13	29	73	380	1711	25
	Pole Mounted Transformers	4143	4141	81%	29	202	137	144	155	3505	29
	Vault Transformers	285	285	78%	33	17	8	42	79	139	33
OH Switches	All	729	305	76%	32	100	38	69	86	435	32
	4kV In-Line	101	46	71%	32	26	0	9	11	55	32
	4kV Manual Air Break	7	2	70%	32	0	4	0	0	4	32
	12 and 25kV In-Line	399	148	80%	31	43	27	19	32	278	31
	12 and 25kV Manual Air Break	183	74	78%	33	25	7	12	17	121	33
	25kV Motorized Load Break	39	10	67%	39	4	8	8	4	16	39
Underground Switches	25kV Underground Load Break Switches	80	30	81%	31	0	10	14	2	54	31
Underground Cables*	All	432	374	80%	29	13	12	133	16	259	29
	4kV	44	29	44%	43	15	6	9	0	14	43
	12 and 25kV	387	344	84%	28	-4	8	124	15	244	28

b) and c) Asset quantities planned for replacement and completed by asset category in each of the years 2012 through to 2021 under all programs are listed below.

	Station Transformers		Breakers	Wood Poles		Distribution Transformers			OH Switches	Underground Switches	Underground Cables	
	4 kV	12 kV	Breakers	4 kV	25 kV	Pad Mounted Transformers	Pole Mounted Transformers	Vault Transformers	All	25kV Underground Load Break Switches	4kV	12 and 25kV
2012	0	0	0	391	69	29	49	3	n/a	0	0	0
2013	0	0	0	375	88	18	78	11	n/a	0	0	0.34
2014	0	0	0	444	92	15	86	12	n/a	0	0	2.2
2015	0	0	0	381	162	49	106	7	n/a	0	0	2.2
2016	0	0	0	461	133	52	109	9	30	0	0	0.96
2017	0	0	0	385	193	75	171	3	40	0	1	1.4
2018	0	0	0	185	362	53	171	9	25	1	1	3.2
2019	0	0	0	137	426	44	170	3	25	1	1	5.2
2020	0	0	0	142	433	44	170	9	25	1	1	5.6
2021	0	0	0	122	435	44	171	3	25	1	1	5.2

n/a = quantities of these assets were not tracked in these years

d) Thunder Bay Hydro expects that in 2017 the following quantities will be in very poor / poor condition.

	Station Transformers		Breakers	Wood Poles		Distribution Transformers			OH Switches	Underground Switches	Underground Cables (km)	
	4 kV	12 kV	Breakers	4 kV	25 kV	Pad Mounted Transformers	Pole Mounted Transformers	Vault Transformers	All	25kV Underground Load Break Switches	4kV	12 and 25kV
2017	0	0	0	385	193	75	171	3	40	0	1	1.4
Very Poor	0	0	0	296	149	54	101	3	22	0	1	1.4
Poor	0	0	0	42	44	15	23	0	4	0	0	0

2-AMPCO-12

Ref: Appendix 2-B DSP Page 126

Preamble: In 2015, Thunder Bay Hydro experienced an increase in System Renewal capital expenditures of $1,419,018. The main driver of the increase was due to the poles identified for replacement as part of Small Pole Replacements project.

a) Please provide the number of poles replaced under this project for the each of the years 2012 to 2016 and confirm the number of replaced poles in very poor and poor condition by year.

b) Please explain further the basis for the increase in poles identified for replacement in 2015.

Thunder Bay Hydro Response:

Small Pole Replacement project quantities

Quantity of poles replaced under 'Small Pole Replacements'					
	2012	2013	2014	2015	2016
Quantity	16	14	47	139	42
Very Poor	14	12	41	122	37
Poor	2	2	6	17	5

a) The increase of poles identified for replacement was due to improvements in the risk assessment process. In previous years the risk assessment process was done by applying a condition based assessment of a select pole in an area, which was then applied to a generalized population. Thunder Bay Hydro has refined our inspection process by improving the risk assessment process to provide mobile capabilities, which has resulted in efficiencies, and now allows the inspectors to review each pole in detail. This process has led to an increase in identifying poles in poor and very poor condition which required immediate replacement due to safety concerns.

2-AMPCO-14

Ref: Appendix 2-B DSP Page 129 Table 5.4.4-14 System Renewal Expenditure Variances 2016 Projection to 2017 Forecast

a) Please provide the number of assets replaced in 2016 and 2017 by asset category under each applicable project.

Thunder Bay Hydro Response:

		Poles		Padmount Transformers		Polemount Transformers		Switches		Overhead Conductor (km)		Underground Conductor (km)	
		2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
A 16	Small Pole Replacements	59	70										
A 17	Lines Safety Reports	146	130										
A 18	Transformer / Switch Replacements			37	44	37	57	6	10				
B	25kV Pole Replacements	0	60										
B	4kV Voltage Conversions	448	391	15	31	72	114	24	30	11	12.6	0.96	1
B	Underground Renewal											0	1.4

ER-VECC-1

Ref: IA Report pg. 3

At page 3 of the report it states:

"It is important to note that the final System Renewal budget for 2017 was not directly and exclusively derived from the Health Index distribution in the ACA report (the relationship is described in detail in the body of this report)."

However at Exhibit 2, page 40 it also states:

"Thunder Bay Hydro expects a cost increase in System Renewal capital expenditures from 2016 to 2017 of $1,215,053. The increase in expenditures is a direct result of the Asset Condition Assessment which was performed in 2016 by Kinectrics and provided a Health Index ("HI") of the entire asset base. The Health Index distribution provided Thunder Bay Hydro a comprehensive view into the condition of assets, and resulted in a suggested level of annual asset renewal in the form of a "Flagged for Action Plan".

a) Is the author suggesting that TBH increase in capital spending is not a direct consequence of the findings of the Kinectrics' ACA study?
b) Does the TBH proposed capital expenditures for the 2017 to 2021 period reflect "flagged for action plan" presented in the Kinectrics 2015 ACA?
c) If not, for each asset category how does it differ?

Thunder Bay Hydro Response

b) TBH proposed capital expenditures for 2017 to 2021 are lower than the presented "flagged for action plan" presented in the 2016 ACA.

c) The below chart indicates the differences between the Kinectrics levelized replacement targets verses the TBH planned replacements targeted for 2017 through to 2021.

	4 kV	12 kV	Breakers	4 kV	25 kV	Pad Mounted Transformers	Pole Mounted Transformers	Vault Transformers	4kV In-Line	4kV Manual Air Break	12 and 25kV In-Line	12 and 25kV Manual Air Break	25kV Motorized Load Break	25kV Underground Load Break Switches	4kV	12 and 25kV
2017 Kinectrics Levelized Replacement Target (Yr0)	0	0	0	232	460	44	171	10	3	0	15	5	2	1	1	6
2017 TBH Replacement Target	0	0	0	385	193	75	171	3	7	2	5	5	0	0	1	1.4
2018 Kinectrics Levelized Replacement Target (Yr1)	0	0	0	177	375	44	171	8	3	0	15	5	2	1	1	5
2018 TBH Replacement Target	0	0	0	197	330	53	171	9	18	1	15	7	2	1	1	3.2
2019 Kinectrics Levelized Replacement Target (Yr2)	0	0	0	176	381	44	171	9	3	0	15	5	3	1	1	6
2019 TBH Replacement Target	0	0	0	183	380	44	170	3	6	0	8	6	0	1	1	5.2
2020 Kinectrics Levelized Replacement Target (Yr3)	1	0	14	176	387	44	171	9	3	0	15	5	2	1	1	6
2020 TBH Replacement Target	0	0	0	195	380	44	170	9	6	0	6	1	6	1	1	5.6
2021 Kinectrics Levelized Replacement Target (Yr4)	0	0	0	176	394	44	171	10	4	1	15	5	2	1	1	6
2021 TBH Replacement Target	0	0	0	222	395	44	171	3	1	0	0	1	0	1	1	5.2

2-VECC-13

Evidence Update June 21 2017: Spreadsheet Error which produced incorrect values for the interrogatory response.

Reference: E2/Appendix 2-B/ DSP/pg.74

a) Please provide a table which shows the number of 25kv poles that have been or are planned for replacement in each year 2012 through 2021.
b) Please add a row for each year showing the cost for 25kv pole replacement in each year.
c) At page 74 of the DSP it states that 10% or 2084 poles are in Very Poor (238) or Poor (1846) condition. Please add another row which shows for each year the number of poles at year end (i.e. after of that year's capital plan) that are forecast to be in either very poor or poor condition.
d) Please provide the same a) through c) for 4kV poles.

THUNDER BAY HYDRO UPDATED RESPONSE

Number of 25kV poles planned for replacement										
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Quantity	69	88	92	162	133	193	330	380	380	395
Cost	$870,981	$882,720	$844,977	$1,515,734	$1,112,348	$1,688,730	$3,181,429	$3,798,667	$3,885,973	$3,923,693
Very Poor	n/a	n/a	n/a	n/a	101	13	0	0	0	0
Poor	n/a	n/a	n/a	n/a	1014	910	604	227	254	572

Number of 4kV poles planned for replacement										
	2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Quantity	391	375	444	381	461	385	197	183	195	222
Cost	$5,628,491	$4,562,253	$4,400,255	$4,330,290	$5,235,419	$5,367,788	$3,924,167	$2,948,334	$2,991,666	$3,000,000
Very Poor	n/a	n/a	n/a	n/a	136	0	0	0	0	0
Poor	n/a	n/a	n/a	n/a	832	583	396	215	83	37

2-VECC-14

Reference: E2/Appendix 2-B/ DSP/

a) The Kinetrics assessment of UG cable health shows only 2% of conductor km in very poor or poor condition (pg. 99). Please provide a similar table to that in 2-VECC-13 for underground cable renewal projects using km of cable and which shows the km in very poor and poor condition at the end of each year 2013 through 2021.

Thunder Bay Hydro Response:

a) Page 14 of the Kinetrics Report 'Thunder Bay Hydro 2015 Asset Condition Assessment' indicates a total of 3% Very Poor classified and UG cable and 3% Poor classified UG cable for a total of 6% (21 conductor-km).

Asset Category		Population	Sample Size	Average Health Index	Health Index Distribution					Average Age
					Very Poor < 25%	Poor 25 - <50%	Fair 50 - <70%	Good 70 - <85%	Very Good >= 85%	
Underground Cables	All	432	374	80%	(11) 3%	(10) 3%	(115) 31%	(14) 4%	(224) 60%	29
	4kV	44	29	44%	(10) 34%	(4) 14%	(6) 21%	(0) 0%	(9) 31%	43
	12 and 25kV	387	344	84%	(1) < 1%%	(6) 2%	(109) 32%	(14) 4%	(215) 63%	28

*data in conductor-km

Km of UG cable planned for replacement

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021
Quantity	0	0.34	2.2	0	2.4	4.2	6.2	6.6	6.2
Cost	$0	$173,026*	$672,379**	$0	$376,868	$800,000	$1,300,000	$1,400,000	$1,300,000
Very Poor	n/a	n/a	n/a	n/a	12.07	16.10	16.66	16.73	17.58
Poor	n/a	n/a	n/a	n/a	12.99	23.92	37.66	45.54	108.32

* 2014 UG cable replacement includes pole reconfiguration and recloser costs.
**2015 UG cable replacement includes pad mount transformer and underground switch costs.

ER -VECC -6

Ref: ACA/pg. 16 Table III-2

a) For each asset category please provide a comparison of Table III-2 10 year levelized Flagged for Action Plan in the ACA with TBH's capital expenditure proposals for 2017 through 2021.

b) Given the ACA is based on 2015 data please explain how 2016 actual capital expenditures are being considered in the response to a).

c) For each asset category please provide both the quantity of assets TBH has or proposes to replace in 2016 and 2017 and provide a comparison to the first year amount flagged in the ACA action plan. Please comment on any differences.

d) Please provide the change in reliability risk if TBH were to replace the number of assets recommended but equally over 10 years.

e) Table III-2 generally shows a larger quantity of asset replacements in year 1 then would be the case if assets were replaced on as an equal amount over the ten years. Please explain why and what difference would occur if TBH replaced a greater number of assets in 2 or 3, rather than year one of its capital plan. That is how does altering the pace of asset replacement affect reliability?

Thunder Bay Hydro Response

The Ontario Energy Board stated in Procedural Order No. 5 that (**emphasis added**):

> "Intervenors shall request any relevant information and documentation from Thunder Bay Hydro on **the new expert report only**, by written interrogatories filed with the OEB and served on all parties by June 2, 2017."

VECC does not cite the new expert report in this interrogatory. Rather VECC's questions relate solely to the ACA. The ACA has been on the evidentiary record, and all parties including VECC have had ample opportunity to ask questions about it. It is

Thunder Bay Hydro submits that this interrogatory is in breach of the procedural directions of the Board in Procedural Order No. 5.

Despite this, to the extent additional information may be of assistance to the Ontario Energy Board in its decision making on this case, and to avoid further procedural delays, Thunder Bay Hydro has asked that Kinectrics provide a response to this interrogatory.

a) While preparing the response to this interrogatory TBH discovered an error in Table III-2. Specifically, the spreadsheet used to calculate the 10 year FFAP included an incorrect cell reference. Attached below are the corrections provided by Kinectrics to fix for that error.

   TBH believes that its DSP is not affected based on the results of this table as the error only affected the last two years of the 10 year levelized quantities and the DSP only encompasses the first 5 years of levelized planning. Therefore there are no further revisions to be made as a result of the error in this table.

   The below amended Table III-2 from the Kinectrics ACA contains both Kinectrics proposed levelized plan and Thunder Bay Hydro's proposed plans in response to this IR.

Asset Category		10 Year LEVELIZED Flagged for Action Total				TBH Proposed First Year (2017) Quantity	TBH Proposed 10 Year (2017-2027) Quantity
		First Year		10 Year			
		Quantity	Percentage	Quantity	Percentage		
Substation Transformers	4 kV Secondary Transformers	0	0%	4	24%	0	0

Asset Category		10 Year LEVELIZED Flagged for Action Total				TBH Proposed First Year (2017) Quantity	TBH Proposed 10 Year (2017-2027) Quantity
		First Year		10 Year			
		Quantity	Percentage	Quantity	Percentage		
	12 kV Secondary Transformers	0	0%	0	0%	0	0
Circuit Breakers	Circuit Breakers	0	0%	14	18%	0	0
Wood Poles	4 kV Wood Poles	232	6%	1815	48%	385	1849
	25 kV Wood Poles	460	3%	4390	30%	193	4242
Distribution Transformers	Pad Mounted Transformers	44	2%	262	12%	75	302
	Pole Mounted Transformers	171	4%	1048	25%	171	1046
	Vault Transformers	10	4%	110	39%	3	91
Overhead Switches	4kV In-Line OH Switches	3	3%	37	37%	20	72
	4kV Manual Air Break OH Switches	0	0%	7	100%	10	17
	12 and 25kV In-Line OH Switches	15	4%	99	25%	5	59
	12 and 25kV Manual Air Break OH Switches	5	3%	39	21%	5	37
	12 and 25kV Motorized Load Break OH Switches	2	5%	22	56%	0	19
Underground Switches	25kV Underground Load Break Switches	1	1%	17	21%	0	16
Underground Cables*	4kV UG Cables	1	2%	11	25%	1	11
	12 and 25kV UG Cables	6	2%	71	18%	1.4	62.6

c) The below table provides a 2016 Thunder Bay Hydro actual replacements and 2017 proposed replacements as well as a comparison of the Kinectrics Levelized Replacement Target for year 0. There are differences in the split between 4kV and 25kV wood poles due to the completion of several 4kV conversion projects work-in-progress prior to alignment in 2019. In addition there are differences in the number of pad mounted distribution transformers and overhead switches planned for replacement or removal due to their functional obsolescence in 4kV projects.

	4 kV	12 kV	Breakers	4 kV	25 kV	Pad Mounted Transformers	Pole Mounted Transformers	Vault Transformers	4kV In-Line	4kV Manual Air Break	12 and 25kV In-Line	12 and 25kV Manual Air Break	25kV Motorized Load Break	25kV Underground Load Break Switches	4kV	12 and 25kV
2016 TBH Actual Replacements	0	0	0	461	133	52	109	9	12	0	12	6	0	0	0	0.96
2017 Kinectrics Levelized Replacement Target (Yr0)	0	0	0	232	460	44	171	10	3	0	15	5	2	1	1	6
2017 TBH Replacement Target	0	0	0	385	193	75	171	3	7	2	5	5	0	0	1	1.4

KINECTRICS RESPONSE

a) Below is the corrected Table III-2 Total Year 1 and 10-Year Total Flagged for Action Plan.

Asset Category		10 Year Flagged for Action Total				10 Year LEVELIZED Flagged for Action Total				Replacement Strategy
		First Year		10 Year		First Year		10 Year		
		Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	
Substation Transformers	4 kV Secondary Transformers	0	0%	4	24%	0	0%	4	24%	proactive
	12 kV Secondary Transformers	0	0%	0	0%	0	0%	0	0%	proactive
Circuit Breakers	Circuit Breakers	0	0%	14	18%	0	0%	14	18%	proactive
Wood Poles	4 kV Wood	364	9%	1865	48%	232	6%	1815	47%	proactive

Asset Category		10 Year Flagged for Action Total				10 Year LEVELIZED Flagged for Action Total				Replacement Strategy
		First Year		10 Year		First Year		10 Year		
		Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	Quantity	Percentage	
	Poles									
	25 kV Wood Poles	544	3%	4807	30%	460	3%	4390	28%	proactive
Distribution Transformers	Pad Mounted Transformers	204	9%	254	12%	44	2%	262	12%	proactive
	Pole Mounted Transformers	625	15%	1049	25%	171	4%	1048	25%	reactive
	Vault Transformers	14	5%	116	41%	10	4%	110	39%	reactive
Overhead Switches	4kV In-Line OH Switches	3	3%	41	41%	3	3%	37	37%	reactive
	4kV Manual Air Break OH Switches	0	0%	4	57%	0	0%	7	100%	reactive
	12 and 25kV In-Line OH Switches	30	8%	95	24%	15	4%	99	25%	reactive
	12 and 25kV Manual Air Break OH Switches	20	11%	41	22%	5	3%	39	21%	reactive
	12 and 25kV Motorized Load Break OH Switches	0	0%	16	41%	2	5%	22	56%	reactive
Underground Switches	25kV Underground Load Break Switches	0	0%	15	19%	1	1%	17	21%	reactive
Underground Cables	4kV UG Cables	2	5%	5	11%	1	2%	11	25%	reactive
	12 and 25kV UG Cables	4	1%	75	19%	6	2%	71	18%	reactive

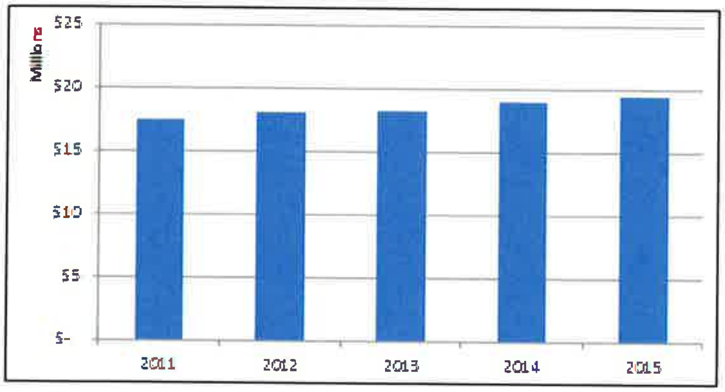
b) ACA was based on the input data/information as of the end of 2015 and is a snap shot in time aimed at assisting with the annual budgeting process. 2016 replacement were not considered in the ACA study.

c) This strikes a balance between dealing with a backlog of assets in the FFAP while mitigating impact on rates.

d) and e) Refer to the Kinectrics response in ER-Staff-80 a) and b) regarding reliability. In addition it is not possible to quantify the reliability change if replacements are not done per FFA. The FFA is a probabilistic assessment, which means that for nearly all assets (with the exception of station transformers and breakers) the specific asset flagged for action is not determined, i.e. only estimated quantities are determined. As such, the reliability impact can't be quantified. It can only be said that, from a qualitative standpoint, that risk increases because the likelihood of failure of assets will increase as they continue to remain in service.

Total Utility Distribution Revenue

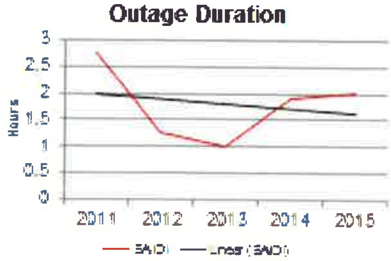
- *$92.2M total Distribution Revenue over past 5 years*
- *17.6% Increase*

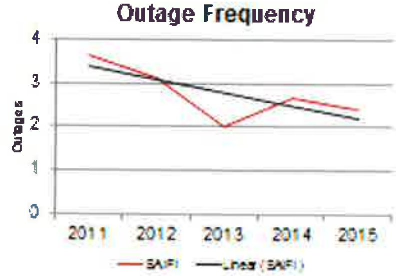


THUNDER BAY HYDRO

Scorecard Highlights

- *All OEB Service Quality have been consistently exceeded*
- *Fully compliant with ESA Safety requirements and Zero Serious Public Safety Incidents in last 5 years*
- *Electricity Reliability Trends show improvement over past 5 years*





THUNDER BAY HYDRO

2-Staff-23

Ref: E2/p. 58

At the above reference, SAIDI and SAIFI statistics are shown for the years 2011 to 2015. Both of these indicators appear to be significantly lower for 2014 than the other four years.

Please explain why this was the case.

Thunder Bay Hydro Response:

Service Reliability

Index	Including outages caused by loss of supply					Excluding outages caused by loss of supply					Excluding Major Events				
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
SAIDI	2.797	1.290	1.038	2.156	2.228	2.783	1.285	1.031	1.922	2.021					
SAIFI	3.805	3.126	2.137	2.944	2.887	3.659	3.124	2.018	2.684	2.390					

5 Year Historical Average

SAIDI		1.902		1.808		
SAIFI		2.980		2.775		

The top chart on this page shows the correct data for the correct year

All of the Yearly data detailed within the original Exhibits 2's Page 58 Service Reliability Chart was erroneously shifted to the next year. (i.e. the 2014 data was in the 2015 column in the COS report). It is presumed that the question posed to Thunder Bay Hydro Electricity Distribution Inc would have been. ***"SAIDI and SAIFI are significantly lower in 2013 than the other 4 years. Explain why"?***

Answer:

Thunder Bay Hydro Electricity Distribution Inc was fortunate and enjoyed a couple of years (2012 and 2013) with fewer significant outages or weather related outage events.

P14 DSP

File Number: EB-2016-0105
Exhibit: 2
Tab:
Attachment: 2-I
Page:

Date: 09-Sep-16

Appendix 2-G
Service Reliability and Quality Indicators
2011 - 2015

Service Reliability

Not yet reportable

Index	Including outages caused by loss of supply					Excluding outages caused by loss of supply						Excluding Major Events			
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
SAIDI	2.94	2.79	1.29	1.04	2.15	2.60	2.77	1.28	1.03	1.92					
SAIFI	4.56	3.80	3.12	2.14	2.94	3.68	3.65	3.12	2.02	2.68					

5 Year Historical Average

	Including outages caused by loss of supply	Excluding outages caused by loss of supply	Excluding Major Events
SAIDI	2.042	1.920	
SAIFI	3.311	3.030	

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

Service Quality

Indicator	OEB Minimum Standard	2011	2012	2013	2014	2015
Low Voltage Connections	90.0%	98.30%	99.80%	99.10%	99.80%	100.00%
High Voltage Connections	90.0%	100.00%	100.00%	100.00%	100.00%	100.00%
Telephone Accessibility	65.0%	92.70%	91.80%	90.10%	91.80%	87.10%
Appointments Met	90.0%	99.10%	91.90%	99.60%	97.80%	100.00%
Written Response to Enquires	80.0%	97.80%	97.30%	97.40%	99.60%	96.90%
Emergency Urban Response	80.0%	96.70%	96.50%	93.50%	97.60%	92.20%
Emergency Rural Response	80.0%	93.90%	100.00%	100.00%	100.00%	97.20%
Telephone Call Abandon Rate	10.0%	0.70%	1.00%	0.90%	0.70%	1.30%
Appointment Scheduling	90.0%	99.10%	91.90%	99.60%	97.80%	98.80%
Rescheduling a Missed Appointment	100.0%	100.00%	100.00%	100.00%	100.00%	100.00%
Reconnection Performance Standard	85.0%	0.00%	100.00%	100.00%	100.00%	100.00%

Target = 1.92

X

Scorecard - Thunder Bay Hydro Electricity Distribution Inc.

9/29/2016

Performance Outcomes	Performance Categories	Measures		2011	2012	2013	2014	2015	Trend	Target: Industry	Target: Distributor
Customer Focus Services are provided in a manner that responds to identified customer preferences.	Service Quality	New Residential/Small Business Services Connected on Time		99.80%	99.10%	99.80%	100.00%	99.90%	up (target met)	90.00%	
		Scheduled Appointments Met On Time		91.90%	99.60%	97.80%	100.00%	99.90%	up (target met)	90.00%	
		Telephone Calls Answered On Time		91.80%	90.10%	91.80%	87.10%	92.40%	down (target met)	65.00%	
	Customer Satisfaction	First Contact Resolution					A+	A+			
		Billing Accuracy					99.97%	99.93%	down (target met)	98.00%	
		Customer Satisfaction Survey Results					A	A			
Operational Effectiveness Continuous improvement in productivity and cost performance is achieved; and distributors deliver on system reliability and quality objectives.	Safety	Level of Public Awareness						82.00%			
		Level of Compliance with Ontario Regulation 22/04 [1]		C	C	C	C	C	flat (target met)		C
		Serious Electrical Incident Index	Number of General Public Incidents	0	0	0	0	0	flat (target met)		0
			Rate per 10, 100, 1000 km of line	0.000	0.000	0.000	0.000	0.000	flat (target met)		0.000
	System Reliability	Average Number of Hours that Power to a Customer is Interrupted [2]		2.77	1.28	1.03	1.92	2.02	down (target not met)		1.92
		Average Number of Times that Power to a Customer is Interrupted [2]		3.65	3.12	2.02	2.69	2.39	down (target met)		3.03
	Asset Management	Distribution System Plan Implementation Progress					On track	On-track			
	Cost Control	Efficiency Assessment			3	3	3	3			
		Total Cost per Customer [3]		$577	$568	$585	$606	$635			
		Total Cost per Km of Line [3]		$24,196	$24,533	$25,631	$26,864	$27,195			
Public Policy Responsiveness Distributors deliver on obligations mandated by government (e.g., in legislation and in regulatory requirements imposed further to Ministerial directives to the Board).	Conservation & Demand Management	Net Cumulative Energy Savings [4]						10.92%			48.42 GWh
	Connection of Renewable Generation	Renewable Generation Connection Impact Assessments Completed On Time		100.00%	100.00%		100.00%	100.00%			
		New Micro-embedded Generation Facilities Connected On Time				100.00%	100.00%	100.00%	flat (target met)	90.00%	
Financial Performance Financial viability is maintained; and savings from operational effectiveness are sustainable.	Financial Ratios	Liquidity: Current Ratio (Current Assets/Current Liabilities)		1.85	1.72	1.62	1.85	1.61			
		Leverage: Total Debt (includes short-term and long-term debt) to Equity Ratio		0.86	0.81	0.66	0.72	0.75			
		Profitability: Regulatory Return on Equity	Deemed (included in rates)	3.75%	3.75%	7.00%	7.00%	7.00%			
			Achieved	7.24%	7.74%	6.34%	5.99%	5.69%			

1. Compliance with Ontario Regulation 22/04 assessed: Compliant (C); Needs Improvement (NI); or Non-Compliant (NC).
2. The trend's arrow direction is based on the comparison of the current 5-year rolling average to the fixed 5-year (2010 to 2014) average distributor-specific target on the right. An upward arrow indicates decreasing reliability while downward indicates improving reliability.
3. A benchmarking analysis determines the total cost figures from the distributor's reported information.
4. The CDM measure is based on the new 2015-2020 Conservation First Framework. This measure is under review and subject to change in the future.

Legend: 5-year trend: up, down, flat. Current year: target met, target not met.

three categories: Defective equipment, interruptions resulting from distributor equipment failures due to age related deterioration, incorrect maintenance and/or application of equipment; Foreign Interference, interruptions resulting from sabotage, vandalism, dig-ups, vehicles and animals and are outside of the distributors control; and Unknown/other, interruptions that cannot be attributed to any particular cause. These three categories account for 70% of all recorded outages.

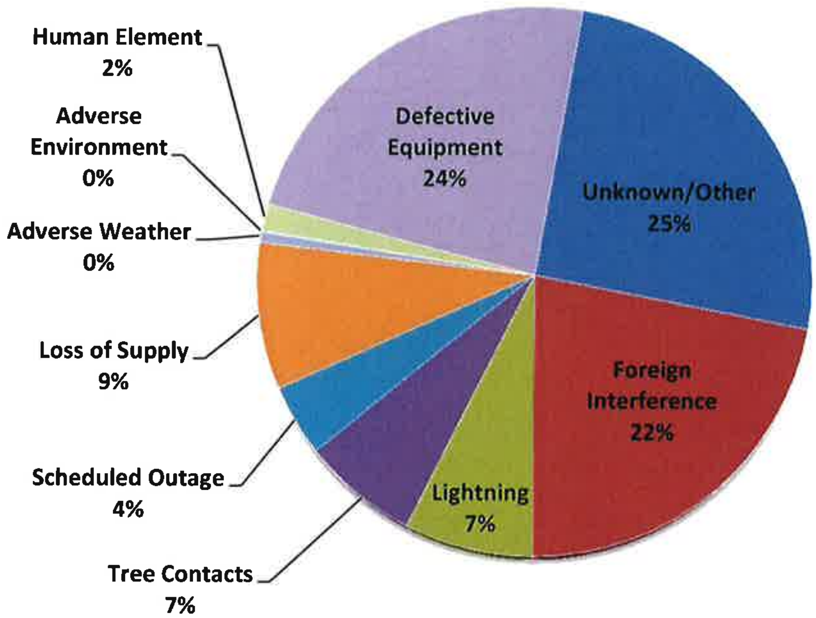


Figure 5.2.3-5 Outage Causes by Duration 2012-2015

V. Asset Management

DSP Implementation Progress

The DSP has been developed in support of this cost of service Application and as such it has not yet been implemented. Thunder Bay Hydro is currently executing its Asset Management Plan which closely aligns with the objectives outlined in this DSP.

The Ontario Energy Board has not yet developed a standardized reporting method for DSP progress, and until such time, Thunder Bay Hydro plans to track DSP performance with the following method.

a) Financial performance measured as plan vs actual expenditures percentage
   a. Over expenditure >100%
   b. Under expenditure <100%
b) Scope Management measured as plan vs actual quantities of assets renewed percentage

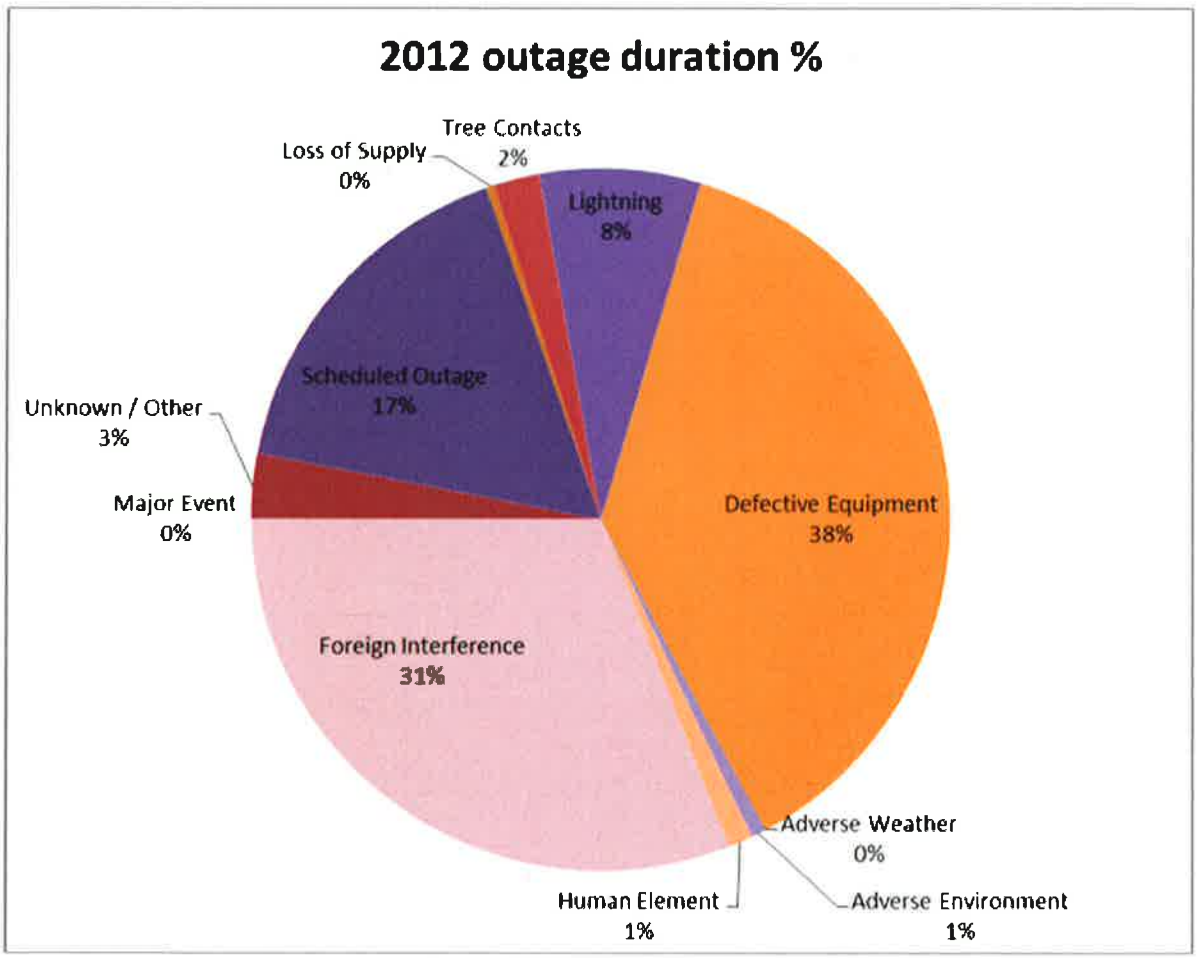
2-AMPCO-6

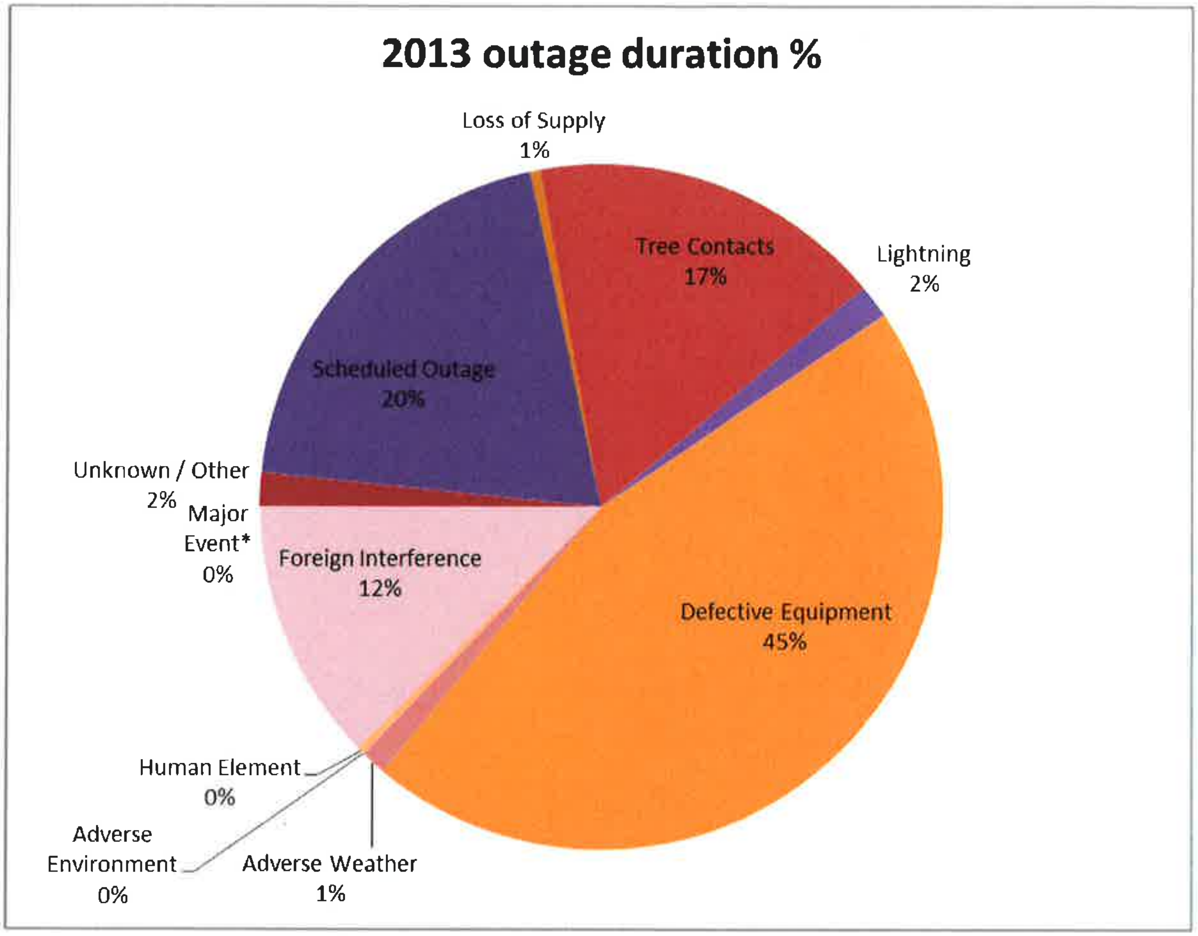
Ref: Appendix 2-B DSP Page 44

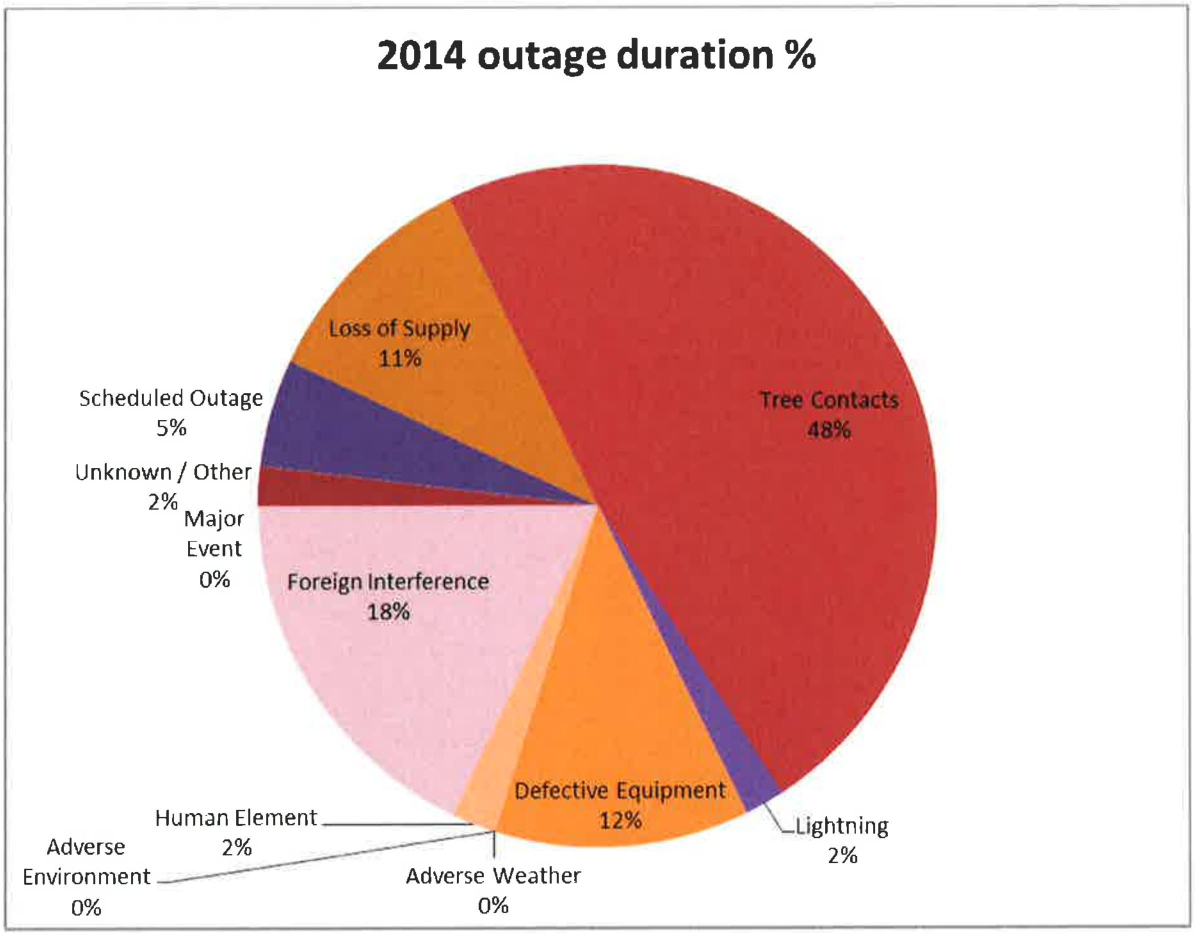
a) Figure 5.2.3-5 Outage Causes by Duration: Please provide Figure 5.2.3-5 separately for each of the following years: 2012, 2013, 2014, and 2015.

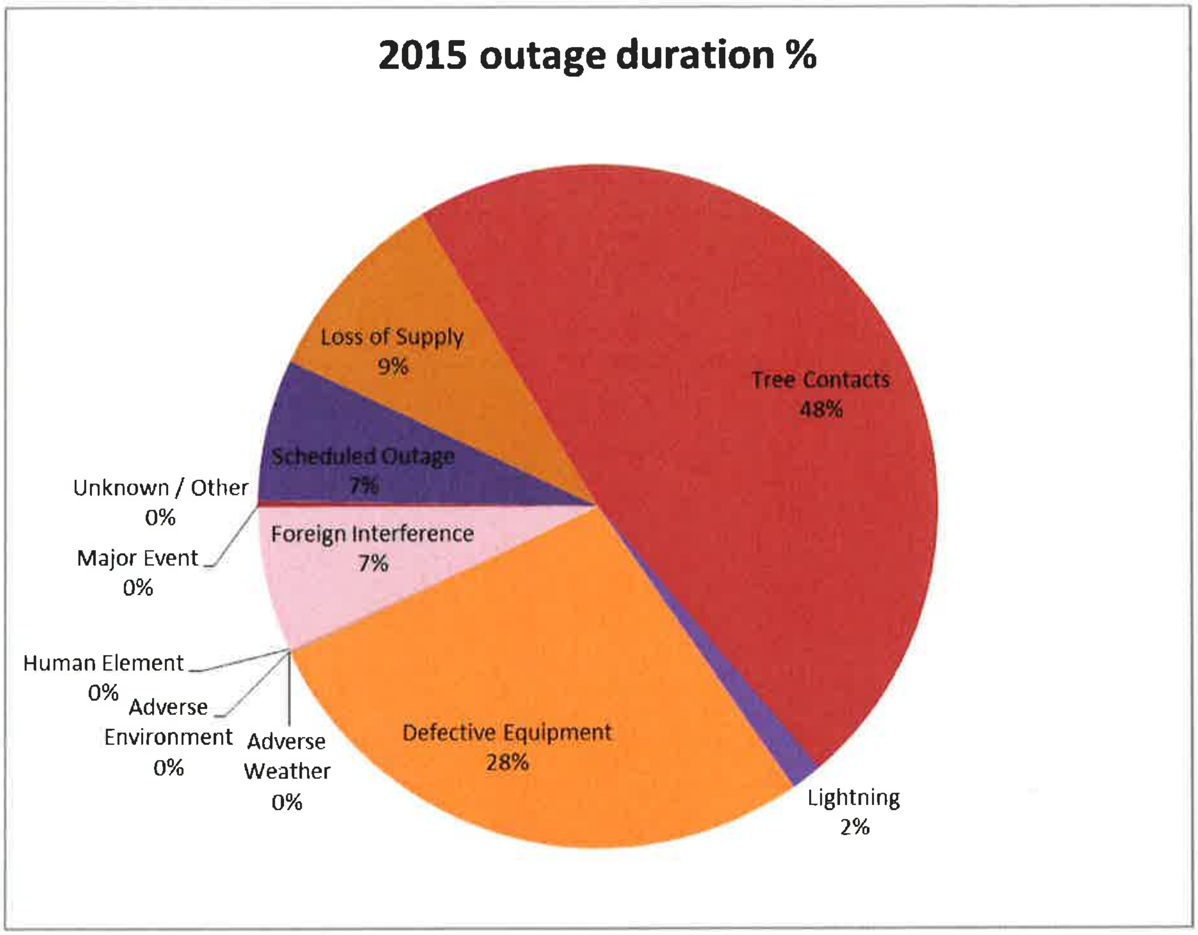
b) Please provide a Figure that shows the Outage Causes by Duration for 2016.

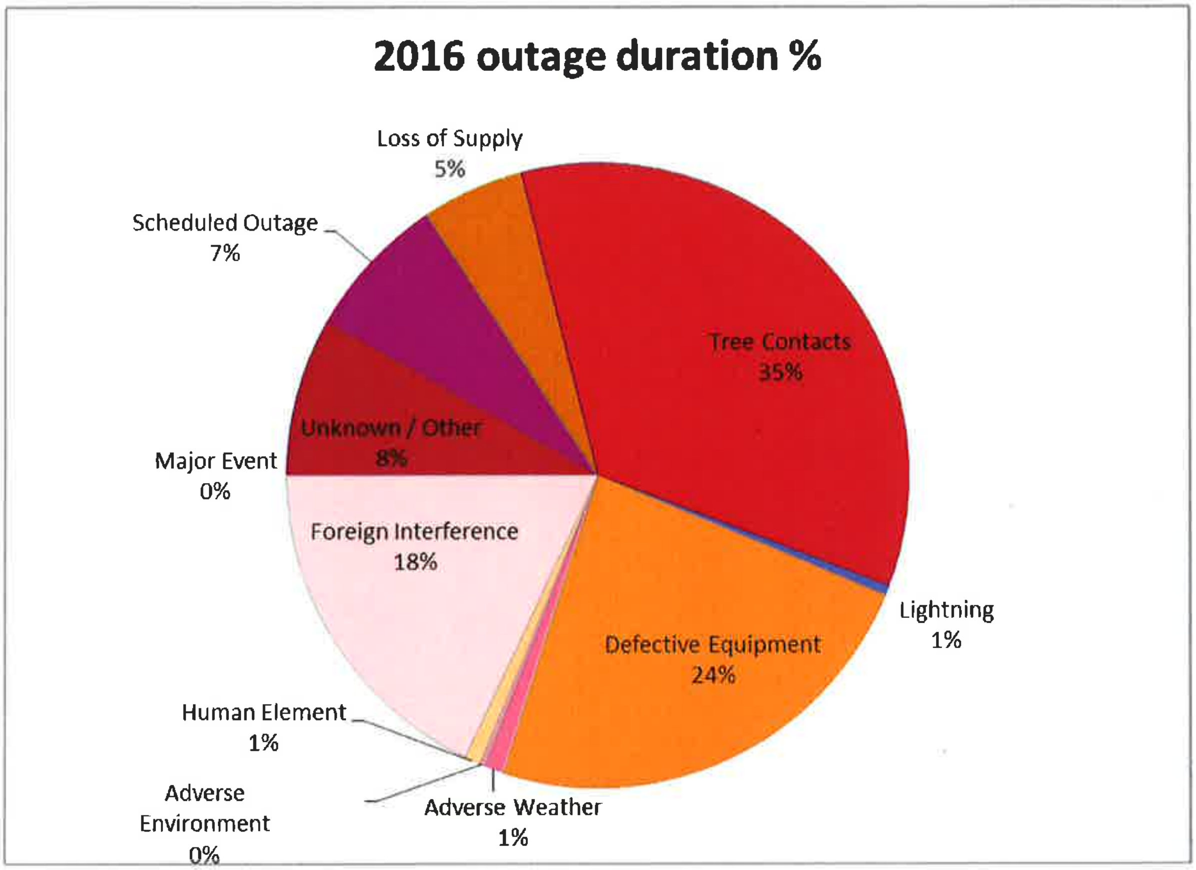
Thunder Bay Hydro Response:




2013 outage duration %
Loss of Supply 1%
Tree Contacts 17%
Lightning 2%
Scheduled Outage 20%
Unknown / Other 2%
Major Event* 0%
Foreign Interference 12%
Defective Equipment 45%
Human Element 0%
Adverse Environment 0%
Adverse Weather 1%


2014 outage duration %
Loss of Supply
11%
Tree Contacts
48%
Scheduled Outage
5%
Unknown / Other
2%
Major
Event
0%
Foreign Interference
18%
Defective Equipment
12%
Lightning
2%
Human Element
2%
Adverse
Environment
0%
Adverse Weather
0%


2015 outage duration %
Loss of Supply
9%
Tree Contacts
48%
Scheduled Outage
7%
Unknown / Other
0%
Foreign Interference
7%
Major Event
0%
Human Element
0%
Adverse
Environment
0%
Adverse
Weather
0%
Defective Equipment
28%
Lightning
2%


2016 outage duration %
Loss of Supply
5%
Scheduled Outage
7%
Tree Contacts
35%
Unknown / Other
8%
Major Event
0%
Foreign Interference
18%
Lightning
1%
Defective Equipment
24%
Human Element
1%
Adverse
Environment
0%
Adverse Weather
1%

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Reliability Statistics
2-AMPCO-6

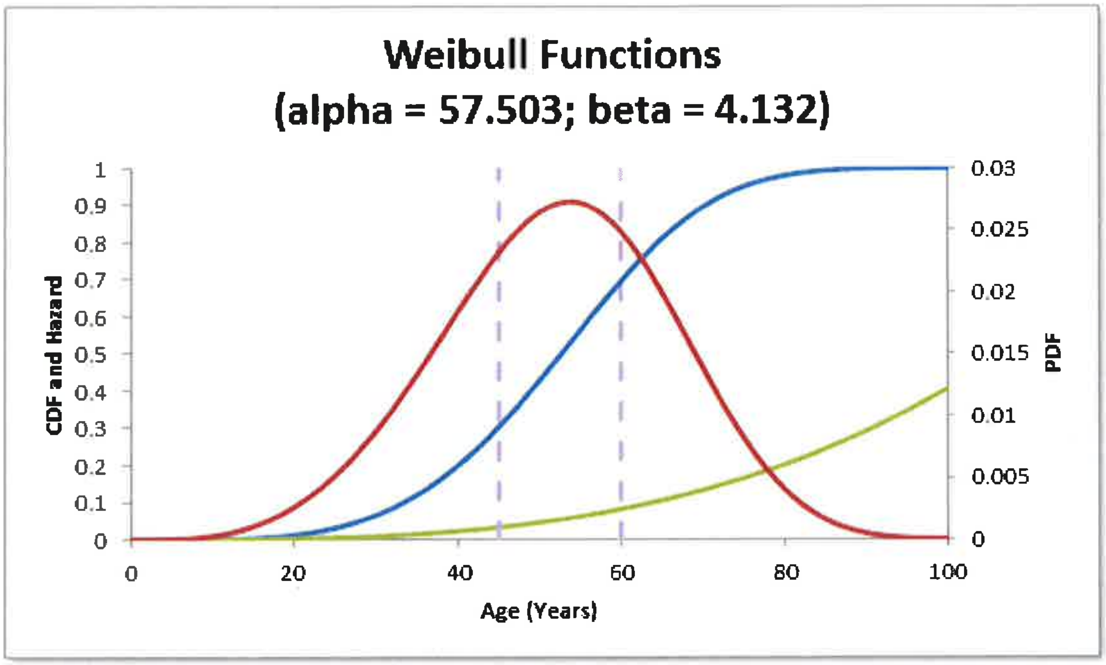
%	2012-2015	2012	2013	2014	2015	2016
Tree Contact	7	2	17	48	48	35
Adverse Weather	0	0	1	0	0	1
Defective Equip	24	38	45	12	28	24
Major Event		0	0	0	0	0
Lightning	7	8	2	2	2	1
Unknown	25	3	2	2	0	8

maintenance records, loading and age. The ACA report included in Exhibit 2, Attachment 2B, provides details of HI distribution for the TBHEDI's assets considered in the ACA study.

Risk Assessment

The Figure 2 below shows Weibull curves used extensively in electrical utilities business to estimate relationship between HI score of individual assets and the corresponding Rate of Failure.

Figure 2 - Weibull Probability of Failure Curves



Failure density curve (the red curve) is first generated using removal statistics and then the rate of failure curve (the green curve) and probability of failure curve (the blue curve) are derived from the failure density curve. TBHEDI, like most other utilities, did not have sufficient removal statistics records required to generate the curves, so instead assumptions based on the experience of the TBHEDI's staff regarding typical useful life and extreme useful life of various assets were used to generate these curves. This is common practice amongst utilities who do not currently have removal statistics available. It is expected that going forward TBHEDI will start collecting removal information so that the risk assessment phase of the ACA process will improve in the future.

Flagged-for-Action Plan (FFAP)

Rather than using the term "Replacement Plan", FFAP was used because replacement is NOT the only option available when asset is found to be in a poor condition. For example some assets that are typically replaced proactively or before they fail are station transformers, circuit breakers and wood poles. Rather than replacement there are a number of actions that could be taken, such as

2. BENCHMARKING CONSIDERATIONS

Comparison of TBHEDI's Performance with Selected LDCs

I compared TBHEDI's reliability and cost performance with that of the OEB defined peer group of 4 LDCs using 2015 OEB data (the latest data available) and the comparison is shown in the Figure 4, Figure 5 and Figure 6 below.

Figure 4 – Benchmarking TBHEDI's 2015 Reliability

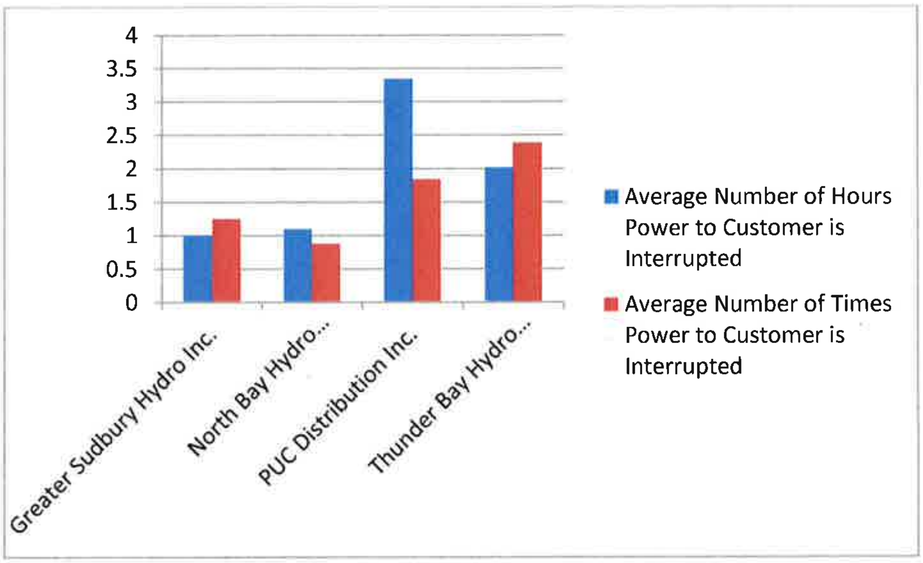
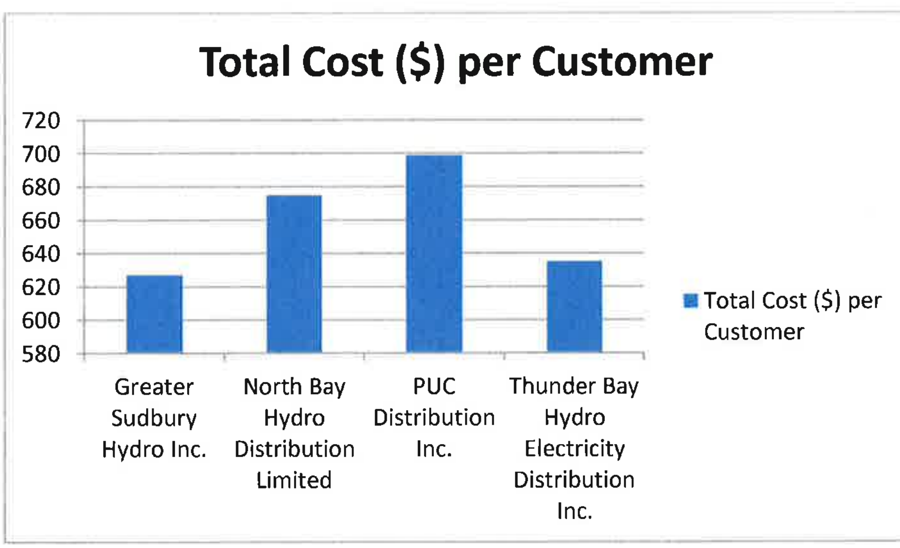
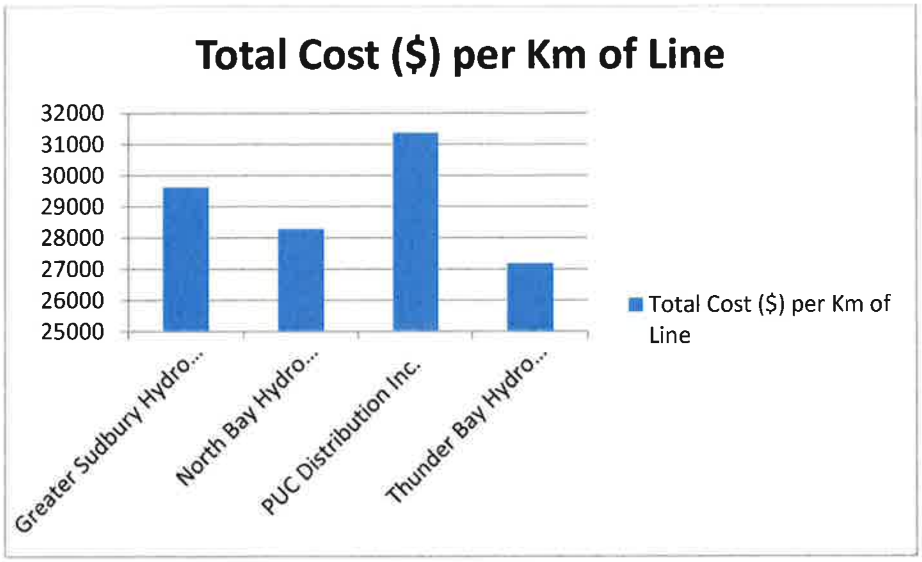


Figure 5 – Benchmarking TBHEDI's Costs Per Customer



2013 OEB Yearbook of Electricity Distributors Data	GSH	NBH	PUC	TBH
	P72	P76	P78	P79
SAIDI	1.49	2.81	2.65	1.04
SAIFI	1.23	3.07	3.53	2.14
SAIDI - Excluding LOS	1.35	2.32	2.48	1.03
SAIFI - Excluding LOS	1.16	1.89	2.67	2.02

Figure 6 – Benchmarking TBHEDI's Cost per Line km



It is seen from the graphs that TBHEDI's *cost per customer* is on a low side (within 1% from the lowest cost but almost 10% lower than the highest cost and about 6% lower than the second highest cost for the peer LDCs). The TBHEDI's cost per km of line is the lowest (more than 13% lower than the highest cost and about 4% lower than the second lowest cost for the peer LDCs).

At the same time, the comparison shows that TBHEDI's *average number of hours power to customers was interrupted* was second highest (almost double of the lowest and second lowest numbers for the peer LDCs) while *average number of times the power to customers was interrupted* was the highest among the peer LDCs (almost 3 times as high as the lowest number and about 30% higher than the second highest number).

Since most of the equipment caused outages are due to line components failures and TBHEDI spends the least amount per line km and close to the lowest cost per customer among the peer LDCs while experiencing by far the highest number of outage frequency rate and second highest outage duration rate, it could be concluded based on this benchmarking that TBHEDI is underspending on its line assets.

Comparison of Useful Life Values used in the ACA Report with OEB Guideline

Table 1 below provides a comparison of Typical Useful Life (TUL) and Maximum useful Life (Max UL) used in the Kinectrics ACA study with the values provided as a guideline in the OEB's publication "Asset Deprecation Study for the Ontario Energy Board" issued on July 8, 2010.

Table 1 – Comparison of TBHEDI's Useful Lives with OEB Guideline Values

Asset Category	TBHEDI		OEB	
	TUL	Max UL	TUL	Max UL
Station Transformers	60	70	45	60

4. IMPACT ON O&M

The increase in System Renewal capital in the test year addresses asset needs identified in the ACA report and involves initiating programs to start replacing proactively 25 kV poles and underground cables. Unlike substation assets, linear assets are not subjected to significant preventative maintenance and, thus, this capital increase will not results in a noticeable reduction in preventative O&M. At the same time renewing linear asset is expected to improved reliability and, as a consequence, is expected to reduce corrective O&M. It is worth noting that these planned replacements represent a much more efficient use of capital funds since planned replacement unit cost is always lower than forced replacement unit cost.

TBHEDI also intends to defer some of the voltage conversion programs due to the longer than expected life of 4 kV substation transformers and described their associated O&M strategy regarding the substations marked for voltage conversion on page 88 of the DSP as follows:

"Thunder Bay Hydro will delay O&M spending in areas that align with system renewal efforts, to the extent possible, where doing so will pose no safety or environmental hazard. This strategy is of particular importance in areas of voltage conversion. The O&M costs associated with maintaining substation assets are approximately $15,000 per year per station. The final outcome of the conversion process is to decommission the substations, resulting in elimination of maintenance associated with that station. Thunder Bay Hydro maintains an annual listing of substations targeted for decommissioning. This strategy focuses on attempting to reduce or defer spending on those substations which are being decommissioned first while ensuring the substations that will be online the longest are being appropriately attended to."

6. COMPATIBILITY WITH KINECTRICS ACA STUDY RESULTS

FFAP is an input in identifying a number of units within each asset category that require attention based on their condition and estimated failure rate. Utility then establishes what the appropriate action is on a case-by-case basis to translate FFAP into a condition based System Renewal investments. This, however, represents only the condition based portion of the System Renewal investments. There are also other drivers that contribute to the System Renewal requirements, such as physical obsolescence, functional obsolescence, compliance with standards, municipal initiatives, and corporate considerations, e.g. financial constraints, input from customers, safety and environmental concerns, etc.

FFAP from Kinectrics ACA report identified a number of units within each asset category requiring attention based on their condition and the corresponding failure rate. This represents condition driven asset requirements and as stated on page 52 of the DSP "Thunder Bay Hydro has revised its previous capital plan to harmonize with results of the Kinectrics report. In doing so, Thunder Bay Hydro considered the impact this shift would have on projects currently under execution, the impact to the current planning cycle, and the impacts to customers, the municipality and 3d party attachers."

Specific areas of the System Renewal expenditures in the test year influenced by the ACA report finding were:

- Slowing down voltage conversion programs due to the longer than expected lives of substation transformers
- Putting in place a new proactive 25 kV wood poles replacement program
- Putting in place a new proactive underground cables replacement program
- Delaying to the extent possible O&M spending on some substation assets included in the voltage conversion plan

DSP states on pages 129-130 that "Thunder Bay Hydro has purposely taken a conservative approach and paced the shift in expenditures over a 3 year period to minimize cost impact to the customer and to complete work in progress. Specifically work in progress on 4kV conversion projects, where there are only one or two project areas prior to be completed, prior to decommissioning of a station. In addition, this change is a fundamental shift in philosophies, and requires changes in construction practices, scheduling and labor allocations. Allowing 3 years to become aligned will allow Thunder Bay Hydro the chance to implement these changes in the most cost effective manner."

A comparison of FFAP numbers vs test year numbers for 25 kV wood poles and 12 and 25 kV underground cables are shown in the Table 2 below.

7. COMPATIBILITY OF THE DSP WITH CHAPTER 5 REQUIREMENTS

The main focus of my assessment was on various aspects associated with System Renewal expenditures. I have also performed a high level overview of the DSP to assess its compatibility with the Chapter 5 requirements. This overview was not as thorough as the assessment of the System Renewal planned expenditures and merely included checking whether the main areas prescribed by OEB have been addressed. Following are my observations:

- The DSP's structure followed the prescribed Chapter 5 format
- In putting together capital plans, TBHEDI engaged in consultations with:
  - Customers,
  - City of Thunder Bay,
  - Ministry of Transportation
  - Ministry of Environment
  - First Nations
  - Public Coordinating Committee
  - Third party attachers,
  - CDM program partners
  - IESO
- There are Performance Metrics in place to monitor DSP performance
- Decision making follows the Asset Management Framework
- DSP provides an overview of asset managed and their condition based on the Kinectrics ACA report
- Existing capital planning process includes prioritization
- No capital is required to integrate forecasted REG nor address system enhancements identified via IRRP process

ER-Staff-79

Ref: p. 3

At the above reference, it is stated that:

It is important to note that the final System Renewal budget for 2017 was not directly and exclusively derived from the Health Index distribution in the ACA report (the relationship is described in detail in the body of this report). Furthermore, although condition based needs represent an important input in developing System Investment capital requirements, there are other factors that are taken into account when deciding on appropriate System Renewal level, such as physical obsolescence, functional obsolescence, compliance with standards, municipal initiatives, and corporate considerations, e.g. financial constraints, input from customers, safety and environmental concerns, etc.

a) Please define each of the above referenced other factors and provide an example of how each has been incorporated into the Thunder Bay Hydro renewal capital expenditures planned for the test year.

b) Please discuss how physical obsolescence and functional obsolescence, as used in the above statement, should be differentiated from the ACA Health Index distribution.

c) In Mr. Tsimberg's opinion, did Thunder Bay Hydro sufficiently take both physical and functional obsolescence of assets into account when "deciding on appropriate System Renewal level" as filed in the application?

THUNDER BAY HYDRO RESPONSE

a) Kinectrics was unable to respond to part (a) without input from Thunder Bay Hydro. This response has been divided between the facts that are being provided by Thunder Bay Hydro, and the responses supplied by Kinectrics, so parties and the OEB can clearly understand where each response is coming from. This approach has been used in other IRRs below where a similar issue arose. The below chart defines each of the referenced 'other factors' and provides an example of how each was incorporated into the decision making regarding capital expenditures planned for the test year.

Other Factor	Definition	Example of Incorporation
Physical Obsolescence	Occurs when an asset is deteriorated to a point of being at risk of failure.	Proactive asset replacements for wood poles
Functional Obsolescence	Occurs when an asset cannot perform as needed due to system requirements	Voltage conversion projects where replacement of transformers is required to complete the conversion to ultimately decommission the station.
Compliance with Standards	Standards set out by organizations such as CSA, ESA, Measurement Canada, and Environment Canada.	Meter testing program PCB Transformer Replacement program
Municipal Initiatives	City of Thunder Bay capital projects (road widening, infrastructure replacement) and beautification initiatives.	Co-ordinating renewal projects with city projects to avoid costs
Financial Constraints	Limit on the available capital expenditures.	Strategic reduction of the budget to meet the required envelope
Input from Customers	Feedback and comments from customer surveys provided to TBHEDI regarding system planning.	Residential Customers preference for cost minimization reduced the overall budget envelope Commercial Customers

		preference for reliability resulted in modifying the grid modernization plan
Safety Concerns	Reports from staff and the public which affect the health and safety of both internal and external parties.	Increased budget in Lines Safety Reports to handle the backlog of assets identified as safety concerns.
Environmental Concerns	Concerns with equipment negatively impacting the environment	Budget for Transformers and Lines Safety Reports impacted due to remediation costs.

KINECTRICS RESPONSE

b) ACA Health Index distribution only identifies units that are in bad condition. Units that are physically or functionally obsolete are not necessarily in a bad condition and, thus, sometimes are removed when NOT close to their physical end of life

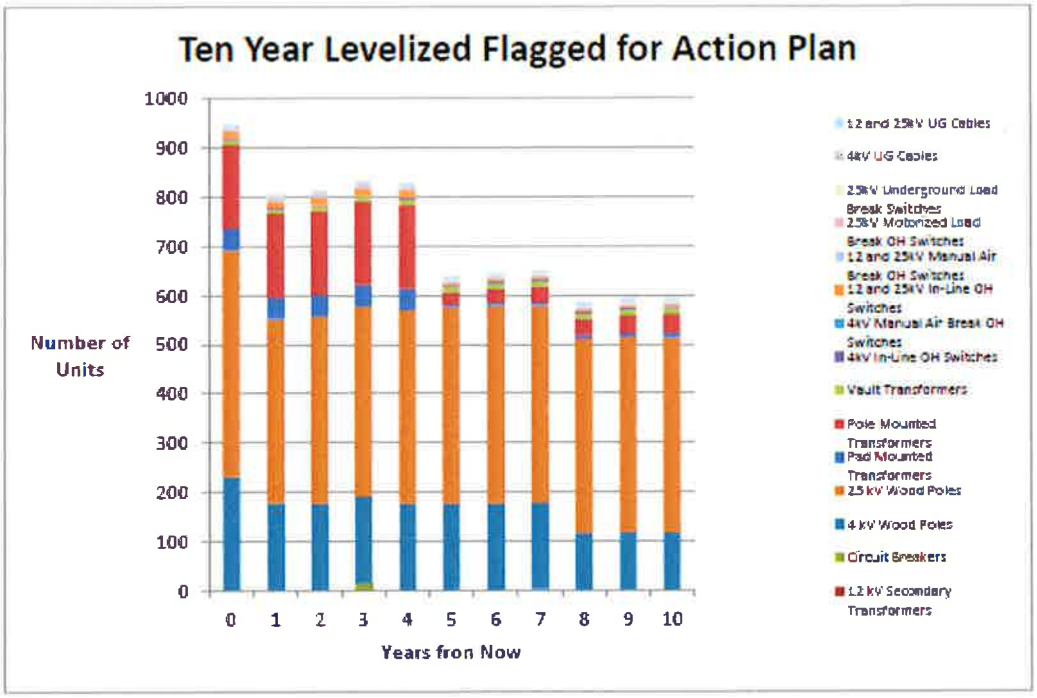
c) I have no opinion on this question. The ACA was focused exclusively on condition based needs. I did not examine the system renewal spending from this perspective.

ER-Staff-83

Ref: p.8

At the above reference, the figure below is shown:

Figure 3 - TBHEDI's 10-Year FFAP



a) Please explain the reasons for the significantly higher number of units flagged for action during the first five years (year 0 to 4) shown in Figure 3, and particularly the number of units in year 0. Please quantify the explanation, to the extent possible.

b) Does the Flagged-for-Action Plan (FFAP) shown in Figure 3 incorporate the asset replacements forecast in the present filing? If not, please provide an updated version of Figure 3 that does incorporate the forecast replacements.

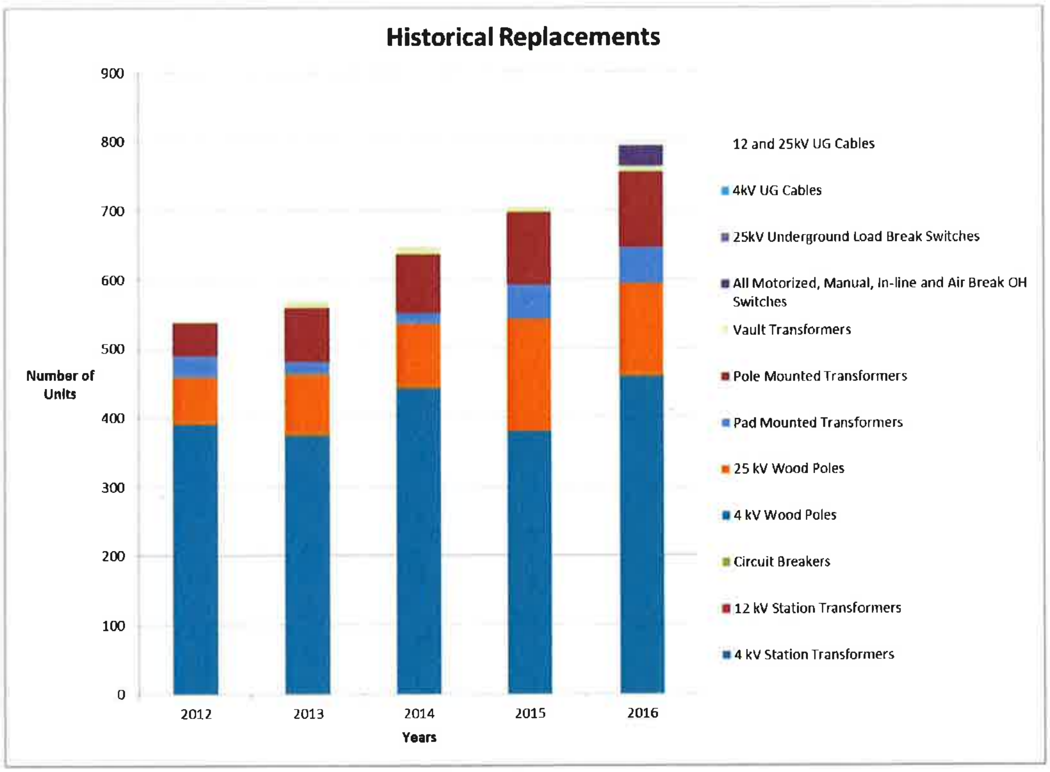
c) What would be the anticipated reliability impacts of implementing a replacement program that was more evenly paced over the planning horizon shown in Figure 3?

d) Please compare the FFAP with historical replacements for the 5 year period immediately prior to year 0 in Figure 3.

e) Please explain the reasons for any significant (>10%) inter-annual unit flagged for action counts over the historical and planned horizons, by asset class.

THUNDER BAY HYDRO RESPONSE

d) Please see below the historical replacements for the 5 year period immediately prior to year 0.



KINECTRICS RESPONSE

a) The number of units flagged for action is derived from HI and generated failure curves as described in the Kinectrics ACA report included in Exhibit 2, Attachment 2-I, Appendix C. For those that are proactively addressed, specific units are flagged for action once their POF exceeds 0.8.The units with only age data available have a number of units expected to fail each year estimated without identifying specific units. Once this analysis was done, a five-year averaging was done or criticality considered in levelizing the FFAP.

The reason there are higher quantities flagged in the first 5 years is because it was found that there is a backlog of units that need to be addressed. i.e. larger quantities in very poor/poor condition that will translate to larger quantities to be addressed in the near future.

b) The asset replacement forecast in the present rate filing incorporates FFAP is an input in representing condition driven replacement needs along with other drivers (see response to ER-Staff-79 a)) and not the other way around.

c) Please see our response to ER-Staff-80 b)

e) FFAP was developed for the first time in 2016 and represents condition based only replacement requirements. Historical replacements represent not only condition based replacements but also replacements for other reasons and, thus, should not be compared to the FFAP in the ACA.

AMPCO-29

Ref: Page 8

a) Please summarize the asset failure information collected by TBHEDI

b) Did the expert review TBHEDI's actual failure data by asset type?

c) How was actual failure data by asset used to determine the HI scores by asset?

d) Did the expert review TBHEDI's historical replacement rates? If yes, how was the information used?

THUNDER BAY HYDRO RESPONSE

a) Asset failure information collected by TBHEDI includes distribution transformers and primary underground cable.

KINECTRICS RESPONSE

b) Yes, for failure information that was provided.

c) Actual failure information was not used. Typical useful life ranges, estimated by TBH subject matter experts, were used to develop the life curves. These curves are used in scoring criteria for the "age" parameter (defined in the report as each asset class's age criteria).

d) The ACA is a condition-based assessment. Since historical replacement rates are not necessarily based on condition, they were not considered.

ER-VECC-2

Ref: ACA Report

a) Please explain the role of Ms. Katrina Lotho in preparing the ACA report and the role of Mr. Tsimberg in reviewing the report.
b) The ACA methodology requires assessment of condition parameters or asset characteristics. Which author carried or verified the TBH's asset condition testing?
c) Specifically, which author verified the sample size (shown in Table III-1) and made the "data gap" assessment shown in Table III-4.
d) Which author inspected the assets characteristics for the assets listed in Table III-1?

THUNDER BAY HYDRO RESPONSE

The Ontario Energy Board stated in Procedural Order No. 5 that (**emphasis added**):

> "Intervenors shall request any relevant information and documentation from Thunder Bay Hydro on **the new expert report only**, by written interrogatories filed with the OEB and served on all parties by June 2, 2017."

VECC does not cite the new expert report in this interrogatory. Rather VECC's questions relate solely to the ACA. The ACA has been on the evidentiary record, and all parties including VECC have had ample opportunity to ask questions about it. Thunder Bay Hydro submits that this interrogatory is in breach of the procedural directions of the Board in Procedural Order No. 5.

Despite this, to the extent additional information may be of assistance to the Ontario Energy Board in its decision making on this case, and to avoid further procedural delays, Thunder Bay Hydro has asked that Kinectrics provide a response to this interrogatory.

KINECTRICS RESPONSE

a) Katrina Lotho calculated Health Indices of assets using asset data provided by TBH. From the calculated health, the flagged for action plan was found. Katrina Lotho then prepared the ACA report that details the findings. Yury Tsimberg reviewed and approved the methodology (e.g. algorithms, assumptions) and the findings from the study, he was ultimately responsible for the contents of the report and had final sign-off authority.

b) Katrina Lotho and Yury Tsimberg reviewed the available asset data provided by TBH. The actual methodologies or test procedures used by TBH to gather this provided data was not within the scope of the ACA.

c) Katrina Lotho determined the sample size. Katrina Lotho made the data gap assessment, and Yury Tsimberg was ultimately responsible for the contents of the report and had final sign-off authority.

d) Asset Data was provided by Thunder Bay Hydro, Katrina Lotho calculated the Health Index Results contained in Table III-1. Health Index results were based on health index calculations also performed by Katrina Lotho. The input data provided by TBH was not validated or verified by Kinectrics.

primary process steps and information flows used by the distributor to identify, select, prioritize and/or pace investments; i.e.:

- *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.

5.3.1.3 Asset Management Strategy (OEB Filing Req. 5.3.1b)

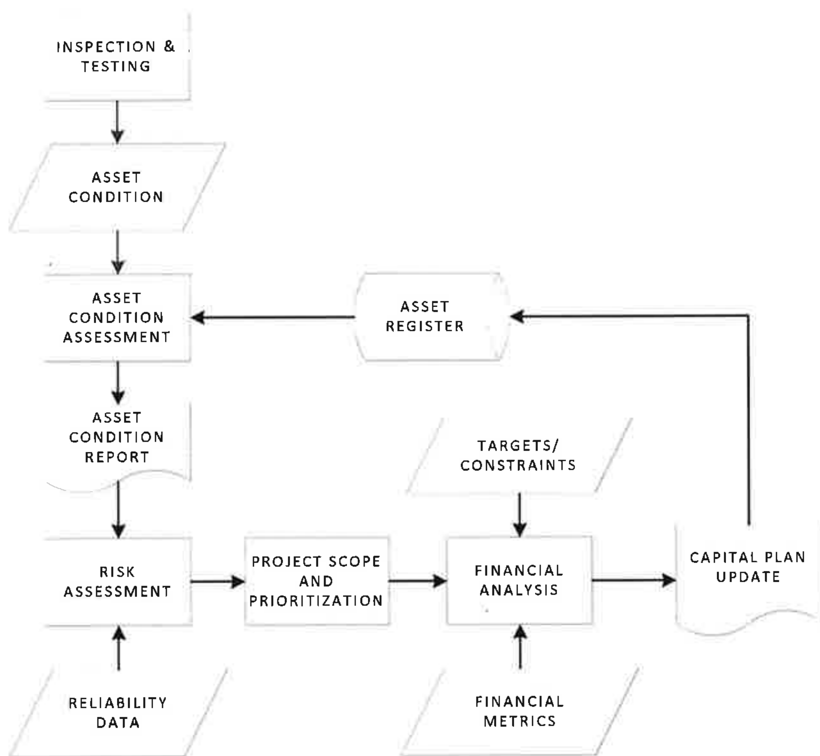


Figure 5.3.1-1 - Thunder Bay Hydro Asset Management Framework

A. Asset Management Framework Summary

Figure 5.3.1-1 above details the strategy Thunder Bay Hydro utilizes to appropriately select and prioritize asset investments. The process begins with the inspection and testing phase. Thunder Bay Hydro has a mature and comprehensive inspection and testing regime that provide details on asset condition. These

ER-AMPCO-30

Ref: Page 7
Ref: Exhibit 2, Attachment 2B, Appendix C, Page 3

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%

a) Does Kinectrics have general guidelines for each of the above five Health Index categories in terms of recommended asset replacement timing?

b) Do the timing recommendations for each category differ by asset type?

c) Do the timing recommendations for each category differ by LDC?

Kinectrics Response

a) The timing for flagging for action is based on a probabilistic assessment. It considers the fact that in a given year, a younger asset may fail but that an asset in poor condition may not fail. Because of the probabilistic nature, the timing for action is not exact (Section II.2 of the ACA report). That said, typically assets found in very poor condition would generally be flagged for action within 5 years.

b) Timing will differ by asset type. Each asset group has a different useful life range. If the typical useful life is 60 years, a "very good" asset may not be flagged for 60 years. If the typical life is 30 years, a "very good" may not be flagged for 30 years. Flagged for action can even vary by unit within an asset class. For example, say transformers A and B right now both have a health index of 55% (i.e. exactly the same condition). However, A is in an environment where it is more heavily stress (say continuously loaded at 85%), whereas B is loaded at 45%. Even though both transformers currently have the same condition, A's likelihood of failure, given its more stressful environment, will be higher, and it will in effect be flagged for action sooner than B.

c) Yes. See b).

Capital Expenditures

Thunder Bay Hydro continues to expand and reinforce its distribution system in order to maintain the reliability for existing customers and meet the demand of new and existing customers in its service territory. Given that Thunder Bay Hydro's load has been relatively flat for several years, the increase in demand comes mainly from distribution system replacements/upgrades needed in existing areas. Thunder Bay Hydro's core business is the safe, reliable delivery of electricity to the residents and businesses of Thunder Bay. To achieve this, a well-developed, long-term approach to infrastructure investment and maintenance is critical. As a direct result, Thunder Bay Hydro's capital spending forecasted in 2012 and 2013 is increasing at a similar pace as in previous years (exclusive of the New Maintenance Facility scheduled for 2013 for $3.3M (see Exhibit 2, Tab 3, Schedule 1 for more detail) and is in line with its 20 year capital plan as discussed in its Asset Management Plan (AMP) in Exhibit 2, Appendix 2-A.

As discussed in rate filing EB-2008-0245, Thunder Bay Hydro conducted a complete risk assessment for all overhead lines, underground equipment, cables and substations. Since the 2007 inspection, Thunder Bay Hydro has been methodically narrowing the scope of the inspection in order to inspect each asset with greater scrutiny. Subsequent to the 2007 inspection, Thunder Bay Hydro has inspected all substations in accordance with the regime specified by Appendix C of the Distribution System Code and has inspected all other outside distribution system assets in keeping with a 3 year cycle. The scope, objectives, and findings of the Thunder Bay Hydro's Asset Condition Assessment are detailed in the Thunder Bay Hydro's AMP, Exhibit 2, Appendix 2-A.

In general, the Asset Condition Assessment findings have provided a critical input to Thunder Bay Hydro's asset replacement strategy and have been used to establish capital replacement rates necessary for the sustainment of; overhead distribution assets, underground distribution assets, and distribution station assets. As a result of this sustainment rate analysis (refer to Thunder Bay Hydro's AMP Sections 4, 5, and 6) an escalated capital replacement rate has been requested (refer to Thunder Bay Hydro's AMP Section 7). The intention of the capital replacement gradient is to recover the overall distribution asset health such that an equivalent

3) Compliance with regulatory and legal obligations;

4) Fulfillment of customer demand work;

5) Retirement of assets which have reached the end of their useful life; and

6) Improvement of operational efficiency.

Asset Management Initiatives

The following initiatives combine to form Thunder Bay Hydro's Asset Management Plan. These initiatives are complimentary to one another, often fulfilling, in whole or in part, the objectives of a parallel activity. In no particular order, the Thunder Bay Hydro asset management initiatives are:

- Asset Condition Assessment;
- Forestry Management Program;
- PCB Management Program;
- Underground Asset Renewal;
- 12kV Distribution Station Refurbishment;
- Above Ground Asset Renewal;
- Voltage Conversion of 4kV to 25kV.

A brief description of these initiatives and their associated budgets are described herein. For further detail and justification, refer to the "Thunder Bay Hydro Electricity Distribution Inc. – Asset Management Plan" in Appendix 2-A.

Asset Condition Assessment

The Asset Condition Assessment is the primary means by which Thunder Bay Hydro is able to prioritize future capital and maintenance efforts. This assessment fulfills Thunder Bay Hydro's obligations as set out in the Distribution System Code (the "Code"), monitors the effectiveness of past maintenance and capital activities, targets the efforts of the maintenance regime, and benchmarks the objectives of the long term capital replacement programs.

(d) Vehicular Collision

(e) Shell Rot Caused by Exposure

Figure 1 - Common Wood Pole Damage

A wood pole may decay from the outside in (shell rot), from the inside out (heart rot), or both. The rate at which a pole decays is a function of the wood species, the preservative applied, the method of preservative application, the environment in which the pole is installed, and the degree to which the pole's protective treatment has been compromised. Regardless of the trigger the result is the same – given enough time, decay will reduce the thickness of the pole's sound outer shell which will result in reduced pole strength (refer to Figure 2). The CSA mandates that once the strength of a wood structure has deteriorated to 60% of the required design capacity, the structure shall be reinforced or replaced[4]. This means that, in the absence of alternate forms of damage, a wood pole should not be allowed to remain in service once its outer shell has deteriorated to 1-1/4" at any point along its length. The Local Distribution Company's challenge has been and continues to be, how to objectively evaluate the degree to which the wood pole population's strength is degraded.

[4] CSA 22.3 No. 1

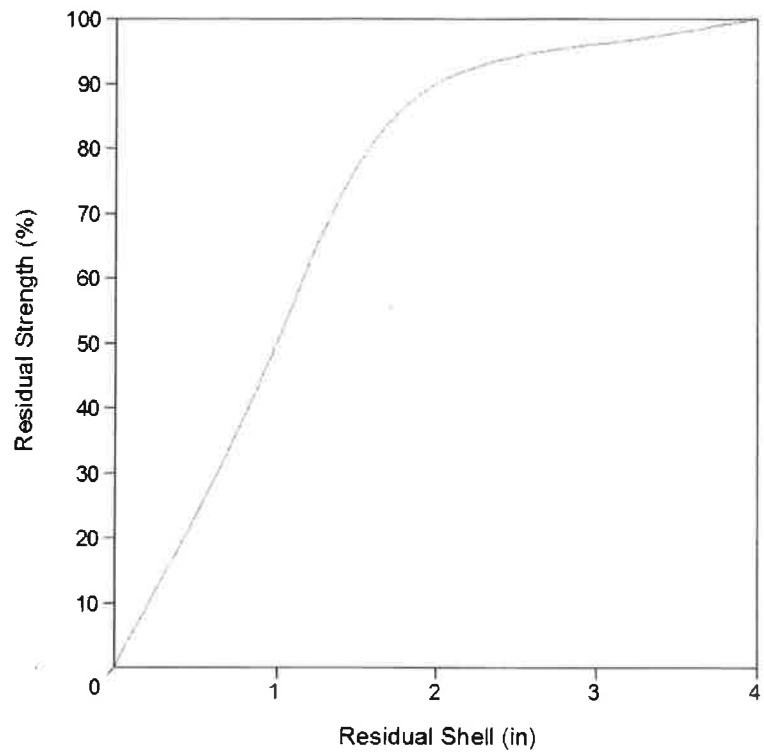


Figure 2 - Pole Strength Vs. Residual Shell Thickness

In addition to traditional methods of sounding[5], probing[6], and visual inspections TBHEDI piloted a testing regime which employed the use of a purposefully designed diagnostic instrument. This testing program took place intermittently from 1999-2005. The

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[5] Sounding refers to rapping a pole from the ground line of the butt up to the extent of the assessor's reach. The assessor is listening to the strike for the hollow thud indicative of a pole with substantial heart rot versus the shortened clunk of a dense, healthy butt.

[6] Probing refers to using a large screwdriver or similar tool to probe areas of localized rot or stab into pole shell suspect of significant heart rot. The objective of this technique is to determine how widespread decay has become or the approximate remaining shell thickness. In general, if a probe easily penetrates through the pole's shell the pole is determined to have no life remaining (in lieu of external bracing).

instrument which was utilized performed a frequency analysis which, when correlated with user inputs, estimated the remaining pole strength in Psi. The user may then compare the estimated strength with the pole's design strength and use these findings to plan for the pole's maintenance, replacement, or follow-up testing. In the opinion of this LDC, the results of this test were at best simply a confirmation of an obviously heavily deteriorated pole's condition, or at worst, an erroneous healthy result from a pole experiencing an uneven distribution of deterioration. As a result of these observations, TBHEDI has returned to sounding, probing, and visual inspections as its primary means of wood pole evaluation.

The execution of the inspection typically involves a single individual performing a street level patrol of the assigned grids over a period of several months each year. The evaluation and subsequent grading of the wood utility poles proceeds as follows:

'Red' poles typically display evidence of one or more of the following;

- Substantial cracking or checking;
- Substantial damage due to vandalism, collision, or pest infiltration;
- Heavy weathering of the pole top; or,
- Substantial deterioration at the ground line.

If a pole is suspected as being 'red' through visual inspection, the pole is then subjected to sounding and probing, thus confirming the degree of degradation. If, upon the closer examination (sounding and probing), the pole is determined to be structurally sound, albeit heavily weathered or scarred, an 'Orange' grade is typically applied.

In keeping with the main objective of this assessment (risk management), the assessor is required by TBHEDI process to submit a concern report for any pole which has been graded red. The pole is then scheduled for replacement. The timing of the replacement is at the discretion of the Power Line Maintenance Supervisor and weighed against the risk of delaying previously submitted concern reports and/or customer driven projects.

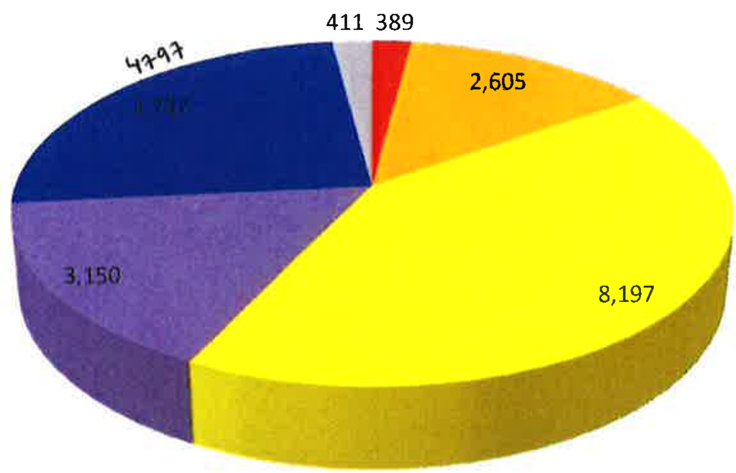

Figure 3 - TBHEDI Pole Health Distribution as at Dec. 2011

Overhead Distribution Lines

Overhead distribution lines refer to the current carrying conductors which distribute power from the transmitter owned transformer stations to the demarcation point between the LDC and the customer.

In general, exposure related degeneration of overhead distribution lines (including corrosion and similar mechanisms) and stress related breakdown (including annealing and straining due to tension) are not the determining factors in a line section's critical path toward end of life.

TBHEDI performs visual inspection which specifically monitors the following symptoms of conductor degeneration:

- Broken strands;
- Strand abrasion;
- Elongation;
- Burn damage;

2-Staff-44

Ref: App. 2 – DSP – S 5.3.2.3: Asset Condition – Wood Poles, p. 74

At the above reference, the following table is shown:

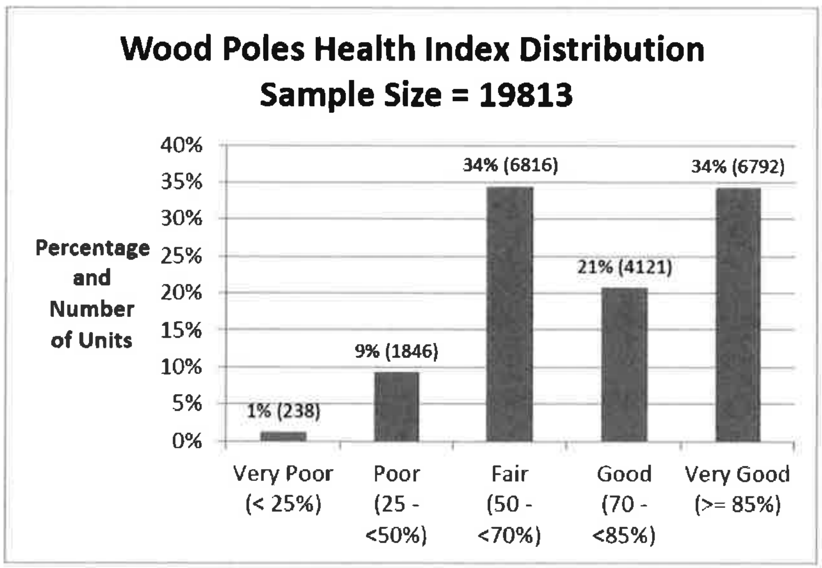

Figure 5.3.2-1 - Kinectrics ACA Wood Pole Health

Please reconcile the wood pole health index distribution with Thunder Bay Hydro's 700 pole per year replacement target.

Thunder Bay Hydro Response:

The health index distribution cannot be reconciled with the 700 pole per year target. The 700 pole per year replacement target was developed utilizing average age of the population (see response to 2-Staff-39(b)); whereas the health index is a quantitative composite measure of an assets condition based on available condition data, (testing, inspections, utilization, expert opinion, age, etc.) of which age is one of several factors considered in the calculation. Thunder Bay Hydro is moving away from an age based asset replacement strategy to an asset condition based strategy and as a result the quantities of poles that are targeted for replacement are as specified in response 2-AMPCO-15.

Wood Poles	EB-2012-0167			EB-2016-0105		
	19,549	poles		19,813	poles	
	Red	389	2.0%	Very Poor	238	1.2%
	Orange	2605	13.3%	Poor	1846	9.3%
	Yellow	8197	41.9%	Fair	6816	34.4%
	Purple	3150	16.1%	Good	4121	20.8%
	Blue	4797	24.5%	Very Good	6792	34.3%
	Grey	411	2.1%			
Ref	AMP P21				ACA P53	