October 26, 2021

Ms. Christine E. Long
Registrar
Ontario Energy Board
P.O. Box 2319
2300 Yonge Street, 27th Floor
Toronto, ON M4P 1E4

Re: EB-2021-0110 Hydro One Networks Inc. 2023-2027 Joint Transmission & Distribution Rate Application
AMPCO's Interrogatories

Dear Ms. Long:

Attached please find AMPCO's interrogatories in the above proceeding.

Best Regards,

Colin Anderson
President

Copy to: Hydro One Networks Inc.

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EB-2021-0110

Hydro One Networks Inc.

Application for electricity transmission and distribution rates and other charges for the period from January 1, 2023 to December 31, 2027

AMPCO Interrogatories October 26, 2021

B1-AMPCO-1

Ref: Exhibit B-1-1 Section 1.6 Page 18

With respect to Customer Satisfaction Research, Hydro One undertakes annual Large Transmission Customer survey. Large Transmission Customer survey are to measure the level of customer satisfaction, and to monitor Hydro One's performance in four dimensions of satisfaction among customers: Price, Customer Service, Product Quality/Reliability and Relationship. This research is conducted by independent expert customer research firms.

Please provide the Large Transmission Customer survey for the years 2017 to date.

B1-AMPCO-2

Ref: Exhibit B-1-1 Section 1.7 Page 5

Figure 3 provides Hydro One's strategic priorities and objectives.

Please discuss if these priorities have changed since EB-2019-0082 and EB-2017-0049.

B1-AMPCO-3

Ref: Exhibit B-1-1 Section 1.7 Page 6

Table 1 provides Hydro One's RRF Performance Outcome Objectives.

Please discuss if these priorities have changed since EB-2019-0082 and EB-2017-0049.

B1-AMPCO-4

Ref: Exhibit B-1-1 Section 1.7 Page 10

The asset needs assessment processes are structured to determine individual asset needs. The process relies on asset data, including condition, utilization, performance, obsolescence and other factors, and focusses on major equipment groups in transmission (ex: transformers, conductor, breakers, and protection and control systems) and distribution (ex: station transformers, poles) that directly affect system reliability. This process drives effective planning decisions by ensuring a consistent view of asset information. As part of the preliminary needs assessment, asset condi tion and other factors are assessed against current and future requirements to identify invest ment candidates.

a) In previous applications, Hydro One utilized two additional risk factors related to demographics and economics to inform asset needs and the identification of candidate investments. In EB-2019-0082 I-12-4, Hydro One provided the relative weightings for the six risk factors for transmission conductors, transformers and breakers.

   Please explain why Hydro One has moved from six risk factors to four risk factors in its risk assessment and discuss the impact.

b) Hydro One provides definitions for the condition, utilization, performance and criticality risk factors in evidence. Please provide a definition for the economic and demographic risk factors.

c) Please complete the following tables to provide the current relative weightings for each risk factor for transmission and distribution assets on the same basis as EB-2019-0082 I-12-4:

Tx Assets	Condition	Utilization	Performance	Criticality	Economics	Demographics
Network Transformers						
Connection Transformers						
Conductors						
Circuit Breakers						
Protection and Control Systems						
Insulators						
Wood poles						
U/G Cable						

Dx Assets	Condition	Utilization	Performance	Criticality	Economics	Demographics
Station Transformers						
Connection Transformers						
Conductors						

Circuit Breakers						
Protection and Control Systems						
Insulators						
Wood poles						
Steel Structure						
U/G Cable						

d) Availability of data varies by asset type. Please complete the following tables to provide the percentage of available data for each asset risk for transmission and distribution assets:

Tx Assets	Population	% Data Condition	% Data Utilization	% Data Performance	% Data Criticality	% Data Economics	% Data Demographics
Network Transformers							
Connection Transformers							
Conductors							
Circuit Breakers							
Protection and Control Systems							
Insulators							
Wood poles							
U/G Cable							

Dx Assets	Population	% Data Condition	% Data Utilization	% Data Performance	% Data Criticality	% Data Economics	% Data Demographics
Transformer							
O/H Conductor							
Cross Arm							
Wood poles							
U/G Cable							
O/H Tranformer							
U/G Transformer							
Submarine Cable							
Insulator							

B1-AMPCO-5

Ref: Exhibit B-1-1 Section 1.7 Page 12

Hydro One indicates on-site assessments with field personnel are conducted to validate and confirm asset condition, based on site-specific considerations. For high-value assets such as transformers, subject matter experts perform a thorough assessment of asset condition and consider and advise on issues such as equipment obsolescence, manufacturer support, and "repair vs. replace" evaluations.

a) Please discuss at what point during the investment planning process repair versus replace evaluations are made for distribution and transmission assets and how they are made. Provide any analysis.

B1-AMPCO-6

Ref: Exhibit B-1-1 Section 1.7 Page 15

The current state assessment establishes the necessary fact base to assess the probability and consequence of safety, reliability and environmental risks at the scoring stage of the Investment Planning process described in section 1.7.4.1 below. Risks related to asset condition, performance and utilization inform the probability score, and risks relating to asset criticality directly inform the consequence score.

a) Please complete the following table to show the allocation of the transmission budget to the three risk taxonomies:

Risk Taxonomies	EB-2019-0082 Transmission Capital $	EB-2019-0082 Transmission Capital %	EB-2021-0110 Transmission Capital $	EB-2021-0110 Transmission Capital %
Safety				
Reliability				
Environmental				
Total				

b) Please complete the table to show the allocation of the distribution budget to the three risk taxonomies:

Risk Taxonomies	EB-2017-0049 Distribution Capital $	EB-2017-0049 Distribution Capital %	EB-2021-0110 Distribution Capital $	EB-2021-0110 Distribution Capital %
Safety				
Reliability				
Environmental Risks				
Total				

B1-AMPCO-7

Ref: Exhibit B-1-1 Section 1.7 Page 16

Hydro one indicates risk assessment considers both the probability and consequence of an event. Risks relating to asset condition, performance and utilization inform the probability score. Risks related to criticality directly inform the consequence score.

a) Please confirm when the above risk assessment process was implemented.

b) Did the above risk assessment process impact the asset strategies in place for some asset types? If yes, please provide details.

c) Please discuss if there have been any adjustments in the risks that inform the probability score and consequence score in determining investment levels compared to previous distribution and transmission applications.

d) Please confirm demographic and economic risks do not inform the probability or consequence score.

B1-AMPCO-8

Ref: Exhibit B-1-1 Section 1.7 Page 16

The risk assessment process is described in six steps.

a) By way of example, please illustrate the process and scoring.

b) Please provide the final mitigated risk scores for each of the proposed transmission investments.

c) Please provide the final mitigated risk scores for each of the proposed distribution investments.

d) Please summarize all changes to the risk assessment process and scoring from EB-2017-0049 and EB-2019-0082.

B1-AMPCO-9

Ref: Exhibit B-1-1 Section 1.7 Page 17

Hydro One indicates the reliability consequence can be classified in terms of unsupplied energy, load impacted and minutes of interruption.

a) Please illustrate the reliability consequence concept by way of example.

b) Please discuss if and how reliability improvements from individual assessments are assessed and quantified as part of the process.

B1-AMPCO-10

Ref: Exhibit B-1-1 Section 1.7 Page 17

Hydro One indicates outage frequency was added to the probability framework to incorporate specific feedback from customers.

By way of example, please illustrate how and why this was implemented.

B1-AMPCO-11

Ref: B-1-1 Section 1.7

Hydro One's Reliability Model Risk Model (RRM) was central to customer engagement in EB-2016-0160 and was referenced d in the customer engagement in EB-2019-0082.

Please discuss how the RRM was used by Hydro One in the customer engagement and/or investment planning process to inform the transmission and distribution investment amounts in this proceeding.

B1-AMPCO-12

Ref: Exhibit B-1-1 Section 1.7

a) Please complete the following table to show investment plan details at each stage of the investment planning process:

Investment Process	Total # Investments Transmission	Total Budget $ Transmission	Total # Investments Distribution	Total Budget $ Distribution
Strategy and Context				
Phase 1 Customer Engagement				
Asset Needs Assessment				
Risk Assessment Process				
Flagging				
Calibration				
Prioritizaton and Optimization				
Challenge Sessions				
Trade-Off Decisions				
Enterprise Engagement				
Phase 2 Customer Engagement				
Input from Third Party Studies				

Board of Director Approval				

b) Please provide the level of investment that was optimizable for the 2023-2027 investment/business cycle compared to the previous two cycles for transmission and distribution.

c) Please discuss any constraints placed on the investment planning process.

d) Please provide the forecast number of projects awarded for execution and the actual number of projects awarded for execution for the years 2016 to 2021 and the cost variance.

B1-AMPCO-13

Ref: Exhibit B-1-1 Section 1.7 Page 25

Hydro One developed three investment plans for each of Distribution and Transmission (Slower, Draft Plan, Accelerated).

a) Please set out the investment amounts and number of investments for each of these plans.

b) Please discuss if Hydro One's asset strategies in terms of reactive versus proactive approaches differ between the three investment plans.

B1-AMPCO-14

Ref: EB-2019-0082 Exhibit JT 1.16

Hydro One provided a list of metrics it uses on both a project and portfolio basis.

Please provide the data for these project and portfolio level metrics for the 2020-2022 investment plan.

B2-AMPCO-15

Ref: Exhibit B-2-1 Section 2.1 Page 18

Hydro One indicates over 10% of all major transmission assets are in poor condition.

a) Please provide the calculation of the 10%.

b) Please provide the percentage of all major transmission asset in poor condition in 2016 and 2018.

B2-AMPCO-16

Ref: EB-2019-0082 Exhibit B-1-1 TSP Section 2.3 Pages 3-7 Table 1

Hydro One provided asset-specific strategies for transmission assets.

Please provide the current version of this Table.

B2-AMPCO-17

Ref: Exhibit B-2-1 Section 2.2

Please advise if Hydro One has made changes it is Inspection and Maintenance practices related to its transmission assets since EB-2019-0082.

B2-AMPCO-18

Ref: Ref 2: EB-2019-0082 Exhibit B TSP Section 2.2 Page 3

Please complete the attached excel spreadsheet (B2-AMPCO-18-01).

B2-AMPCO-19

Ref: Exhibit B-2-1 Section 2.4 Page 4

ESL is defined as the average number of years that an asset is expected to operate safely and reliably under normal system conditions and is determined with reference to manufacturer guidelines and Hydro One's historical asset retirement data.

a) When was the last time Hydro One reviewed its ESL data in the context of its historical asset retirement data.

b) Please provide a description of the nature of Hydro One's historical asset retirement data.

c) Please provide the historical asset retirement data for transformers, conductors and wood poles for the years 2016 to 2021.

B2-AMPCO-20

Ref: EB-2019-0082 Exhibit JT 1.37

Hydro One provided the number of unplanned outage hours due to equipment failure system-wide, for 2016, 2017, and 2018 as follows:

Year	Hours
2016	262,777
2017	255,116
2018	289,532

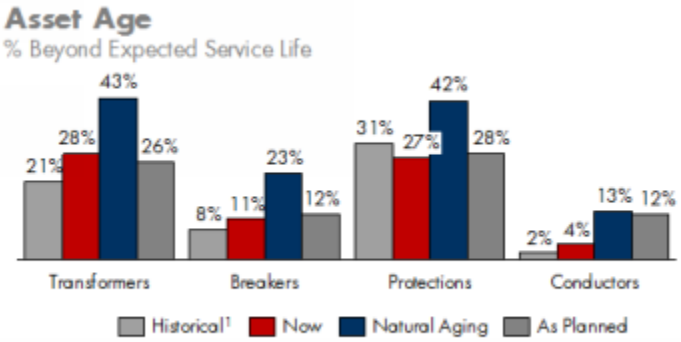
a) Please provide the data for 2019 to 2021.

b) For the years 2016 to 2018, please provide the total unplanned outage hours.

B2-AMPCO-21

Ref: EB-2019-0082 Exhibit A-3-1 Attachment 1 Page 1

The 2019-2024 Business Plan from the last proceeding states "Based on Hydro One's assessment of its transmission system, a significant portion of the assets are reaching the end of their expected service life (ESL) and have deteriorated to the point where investment is required to maintain customer reliability and meet safety and environmental sustainability requirements. Through natural aging, it is forecast that 43% of transformers, 23% of breakers, 42% of protection systems, and 13% of conductors will reach their ESL over the next six years, as shown in the figure following. This evolving age profile is largely due to the significant system development in the 1950s and 1960s; these assets now require replacement.



[1]*Historical as per Transmission Rate Application EB-2012-0031 filed May 28, 201*

Please complete the following table regarding assets beyond their ESL at the end of 2017:

	Fleet Population	% Replaced 2018 to 2021	Current State (% Beyond ESL)	Natural Aging Over 6 years	Impact of Plan 2027

				2022 to 2027 (%)	(% As Planned)
Transformers					
Breakers					
Protections					
Conductors					

B2-AMPCO-22

Ref: EB-2018-0092

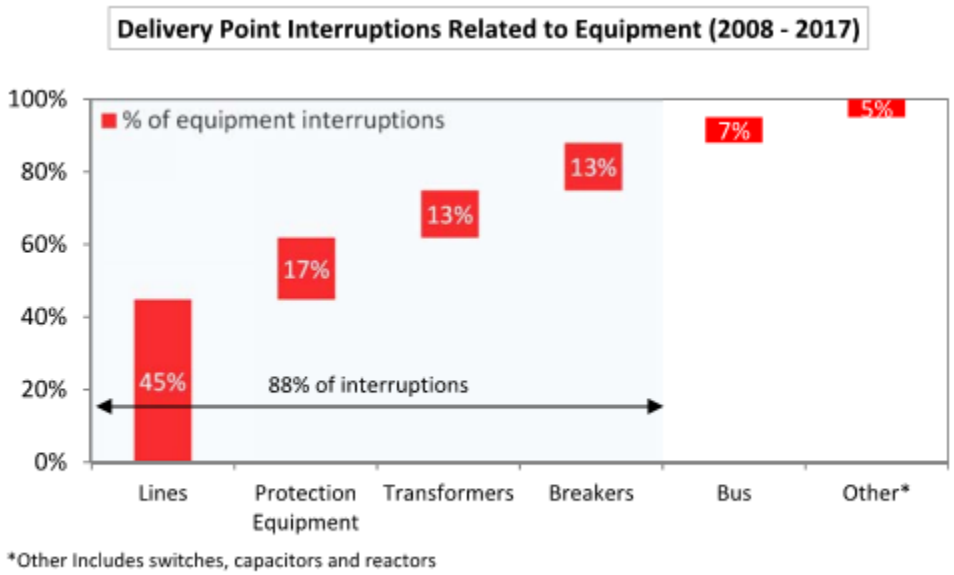


Figure 2 - Delivery Point Interruptions Related to Equipment (2008 through 2017)

a) Please complete the delivery point interruptions related to equipment (%) for the following assets:

Interruptions by Equipment Type	Avg 2008 to 2012 (%)	Avg 2013 to 2017 (%)	2018 (%)	2019 (%)	2020 (%)	2021 (%)
Lines						
Protection Equipment						
Transformers						
Breakers						
Bus						
Other (switches, capacitors,						

b) Please provide a further breakdown of the data for the assets under Lines.

B2-AMPCO-22

Ref: EB-2019-0082

Table 1: Historical Interruption Duration

	% of Interruption Duration (2011-15)
Lines	69%
Transformers	6%
Breakers	9%
Other	16%

a) Please provide the interruption duration data for Lines, Transformers, Breakers and Other for each of the years 2016 to 2021.

Interruption Duration by Equipment Type	2016 (%)	2017 (%)	2018 (%)	2019 (%)	2020 (%)	2021 (%)
Lines						
Transformers						
Breakers						
Other						

b) Please provide a further breakdown of Lines by equipment type.

B2-AMPCO-23

Ref: EB-2019-0082 Exhibit I-5-CME-19 Attachment 1

a) Please identify the transformer replacements not undertaken and why.

b) Please update the forecast in-service date in Attachment 1.

B2-AMPCO-24

Please complete the attached excel spreadsheet.

B2-AMPCO-25

Ref 1: Exhibit B-2-1 Section 2.8 Page 9

Table 3 summarizes the System Access Material Investments.

Ref 2: Exhibit B-2-1 Section 2.8 Page 17

Table 5 summarizes the Major System Renewal Investments.

Ref 3: Exhibit B-2-1 Section 2.8 Page 17

Table 7 summarizes System Service Material Investments

Please provide an excel version of Tables 3, 5 and 7 combined.

B2-AMPCO-26

Ref: EB-2021-0110 Exhibit B-2-1 Section 2.11

a) Please identify the innovation projects.

b) Please identify the new investments that were not part of EB-2019-0082.

B2-AMPCO-27

Ref: Exhibit B-2-1 Section 2.9 Attachment 1 Appendix 2-AA

a) Please provide Appendix 2-AA on the basis of in-service capital additions and provide an excel version of the table.

B2-AMPCO-28

Ref: Exhibit B-2-1 Section 2.9 Attachment 1 Appendix 2-AA

For each relevant investment category in Appendix 2-AA, please provide the number of transformers, circuit breakers, wood poles, protection systems, conductors, underground cables and insulators replaced under each category for the period 2018 to 2022 and forecast for 2023 to 2027.

B2-AMPCO-29

Ref 1: Exhibit B-2-1 Section 2.9 Attachment 1 Appendix 2-AA

Ref 2: Exhibit B-2-1 Section 2.11

Please map the Investment Summary Documents (ISDs) at reference #2 to the capital projects listed in Appendix 2-AA.

B2-AMPCO-30

Ref 1: EB-2019-0082 Exhibit I-12-AMPCO-037-01

Please add the following columns to the table: 2020 actuals, 2021 actuals and update the forecast for 2022 to 2024 and provide an excel version of the table.

B2-AMPCO-31

Ref 1: EB-2019-0082 Exhibit I-12-AMPCO-038-01

Please add a new column, 2019 actuals, to the table and provide an excel version of the table.

B2-AMPCO-32

Ref: ISD T-SR-01

a) Page 8: Figure 1 provides the condition summary of the Network Station Transformer Fleet in 2020.

   Please provide Figure 1 based on 2016 asset condition data.

b) Page 9: Figure 2 provides the condition summary of HV Breaker Fleet.

   Please provide Figure 2 based on 2016 asset condition data.

c) Page 13: Over the 2023-2027 period, the Investment targets 30 stations and addresses the replacement of 35 transformers (22 to be in-serviced during the 2023-2027 period), 154 breakers (93 to be in-serviced during the 2023-2027 period), and 753 protection systems (523 to be in-serviced during the 2023-2027 period).

   Please provide the investments replaced on the same basis over the 2018-2022 period.

d) Page 15: Please provide Table 3 for the period 2018 to 2022.

e) Pages 17-18: Please provide the estimated cost of Alternative 1 and Alternative 2.

f) Page 30 Appendix B: Please provide Appendix B Detailed Investment Costs for the period 2018 to 2022.

g) Please identify the investments in Appendix B (part f) not undertaken and explain why.

B2-AMPCO-33

Ref: ISD T-SR-02

a) Page 5: There is still a number of obsolete, poor condition ABCBs in Hydro One's breaker fleet that require replacement.

   Please provide the quantity of ABCDs that require replacement.

b) Page 8: Please provide Table 3 for the period 2018 to 2022.

c) Pages 9-10: Please provide the estimated cost of Alternative 1 and Alternative 2.

d) Page 12 Appendix A: Please provide the total assets replaced over the 2018 to 2022 period with respect to transformers, breakers and protection systems.

e) Page 15 Appendix B: Please provide Appendix B Detailed Investment Costs for the period 2018 to 2022.

f) Please identify the investments in Appendix B (part e) not undertaken and explain why.

B2-AMPCO-34

Ref: ISD T-SR-02 Page 5

Figure 1 shows the Circuit Breaker forced outage duration by breaker type.

a) Please confirm all forced outages in Figure 1 resulted in customer interruptions.

b) Please provide the data point for 2021.

c) Please provide the number of ABCBs replaced in each of the years 2010 to 2022.

B2-AMPCO-35

Ref: ISD T-SR-03

a) Page 7: Figure 1 provides the condition summary of the Connection Station Transformer Fleet in 2020.

   Please provide Figure 1 based on 2016 asset condition data.

b) Page 9: Figure 2 provides the condition summary of MV Breaker Fleet.

Please provide Figure 2 based on 2016 asset condition data.

c) Page 15: Please provide Table 3 for the period 2018 to 2022.

d) Pages 17-18: Please provide the estimated cost of Alternative 1 and Alternative 2.

e) Page 20 Appendix A: Please provide the total assets replaced over the 2018 to 2022 period with respect to transformers, breakers and protection systems.

f) Page 39 Appendix B: Please provide Appendix B Detailed Investment Costs for the period 2018 to 2022.

g) Please identify the investments in Appendix B (part f) not undertaken and explain why.

B2-AMPCO-36

Ref: ISD T-SR-04

a) Page 4: Figure 1 provides the condition summary of the Wood Pole population in 2020.

Please provide Figure 1 based on 2016 asset condition data.

b) Page 4: Figure 2 provides the Woodpole forced outage frequency.

Please provide the data point for 2021.

c) Page 7: Please provide Table 1 for the period 2018 to 2022.

d) Page 8: Please provide Table 3 for the period 2018 to 2022.

e) Page 9: Please provide the estimated cost of Alternative 1.

B2-AMPCO-37

Ref: ISD T-SR-04 Page 5

Figure 3 shows the Woodpole forced outage duration.

a) Please confirm all forced outages in Figure 3 resulted in customer interruptions.

b) Please provide the data point for 2021.

c) Please provide the number of woodpoles replaced in each of the years 2010 to 2022.

d) Please provide the number of woodpoles tested each year for the years 2016 to 2020.

B2-AMPCO-38

Ref: ISD T-SR-05

a) Page 3: Table 1 provides 2020 steel structure demographic data.

   Please provide Table 1 based on 2016 data.

b) Page 6: Hydro One states based on the best available data, 20% of Hydro One's steel structures have been recoated, and 27% have fair/poor condition (23% is in fair, 4% in poor condition), reflecting that the steel structure is experiencing corrosion on the HDG and on the bare steel layer.

   Please provide the same information based on 2016 data.

c) Page 6: Table 2 provides forecast Steel Structure Coating units.

   Please provide Table 2 for the period 2018 to 2022.

d) Page 7: Please provide Table 4 for the period 2018 to 2022.

e) Page 8: Please provide the estimated cost of Alternative 1.

B2-AMPCO-39

Ref: ISD T-SR-06

a) Page 8: Table 1 provides the forecast units for the Tower Foundation Assess/Clean/Coat Program.

   Please provide Table 1 for the period 2018 to 2022.

b) Page 8: Table 2 provides the forecast units for the Tower Member Refurbishment Program.

   Please provide Table 2 for the period 2018 to 2022.

c) Page 9: Please provide Table 4 for the period 2018 to 2022.

d) Page 10: Please provide the estimated cost of Alternative 1.

B2-AMPCO-40

Ref: ISD T-SR-07

a) Page 4: Figure 2 provides the condition summary of Shieldwire in 2020.

   Please provide Figure 2 based on 2016 asset condition data.

b) Page 6: Table 1 provides the forecast Shieldwire replacements for the period 2023 to 2027.

   Please provide Table for the 2018 to 2022 period.

c) Page 7: Please provide Table 3 for the period 2018 to 2022.

d) Pages 8-9: Please provide the estimated cost of Alternative 1 and Alternative 3.

B2-AMPCO-41

Ref: ISD T-SR-08

a) Page 9: Figure 7 provides the insulator fleet condition status in 2020.

   Please provide Figure 7 based on 2016 asset condition data.

b) Page 18: Table 2 provides the Insulator replacements for the period 2023 to 2027.

   Please provide Table 2 for the 2018 to 2022 period.

c) Page 19: Please provide Table 4 for the period 2018 to 2022.

d) Pages 19: Please provide the estimated cost of Alternative 1.

B2-AMPCO-42

Ref: ISD T-SR-09 Page 10

Figure 8 shows the frequency of COB/CP Insulator Failures.

a) Please confirm all forced outages in Figure 8 resulted in customer interruptions.

b) Please provide the data point for 2021.

c) Please provide the number of insulators replaced in each of the years 2010 to 2022.

B2-AMPCO-43

Ref: ISD T-SR-09

a) Page 6: Please provide Table 2 for the period 2018 to 2022.

b) Please explain how the budget for 2023 to 2027 was determined.

B2-AMPCO-44

Ref: ISD T-SR-10

a) Page 5: Over the rate term, Hydro One is planning to replace approximately 210 protection relays at various transmission network and connection stations.

   Please provide the number of protection relays replaced over the 2018 to 2022 period.

b) Page 7: Please provide Table 3 for the period 2018 to 2022.

c) Page 8: Please provide the estimated cost of Alternative 1.

B2-AMPCO-45

Ref: ISD T-SR-11

a) Page 5: Table 1 provides a summary of SONET equipment.

   Pleas provide the equipment to be replaced over the 2023 to 2027 peropd compared to 2018 to 2022.

b) Page 6: Figure 1 provides failure incidents for SONET Equipment.

   Please provide the data for 2021.

c) Page 9 Table 3: Please provide Table 3 for the 2018 to 2022 period.

d) Page 9: Please provide the estimated cost of Alternative 1.

B2-AMPCO-46

Ref: ISD T-SR-13

a) Page 10: Please provide Table 2 for the years 2018 to 2022.

b) Pages 12-13: Please provide the estimated cost of Alternative 1 and Alternative 2.

c) Page 16 Appendix A: Please provide the circuit-km replaced for the period 2018 to 2022.

d) Page 22 Appendix B: Please provide Appendix B Detailed Investment Costs for the period 2018 to 2022.

e) Please identify the investments in Appendix B (part d) not undertaken as planned and explain why.

B2-AMPCO-47

Ref: ISD T-SR-15 Page 6

Table 2 provides the total investment cost for each of the years 2023 to 2027.

Please provide Table 2 for the period 2018 to 2022.

B2-AMPCO-48

Ref: ISD T-SR-15 Page 7

Hydro One indicates the average investment cost for this investment over the five-year period is in line with the average five-year historical spending. The factors influencing the cost of the investment include:

- The scope of the replacement work required; and
- The type and quantity of assets requiring replacement.

Please provide the type and quantity of assets replaced on an emergency basis for the period 2018 to 2020.

B2-AMPCO-49

Ref: ISD T-SR-17

a) Page 5 Table 1: Please provide the outage statistics for 2021.

b) Pages 14 Table 2: Please provide Table 2 for the period 2018 to 2022.

c) Page 16: Please provide the estimated cost of Alternative 1.

B2-AMPCO-50

Ref: ISD T-SR-18

a) Page 1: This investment involves the replacement of 7.2 circuit km of 115 kV low-pressure oil-filled underground cables with cross-linked polyethylene (XLPE) type cable.

   Please provide the circuit km replaced over the 2018 to 2022 period.

b) Page 4 Table 2: Please provide Table 2 for the period 2018 to 2022.

c) Page 5: Please provide the estimated cost of Alternative 1.

B3-AMPCO-51

Ref: Exhibit B-3-1 Section 3.2 Page 3

ESL enables a view of asset demographics based on the average number of years that an asset is expected to operate under normal system conditions and is determined with reference to manufacturer guidelines and Hydro One's historical asset retirement data.

a) Has Hydro One has adjusted the ESL for any distribution assets since EB-2017-0049? If yes, please provide the data.

b) Please provide a table that sets out the following for each major asset category in Section 3.2:

   - ESL
   - average asset age in 2016
   - average asset age in 2020
   - percentage of fleet beyond ESL in 2016
   - percentage of fleet beyond ESL in 2020
   - average age of asset retirement over the period 2010 to 2015
   - average age of asset retirement over the period 2016 to 2020

B3-AMPCO-52

Ref: Exhibit B-3-1 Section 3.2 Page 3

The current average age of Hydro One's distribution station transformer fleet is 39 years. Currently, 33% of the fleet is beyond their ESL of 50 years, and an additional 17% (if no capital replacements are undertaken) will reach or exceed their ESL by 2027, which would bring the total to 50%.

Please provide the percentage of transformers that will reach or exceed their ESL by 2027 based on planned capital replacements.

B3-AMPCO-53

Ref: Exhibit B-3-1 Section 3.2 Page 4

The average age of poles is 40.2 years. There are currently 378,000 poles (23%) that are 60 year of age or older. Over the 2023 to 2027 planning period, the number of poles 60 years or older would increase to 500,000 poles (31%) in the absence of pole replacements.

Please provide the percentage of poles that will reach or exceed their ESL by 2027 based on planned capital replacements.

B3-AMPCO-54

Ref: Exhibit B-3-1 Section 3.2

Please discuss how the use of testing results and maintenance history has been improved since EB-2017-0049 in making replace versus repair decisions for substation equipment.

B3-AMPCO-55

Ref: Exhibit B-3-1 Section 3.2

Please provide a table that sets out the percentage contribution to SAIDI for each of the years 2010 to 2021 for the following assets excluding Force Majeure:

- Transformer
- Pole
- Cross arm
- Overhead conductor
- Underground cable

- Submarine cable
- Overhead transformer
- Underground transformer
- Vegetation outages (tree caused)

B3-AMPCO-56

Ref: Exhibit B-3-1 Section 3.2

Please provide a table that sets out the percentage contribution to SAIFI for each of the years 2010 to 2021 for the following assets excluding Force Majeure:

- Transformer
- Pole
- Cross arm
- Overhead conductor
- Underground cable
- Submarine cable
- Overhead transformer
- Underground transformer
- Vegetation outages (tree contact)

B3-AMPCO-57

Exhibit B-3-1 Section 3.2 Page 83

Hydro One's non-force majeure SAIDI due to vegetation contacts from 2010 to 2017 shows a worsening trend and the trend was not expected to change without intervention. Based on the recommendation from the 2017 Forestry Assessment study by Clear Path, Hydro One switched from a corridor-driven vegetation management program to a defect driven program (i.e., OCP). The implementation of OCP has resulted in a 13% improvement in overall system wide reliability from 2017 to 2020.

Please provide the calculation of the 13%.

B3-AMPCO-58

Ref: Exhibit B-3-1 Section 3.5

a) Please provide the total number of interruptions on the system for the each of years 2016 to 2021.

b) Please provide the total number of interruptions on the system for the each of years 2016 to 2021 excluding Force Majeure, Loss of Supply and Planned Outages.

c) Please provide the number of Force Majeure events per year for the years 2016 to 2021.

d) Please provide the number of storm events per year for the years 2016 to 2021.

B3-AMPCO-59

Ref: Exhibit B-3-1 Section 3.5

Please confirm Hydro One does not track MAIDI or MAIFI.

B3-AMPCO-60

Ref: Exhibit B-3-1 Section 3.5

With respect to the number of asset failures resulting in a customer interruption, please complete the attached excel spreadsheet.

B3-AMPCO-61

Ref: Exhibit B-3-1 Section 3.5 Page 19

Please provide SAIDI for the years 2016 to 2020 excluding Loss of Supply, Excluding Force Majeure and Excluding Planned Outages.

B3-AMPCO-62

Ref: Exhibit B-3-1 Section 3.5 Page 21

Please provide SAIFI for the years 2016 to 2020 excluding Loss of Supply, Excluding Force Majeure and Excluding Planned Outages.

B3-AMPCO-63

Ref: EB-2017-0049 Exhibit I Tab 24 Schedule AMPCO-21

Please update part (b) to provide the number of all variance proposals and the cost impact at EOY for the years 2018 to 2021.

B3-AMPCO-64

Ref: EB-2017-0049 Exhibit I Tab 24 Schedule AMPCO-22

Please update Table 1 to reflect the variance between annual forecast quantities compared to actuals for the years 2017 to 2021.

B3-AMPCO-65

Ref: EB-2017-0049 Exhibit I Tab 24 Schedule AMPCO-23 Attachment 1

a) Please update the excel spreadsheet to include the condition data for the years 2018 to 2021. Please provide a copy of the excel spreadsheet

b) Please indicate the asset types or sub-types with condition algorithms.

c) Please provide the condition algorithm information for each asset type identified in part (b).

B3-AMPCO-66

Ref: EB-2017-0049 Exhibit I-24-AMPCO-25 Attachment 1

Please update the excel spreadsheet provided in response to the above interrogatory to include the actual replacement for the years 2018 to 2021 and the planned asset replacement for the years 2022 to 2027. Please provide a copy of the excel spreadsheet.

B3-AMPCO-67

Ref 1: Exhibit B-3-1 Section 3.5
Ref: 2 EB-2017-0049

a) Please complete the following table (excluding Force Majeure & Loss of Supply events):

SAIDI (Avg 2016 to 2020)	Avg Outages/year	Avg # Customers/Outage	Avg # Hours/Outage	Contribution to SAIDI	Contribution to SAIDI (%)	Forecast Impact of Plan on SAIDI in 2027 (%)
Poles						
Stations						
Other Line Components						
Vegetation						
Estimated Impact to SAIDI (%)						
Forecasted SAIDI (hours)						

b) Please complete the following table (excluding Force Majeure & Loss of Supply events):

SAIFI (Avg 2016 to 2021)	Avg Outages/year	Avg # Customers/Outage	Avg # Hours/Outage	Contribution to SAIFI	Contribution to SAIFI (%)	Forecast Impact of Plan on SAIFI in 2027 (%)
Poles						
Stations						
Other Line Components						
Vegetation						
Estimated Impact to SAIFI (%)						
Forecasted SAIFI (instances)						

B3-AMPCO-68

Ref: Exhibit B-3-1 Section 3.5

Please complete the following table:

Defective Equipment	2016	2017	2018	2019	2020	5 year average
SAIDI including FM						
SAIDI excluding FM						
SAIFI including FM						
SAIFI excluding FM						

B3-AMPCO-69

Ref: Exhibit B-3-1 Section 3.5

Please complete the following table:

Tree Contacts	2016	2017	2018	2019	2020	5 year average
SAIDI including FM						
SAIDI excluding FM						
SAIFI including FM						
SAIFI excluding FM						

B3-AMPCO-70

Ref: Exhibit B-3-1 Section 3.5 Page 20

Figure 2 below provides a breakdown of contributors to SAIDI.

a) Please confirm Figure 2 excludes Loss of Supply and Force Majeure.

b) Pease provide a further breakdown of the contribution to Defective Equipment by equipment type for each of the years 2016 to 2020.

B3-AMPCO-71

Ref: Exhibit B-3-1 Section 3.5 Page 22

Figure 3 below provides a breakdown of contributors to SAIFI.

a) Please confirm Figure 3 excludes Loss of Supply and Force Majeure.

b) Please provide a further breakdown of the contribution to Defective Equipment by equipment type for each of the years 2016 to 2020.

B3-AMPCO-72

Ref: EB-2017-0049 Exhibit I Tab 23 AMPCO-11 (a)

Please update the table (Power Outage Causes %) in response to part (a) for the years 2018 to 2021.

B3-AMPCO-73

Ref: EB-2017-0049 Exhibit A Tab 3 Schedule 1 Page 16-17

Table 4 and Table 5 indicates that Hydro One's proposed Plan B Modified investment plan was forecast to deliver a 0% impact on SAIDI and a 0% impact on SAIFI, respectively by the end of 2022.

a) With respect to Table 4, please update the forecasted impact on SAIDI by the end of 2022 column, based on the investment plan spending undertaken by Hydro One to the end of 2022.

b) With respect to Table 5, please update the forecasted impact on SAIFI column by the end of 2022 based on the investment plan spending undertaken by Hydro One to the end of 2022.

B3-AMPCO-74

Ref: EB-2017-0049 Exhibit B1-1-1 DSP Section 2.3 Table 36

Table 36 provides the asset strategy summary by component. Please update Table 36 to align with the current application.

B3-AMPCO-75

B-2017-0049 Exhibit B1-1-1DSP Section 3.3Page 18

At Table 60 Hydro One provides the projects driving innovation over the 2018 to 2022 period.

Please provide the projects driving innovation over the 2023 to 2027 period.

B3-AMPCO-76

Please complete the following Table:

	Transformer	Wood Pole	Conductor	Cross Arm
2018-2022 # Assets Added to Poor Condition Category				

2018-2022 # Assets Replaced				
2023-2027 Forecast # assets added to poor condition category		50,000		

B3-AMPCO-77

Ref: Exhibit B-3-1 Section 3.2

a) Please complete the following table:

	2018-2022	2023-2027
Total # Major Assets Replaced		
% of Major Assets Replaced		

B3-AMPCO-78

Ref: Exhibit B-3-1 Section 3.9 Attachment #1

a) Please add 2018 to 2020 Plan amounts to Appendix 2-AA and provide an excel version.

b) Please provide Appendix 2-AA from part (a) on the basis of Inservice Additions and provide an excel version.

c) Please provide the annual amount of System Service work: (1) deferred; (2) cancelled; and (3) advanced for each of the years 2016 to 2021.

B3-AMPCO-79

Ref: Exhibit B-3-1 Section 3.9 Attachment #1

For each relevant investment category in Appendix 2-AA, please provide the number of station transformers, overhead transformers, underground transformers, wood poles, overhead

conductors, underground cable, cross arms and insulators replaced under each category for the period 2018 to 2022 and forecast for 2023 to 2027.

B3-AMPCO-80

Ref: ISD D-SA-01

a) Please complete the following table:

D-SA-01	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
# Joint Use Requests										
# Line Relocation Requests										
# Poles Replaced										

b) Please provide the capital contribution amounts for each of the years 2018 to 2022.

B3-AMPCO-81

Ref: ISD D-SA-02

Please complete the following table on the basis of Gross Investment Costs:

D-SA-02	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
New Connections ($)										
Service Upgrades ($)										
Service Cancellations ($)										
Total										

B3-AMPCO-82

Ref: ISD D-SA-02 Page 9 Table 3

a) Please provide the removals and capital contribution amounts for each of the years 2018 to 2022.

B3-AMPCO-83

Ref: ISD D-SA-04

The AMI 1.0 system is experiencing increasing failure rates and is reaching its end of life.

a) Please provide the End of Life for the AMI 1.0 system.

a) Please provide the percentage of the system at end of life in 2016 compared to 2020.

b) Please provide the replacement rate for the period 2018 to 2022 compared to 2023 to 2027.

B3-AMPCO-84

Ref: ISD D-SA-04

a) Page 4 Figure 1: Please add 2018 to 2021 data to Figure 1.

b) Page 5: Please provide the estimated number of failed AMI 1.0 meters replaced over the 2018 to 2022 period.

c) Page 5: Please provide the number of meters to address sampling and reverification regulatory requirements for the period 2018 to 2022.

B3-AMPCO-85

Ref: D-SR-04 Page 4 Figure 2

Please provide the number of transformer Class 1 and Class 2 failures in 2021.

B3-AMPCO-86

Ref: D-SR-04 Page 8

a) Please provide the cost of Alternative 1 and Alternative 3.

b) Please estimate the number of transformers that would be replaced on a reactive basis under Alternative 1.

c) Please provide the forecast number of transformers replaced under Alternative 3.

B3-AMPCO-87

Ref: D-SR-04 Appendix A

a) Please add the following columns to Appendix A: Number of Transformers to be Replaced and Transformer Condition Rating.

b) Please provide Appendix A Planned for the years 2018 to 2022 and include the additional columns in part (a).

c) Please provide Appendix A Actual for the years 2018 to 2022 and include the additional columns in part (a).

d) Please identify the projects in part (b) that were not completed as planned and why.

e) Please provide the number of pad-mounted distribution station (PDS) forecasted over the 2023 to 2027 period.

f) Please provide the number of pad-mounted distribution station (PDS) completed over the 2018 to 2022 period.

B3-AMPCO-88

Ref: D-SR-05

a) Page 4: Please provide the number of storms plus Force Majeure events for the years 2016 to 2021.

b) Page 4 Figure 2: Please add the numerical values to the chart for each year.

c) Page 5: Please provide the number of Trouble Calls by year for the years 2016 to 2021.

d) Page 5: Please provide the number of assets replaced over the period 2018 to 2021 under D-SR-05.

D-SR-05 Asset Replacement	2018	2019	2020	2021
Wood poles				
Transformers				
Insulators				
Conductors				
Cross Arms				
Reclosers				
Switches				
Submarine Cables (km)				
Regulators				
Other (specify)				
Total				

e) Please explain how transformer costs are allocated between ISD SR-04 and ISD SR-05.

B3-AMPCO-89

Ref: ISD D-SR-05 Page 6

Hydro One proposes to increase the 5-year spend on this project by $60 million compared to 2018-2022 ($551.7 M - $491.8 M).

The forecast expenditures for this demand program are projected from historical costs and trends. Storm response expenditures are based on an inflation-adjusted average of annual expenditures since 2005, with "outlier" years of unusually high expenditures (i.e. due to more severe storms) removed from the forecast – namely, 2006, 2013, and 2018. The expenditures for other categories of activities are guided by an inflation adjusted three year historical average.

Please provide the above calculation to further explain the drivers for the $60 million increase in proposed spending.

B3-AMPCO-90

Ref: D-SR-07 Page 3

Poor condition poles include a subset of 17,000 red pine poles.

a) Please provide the quantity of red pine poles.

b) Please provide the number of red pine poles replaced over the 2018 to 2022 period.

c) Please provide the forecast number of red pine poles to be replaced over the 2023 to 2027 period.

B3-AMPCO-91

Ref: D-SR-07 Page 3

With respect to the Test and Treat program that commenced in 2020:

a) Please provide the number of poles tested in 2020 and 2021 to date.

b) Please provide the number and percentage of poles in 2020 and 2021 that did not result in a poor condition rating.

B3-AMPCO-92

Ref: D-SR-07 Page 5

Figure 3 provides the number of pole caused interruptions excluding FM for the years 2011 to 2020.

a) Please provide the number of poles that failed by year that were in poor condition.

b) Please provide the number of poles that failed that were beyond ESL.

c) Please provide the average age of pole failures by year.

B3-AMPCO-93

Ref: D-SR-07 Page 8

Table 1 provides the planned volumes for the years 2023 to 2027.

a) Please provide the planned volumes for the years 2018 to 2022.

b) Please provide the actual volumes for the years 2018 to 2021.

B3-AMPCO-94

Ref: D-SR-07 Page 11

Please complete the following table on the basis of Gross Investment Cost:

D-SR-07	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Test and Treat										
Pole Refurbishment										
Pole Replacement										
Removals										
Total										

B3-AMPCO-95

Ref: D-SR-07 Page 11

a) Please provide the cost of Alternative 1 and Alternative 3.

b) Please estimate the number of wood poles that would be replaced on a reactive basis under Alternative 1.

B3-AMPCO-96

Ref: D-SR-08 Page 4

Figure 1 provides the Number of Interruptions Attributed to Cross-arm Failures (Excluding FM Events).

Please complete the following table:

D-SR-08	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
# interruptions	58	54	52	57	94	54	78	104	86	107	

Total Customer Impact (CMI)											
# assets in poor condition											
# interruptions due to assets in poor condition											

B3-AMPCO-97

Ref: D-SR-08 Page 7

Table 1 provides the Number of Cross Arms to be Replaced in the Plan Period.

Please provide the number of cross arms replaced over the period 2018-2022.

B3-AMPCO-98

Ref: D-SR-08 Page 8

Table 2 provides the Number of Transformers to be Replaced over the Plan Period.

Please provide the number of transformers replaced over the period 2018-2022.

B3-AMPCO-99

Ref: D-SR-08 Page 9

Table 4 provides the Number of Sentinel Lights to be Replaced or Removed in the Plan Period.

Please provide the number of sentinel lights to be replaced or removed over the 2018-2022 period.

B3-AMPCO-100

Ref: D-SR-08 Page 4

Please complete the following table on the basis of Gross Investment costs:

D-SR-08	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Cross Arms Replaced										
Transformers Replaced										
Nests Addressed										
Sentinel lights replaced/removed										
Removals										
Net Investment Cost										

B3-AMPCO-101

Ref: D-SR-08 Page 12

a) Please provide the cost of Alternative 3.

b) Please provide the total cross arms replaced under Alternative 3.

B3-AMPCO-102

Ref: D-SR-09 Page 3

The Submarine Cable Replacement Program is expected to replace or refurbish all submarine cables with currently known defects and additional cables that become damaged or exposed over the planning period.

a) Please provide the data on the submarine cables replaced or refurbished for the 2018-2022 period.

b) Please provide the data on the submarine cables to be replaced or refurbished for the 2023-2027 period.

B3-AMPCO-103

Ref: D-SR-11 Page 12 Appendix A

Please complete the following table:

D-SR-11	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Planned Line Rebuild (km)										
Planned Line Relocation (km)										
Total										

a) Please provide the total km of actual line rebuild for the period 2018 to 2021.

b) Please provide the total km of actual line relocation for the period 2018 to 2021.

c) Please provide the total number of poles replaced for the period 2018 to 2022.

d) Please provide the forecast number of poles to be replaced for the period 2023 to 2027.

e) Please provide the average quantity of conductors and insulators per km of line.

B3-AMPCO-104

Ref: D-SR-11 Page 12 Appendix A

a) Please provide Appendix A Planned for the years 2018 to 2022.

b) Please provide Appendix A Actual for the years 2018 to 2022.

c) Please identify the projects in part (a) that were not completed as planned and why.

B3-AMPCO-105

Ref: D-SR-11 Page 12 Appendix A

With respect to Underground Cable injection, please provide the km and cost for the period 2018 to 2022.

B3-AMPCO-106

Ref: D-SR-12 Page 10

Figure 5 illustrates the failure rates of meters by their age.

Please discuss if Figure 5 is based on actual Hydro One meter data. If not, please provide Figure 5 based on Hydro One data.

B3-AMPCO-107

Ref: D-SR-12 Page 33

Please provide the cost of Alternative 1.

B3-AMPCO-108

Ref: Exhibit B4

Ref: EB-2019-0082 Exhibit JT 2.19

Hydro One provides the vehicle utilization rate (tranbsmission) for the years 2015 to 2018.

in $ millions, u.o.s.	2015	2016	2017	2018	
Operating Cost	133.1	133.2	133.7	135.7	Ⓐ
Utilization, *in millions of hours*	6.2	6.2	5.8	5.7	Ⓑ
Utilization Rate	**21.4**	**21.3**	**23.0**	**24.0**	Ⓐ÷Ⓑ

a) Please add the years 2019 to 2021 to the table.

b) Please provide the same table for distribution for the years 2015 to 2021.

B3-AMPCO-109

Ref: Exhibit E Tab 6 Schedule 1

a) For each of the years 2018 to 2021, please provide monthly data on the following: Hire, Retirements Other Exits and Vacancies for transmission and distribution.

b) Please summarize Hydro One's assumptions regarding vacancy levels in the current application.

B3-AMPCO-110

Ref: Exhibit E Tab 6 Schedule 1

a) Please complete the following table for transmission and distribution:

	2018 Forecast	2018 Actual	2019 Forecast	2019 Actual	2020 Forecast	2020 Actual	2021 Forecast	2021 Actual (to date)
Total Number of Hours Worked (Excluding Overtime)								
Total Number of Hours of Overtime								
Total Hours								

b) Please complete the following table for transmission and distribution:

	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast	2026 Forecast	2027 Forecast
Total Number of Hours Worked (Excluding Overtime)						
Total Number of Hours of Overtime						
Total						

c) Please identify the months with the highest overtime and why for transmission and distribution.