SEC INTERROGATORY #1

Reference:

Interrogatory:
Please explain how approval of this will contribute to the Government of Ontario's goal of reducing electricity rates by an additional 12%.

Response:
While Hydro One is aware of the Government of Ontario's policy objective of working towards an overall reduction of 12% to electricity rates, it is not aware of the specific means through which the Government of Ontario plans to achieve this objective or how electricity rates are defined in this context. As such, Hydro One cannot speculate as to how approval of the application in this proceeding may contribute to such policy objective. However, as explained in Exhibit A, Tab 3, Schedule 1, the plan underlying Hydro One's application appropriately balances the needs of the transmission system, the relevant assets and the identified customer preferences regarding outcomes and rates:

Hydro One is sensitive to the rate impact of its plan on both its transmission customers and distribution-connected customers. In 2020, a typical Hydro One medium density (R1) residential customer consuming 750 kWh/month will see an increase of $0.77/month or 0.6% on their total bill as a result of the Application. Almost half of this increase is attributable to load decline due to government conservation initiatives and lower consumption. While some of the drivers of the bill impact, such as a decline in load, are out of Hydro One's control, Hydro One has made efforts to manage its costs while meeting its asset needs. In its plan, Hydro One has identified $370 million in productivity savings over the period of the Application. Hydro One has reduced its 2020 OM&A expenses by 9% over 2018 OEB approved levels of spending which will be achieved through sustained productivity gains, and revisions to its maintenance programs.

Witness: Spencer Gill

SEC INTERROGATORY #2

Reference:

Interrogatory:
Please provide all materials provided to the Board of Directors for the approval of this application and the associated 2020-22 budgets.

Response:
The 2019-2024 Transmission Business plan was provided to the Hydro One Board of Directors on December 14, 2018 and may be found at Exhibit A, Tab 3, Schedule 1, Tab 1.

Attached please find the materials provided to the Hydro One Board of Directors dated January 23, 2019 for their review and approval of this Application.

Filed: 2019-08-02
EB-2019-0082
Exhibit I-7-SEC-2
Attachment 1
Page 1 of 12

2020-2022 Transmission Rate Application

Board of Directors | January 23, 2019

hydro One

Agenda

1. Summary & recommendation
2. Communications plan summary
3. Transmission rate application
   i. Summary
   ii. Application filing timeline
   iii. Customer needs & preferences
   iv. Requirements of the system
   v. Rate Impacts
   vi. Key components of the application
   vii. OEB concerns addressed
4. Key risks

Appendix I - Communications Plan

Appendix II - Executive Summary of Application

1. Summary & Recommendation

Summary

- At the October 1, 2018 Board of Directors meeting, the Board approved a two-stage transmission rate application process:
  - 2019 inflation-only application filed on October 26, 2018. If the application is approved, the typical residential customer will see a total monthly bill increase of $0.23 or 0.2%
    - The Ontario Energy Board (OEB) issued a decision approving Hydro One's 2018 rates as interim rates for 2019. A procedural order on next steps is expected shortly
  - 2020-2022 Custom Incentive Rate application to be filed February 28, 2019. If the application is approved, the typical residential customer will see an average monthly bill increase of $0.64 or 0.5%
- On December 14, 2018, the Board approved the Business Plan for 2019 to 2024, which is the foundation of the 2020-2022 transmission rate application

Recommendation

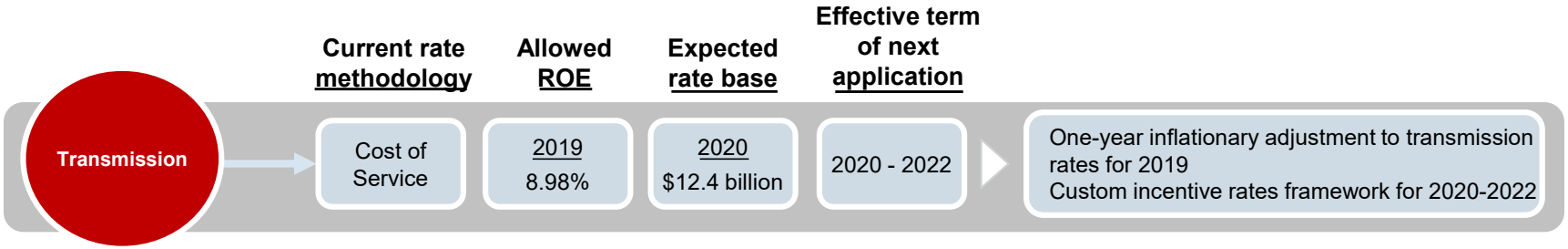
- Management recommends the filing of the 2020-2022 transmission rate application on February 28, 2019

2. Communications Plan Summary

- The Communications Plan includes a briefing note, draft press release and infographic (See Appendix I)
- Key objectives of the plan are to:
  - minimize negative sentiment and the duration of coverage
  - achieve a neutral and balanced outcome in the regulatory process
- Hydro One's narrative will reframe the focus on rates to a larger conversation about investment and benefits
- Communications will be proactive, simple and engaging, using plain language, easy to understand visuals and compelling customer stories
- Hydro One's narrative will be shared through multiple channels including a press release, media interviews, social media, web content, etc.

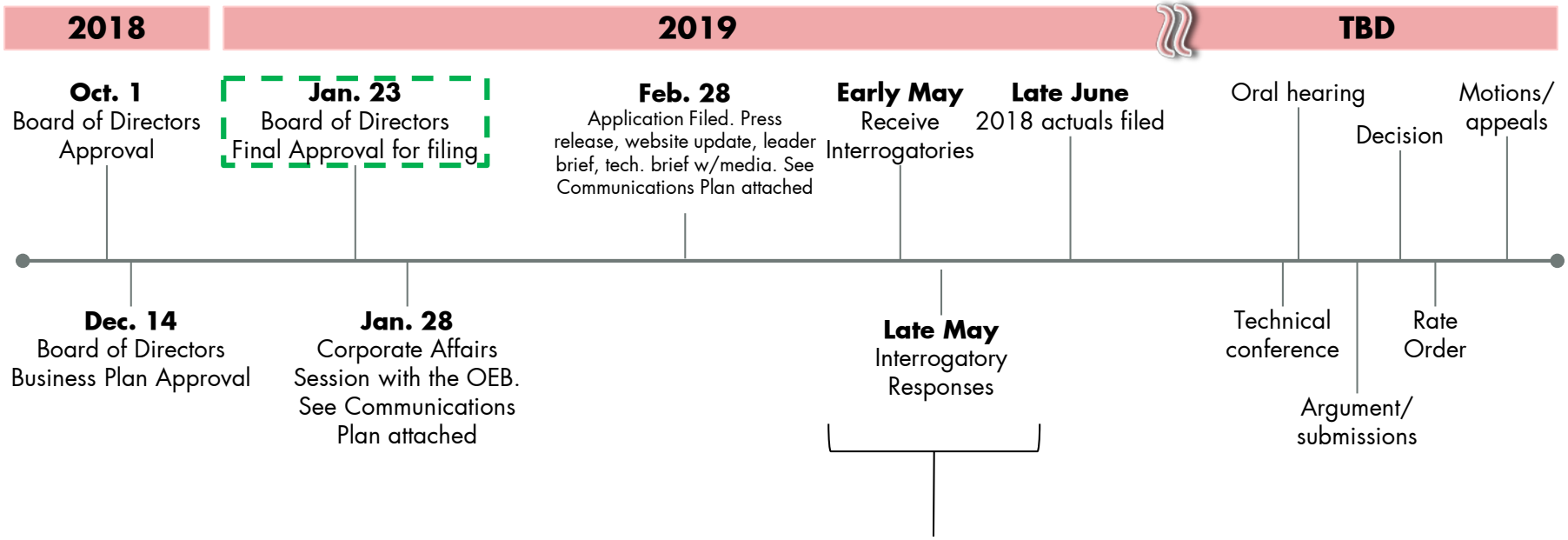
3i. Summary of Rate Application

- On February 28, 2019, Hydro One will file a three-year transmission rate application for 2020-2022 rates



- Hydro One is requesting:
  - $3.9B Capital Envelope (2020-2022)
  - $1.1B OM&A Envelope (2020-2022)
  - $1.7B Revenue Requirement (2020), $1.8B (2021), $1.8B (2022)

3ii. Application Filing Timeline



- Timelines are at the discretion of the OEB. Interrogatories may be delayed until after the June update
- Interrogatory Responses will be due 2 to 3 weeks after

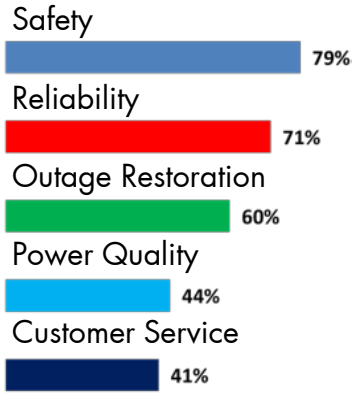
3iii. Customer Needs and Preferences

- The transmission plan integrates feedback from a customer engagement survey[1] completed in 2017 and feedback from ongoing engagement activities in 2018

- In the survey, customers'[2] preferred outcomes included:
  - Top priority was related to safety, as outages present a safety hazard to operations
  - Next priority was reliability and improvements to outage restoration, especially SAIFI
  - Business customer segments prefer investments to be spread out over time, with stable rate increases
  - Customers selected an investment scenario than maintained the pace of capital investments and had an associate rate impact of 5.1%/year[4]

- To improve customer service, the following initiatives are underway or planned:
  - Initiatives to improve reliability, including transformer replacements and lines refurbishment
  - Work to resolve power quality issues for large customers, by adding capacity to the system
  - New customer connections/ upgrades to enable growth
  - Directly engage large transmission customers through dedicated Account Executives who act as a "single point of contact", allowing Hydro One to better understand customers' concerns

TX CUSTOMERS[3]



1. *Report on Hydro One Transmission Customer Engagement Survey, Innovative Research Group, July 2017 (Innovative Report)*
2. *Hydro One Transmission's customer base is made up of: (1) electricity generators who deliver power to the transmission system, (2) distributors who deliver power to direct customers, and (3) end-users such as mining and industrial enterprises that use the power themselves at transmission level voltage*
3. *Innovative Report, p. 28*
4. *Innovative Report, p. 20*

3iv. Requirements of the System

WHY WE ARE SPENDING

Optimize the Core

SAFETY & ENVIRONMENT

Be an industry leader in **Health, Safety & Environment** for our employees, contractors and the public. Achieve and maintain "World Class" H&S Performance, protect the environment, and maintain a safe and inclusive workplace for all employees.

RELIABILITY

Deliver improved **Reliability** to our customers, incorporating their input and priorities. Strive to restore Q1 Transmission performance

COST EFFECTIVE

Maintain a continuous focus on **Cost Effectiveness** through productivity and operating efficiency to deliver superior customer experience at the lowest possible cost.

CUSTOMERS

Deliver industry-leading **Customer Service**, in response to customer needs and preferences. Seek continuous improvement in meeting our customer commitments.

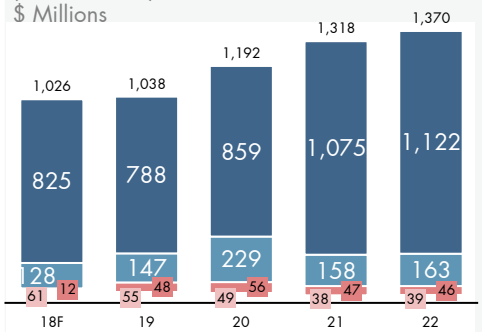
Bring Innovation to the Core

INNOVATION

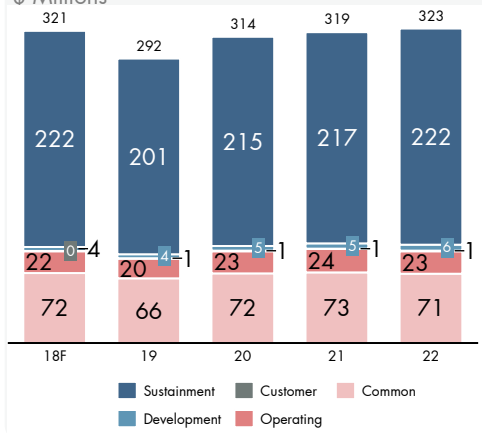
Foster **Innovation** in the business to adopt to changing customer requirements and market opportunities. Invest in grid infrastructure and grid modernization to deliver a high level of reliability to our customers.

WHAT WE ARE SPENDING

CAPITAL PLAN: $3,881M over three years
(7.2% Growth)
$ Millions



OM&A PLAN: $956M over three years
(1.4% Growth)
$ Millions

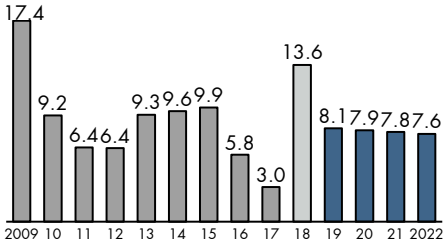


WHAT WE ARE GETTING

RELIABILITY OUTCOMES

Strive to restore Q1 reliability

SAIDI – Actual & Forecast Targets excluding FM events
Duration (Minutes)



SYSTEM RENEWAL AND MAINTENANCE

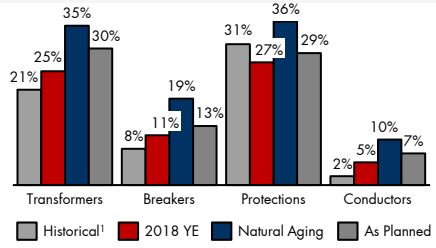
Transformers
51 replaced (7%); 14 removed (2%)

Breakers
328 replaced (7%)
Including 30 ABCBs (22%)

Protections
1,338 replaced (11%)

Conductors
1,055 circuit-km replaced (4%)

Asset Age
% Beyond Expected Service Life



PLAN HIGHLIGHTS

SAFETY & ENVIRONMENT

Journey to Zero and Embedded Safety by Design programs
- $1.8B which mitigates safety risk (e.g., $204M for targeted Tx line insulator programs)
- $25M in Tx Lines overheard condition assessments and patrols
- Reducing environmental risk (e.g., $45M PCB Retrofill, $8M for transformer oil leak reduction)

RELIABILITY

Improve Reliability by striving to restore Q1 reliability
- $1.5B at 156 Tx stations; replacement of 51 transformers at 23 stations
- $142M in Tx Cyber Security
- Growing Tx lines refurbishment program ($554M) to replace end of life lines
- Address Tx worst performing circuits impacting 20 delivery points
- Build new Integrated System Operating Centre

COST EFFECTIVE

Cost efficiencies and pacing of investments to reduce planned spend in response to customer and regulatory feedback
- Initiatives to extend asset life like Tx Tower Coating ($55M)
- $314M in Productivity Savings

CUSTOMERS

Customer Focused to resolve power quality issues and $45M spend ($193M gross) for **new customer connections**
- $480M in development capital to build new capacity of 1665MW to **enable growth** e.g. Leamington and Milton

INNOVATION

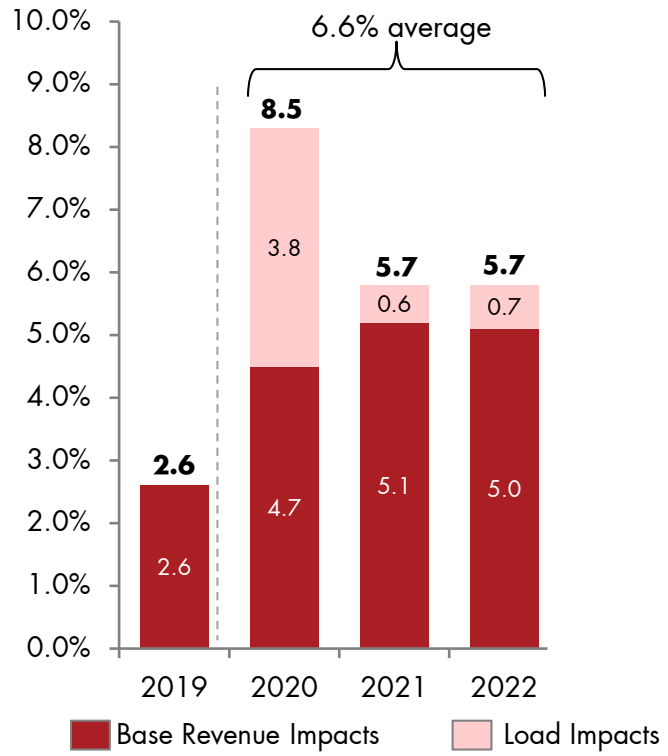
New Operations Innovation
- $9M of new research and development initiatives e.g. EPRI, CEATI, etc.
- $42M in new analytic tools, SAP upgrades, Stations Move to Mobile, etc.

1. Historical as per Transmission Rate Application EB-2012-0031 filed May 28, 2012

3v. Rate Impacts

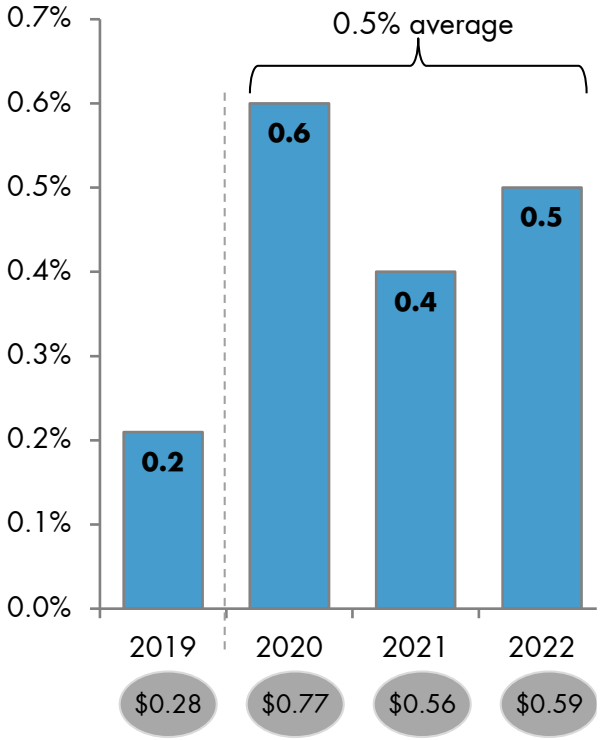
Tx Tariff Impacts (%)

2019-2022



Bill impact: Typical Residential Customer

2019-2022



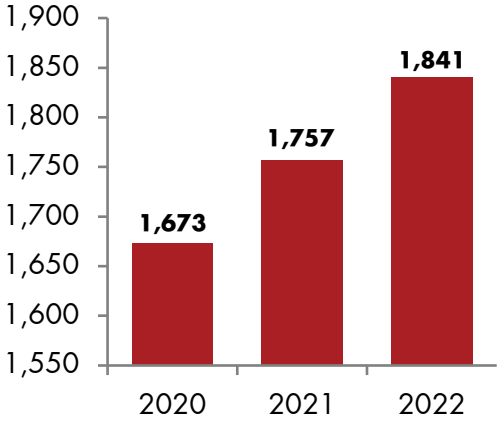
- **Key Comments**
  - 45% of tariff increase in 2020 is from load reduction due to conservation initiatives and lower consumption
  - Inflationary application for 2019
  - Lower OM&A in revenue requirement starting in 2020

- **Favourable Deferred Tax Asset (DTA) impact not reflected above**
  - Average increase of 0.5% per year or $0.64 per monthly bill (2019-2022)
  - If DTA decision is favourable, there will be an additional 2.3% rate increase

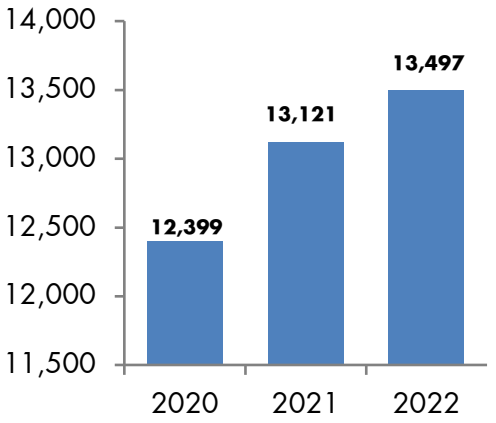
3vi. Key Components of the Application

Custom Application *(see Executive Summary s. 4, Appendix II)*	▪ January 1, 2020 effective date ▪ 3-year Custom Incentive Rate application ▪ Not proposing a mid-term update to cost of capital and load forecast ▪ Application addresses prior concerns and criticisms, including the prior OEB Decision on Transmission (see next slide)
Load Forecast & Bill Impacts *(see Executive Summary s. 6.3 and 6.11)*	▪ Net impact on 2020 transmission rates of 8.5%, of which 3.8% is attributable to load reduction ▪ 2020 bill impact for a typical customer of $0.77 or 0.6% of total bill
Features & Mechanisms *(see Executive Summary s. 4)*	▪ An Earnings Sharing Mechanism permits customers to share 50% of earnings that exceed ROE by more than 100 bps. ▪ A Capital In-Service Variance Account tracks the cumulative difference between the actual in-service capital additions and the OEB-approved revenue requirement, for any in-service additions that are 98% or lower than the OEB-approved level ▪ Ability to seek recovery of material costs from unforeseen events and an earnings deadband
Productivity *(see Executive Summary s. 5.4)*	▪ $370 MM in productivity savings over the 2020-2022 plan period: • $212 MM Capital • $71 MM OM&A • $87 MM in additional productivity, to be defined as initiatives evolve
Performance & Reporting *(see Executive Summary s. 6.6)*	▪ Custom Transmission Scorecard reflecting the OEB's prior decision ▪ Increased alignment with the OEB Renewed Regulatory Framework ▪ Performance targets set for the planning period that reflect the expected outcomes of planned investments

Revenue Requirement ($MM)
2020-2022



Total Rate Base ($MM)
2020-2022



3vii. OEB Concerns Addressed

Prior OEB Finding	Detailed OEB Feedback	Actions Taken
Customer engagement	▪ Use customer engagement feedback to inform plan	▪ Earlier, more comprehensive customer engagement ▪ New risk taxonomies informed by customer engagement feedback
Deficiencies in prioritization	▪ Questioned prioritization and optimization process	▪ Clear, comparable new taxonomies drive investment scoring and prioritization brought to Distribution ▪ Risk scores used to maximize risk mitigation per dollar spent
Asset Condition Assessments	▪ Need a comprehensive asset condition process that informs the prioritization	▪ Risk scores are tied back to available condition assessments ▪ Updated inventory of assets and condition assessment strategy with identified opportunities ▪ Third-party assessments and data initiatives completed
Value Added in Review	▪ In the last application, the plan did not change despite seven months of review	▪ Multiple challenge sessions where the merits of individual investments are debated
Sequencing	▪ Plan was submitted for rate filing before Hydro One Board approval	▪ Sequencing issues addressed for multi-year performance based regulatory applications
Internal Audit	▪ Planning process had outstanding internal audit items to address	▪ All original internal audit items are complete ▪ Follow up internal audit shows lower overall risk level and other recommendations have been addressed
Work Program Delivery	▪ Hydro One had not historically delivered its capital and OM&A programs to OEB approved level	▪ Enhanced upfront engineering and planning deliverables ▪ Increased governance throughout investment lifecycle ▪ Minimal in-service addition variances (1% for 2017, forecasted -2% for 2018)

4. Key Risks

Risk	Description	Mitigation
Government Policy	Government mandate to lower electricity bills may impact regulatory process	Provide persuasive evidence supporting funding request. Communicate need for funding to government
Capital Disallowance	Proposed capital investment amount is higher than historical requests. OEB reduced capital request by $126.1M in 2017 to $950M and by $122.2M in 2018 to $1,000M	Application includes studies comparing Hydro One to other North American utilities. Applications describes how capital investments will result in outcomes that are beneficial to Ontarians
OM&A Disallowance	Proposed OM&A costs for 2020 are higher than 2019 and will be scrutinized	Efficiency savings have lowered OM&A costs by 6% relative to 2018 OEB approved OM&A costs. Application explains that a component of 2019 OM&A reductions were one-time, non-sustainable reductions
Load Forecast	Revenue is based on actual load demand but rates are set based on a load forecast. If actual demand is less than forecast, revenue is at risk	Historically, weather normalized load forecasts have been accurate and the OEB expects utilities to bear the risk of weather fluctuations
Effective Date	Hydro One is filing the application in February 2019 for rates effective January 1, 2020 but OEB decisions have been unusually delayed, putting the effective date at risk	If the OEB issues its decision after January 1, 2020, Hydro One will ask for interim rates effective January 1, 2020
Rate Base Disallowance	Regulator may disallow additions to rate base to the extent they are not consistent with findings in their last decision	Report detailing in-service additions and capital expenditures explains material variances and prudence of any over-expenditures

SEC INTERROGATORY #3

Reference:

Interrogatory:

Please provide a copy of all budget guidance documents that were issued regarding the budget that underlies the application.

Response:

Please refer to I-11-CCC-007, Attachment 1 for the 2019-2024 Investment Planning Kick-off materials.

Witness: Joel Jodoin, Bruno Jesus

SEC INTERROGATORY #4

Reference:

Interrogatory:
Please provide a copy of each of Hydro One's 2017 and 2018 corporate scorecards.

Response:
Please refer to Exhibit I, Tab 12, Schedule AMPCO-83.

Witness: Sabrin Lila

SEC INTERROGATORY #5

Reference:

Interrogatory:

Please provide a copy of all benchmarking analysis, reports, opinions and/or assessments, undertaken by, for, or that includes Hydro One, since 2017, regarding any aspect that directly or indirectly relates to a material aspect of its transmission business that is not already included in this application.

Response:

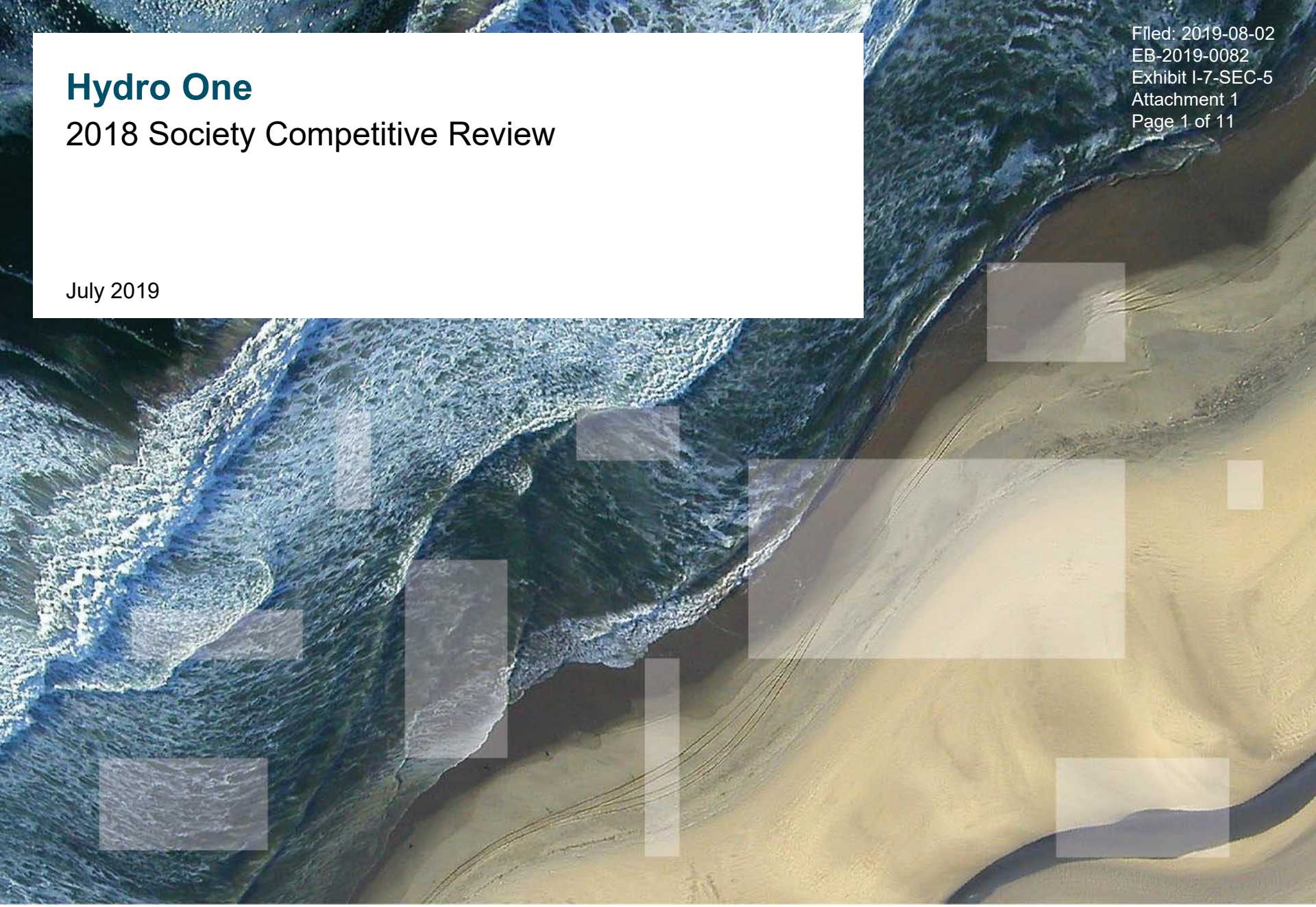
Please refer to Attachment 1 of this interrogatory response.

Witness: ALL WITNESSES

Hydro One

2018 Society Competitive Review

July 2019



Segment Definitions and Rationale

- Hydro One's peer groups have been differentiated to reflect the segmented labour markets for talent, i.e., Operations and Core Services roles, and are applied consistently for the following employee groups to ensure a consistent end-to-end approach for understanding market position holistically:
  - Executives
  - Management Group
  - PWU represented roles
  - Society represented roles

Segment	Segment Definition	Peer Group Selection Criteria
Operations	Requires specific education, skills and knowledge in a professional area that is directly related to concepts and methods associated with the transmission, distribution and regulation of power. Examples include: Operations, Engineering, Skilled Trades	▪ *Predominant focus on industry/nature of work*: reflects organizations where comparable specialized skill sets reside ▪ **Industry:** Utility ▪ **Geography:** Canada, with <30% Alberta representation ▪ **Size**: Revenue size > $500M ▪ **Ownership:** Balance of public and private-sector ownership models
Core Services	Roles that require education, skills and knowledge that are not specific to the transmission, distribution and regulation of power. Examples of such functions include Finance, Human Resources and Information Technology	▪ *Predominant focus on range of Ontario talent sources*: incorporates a variety of organizations based on labour market – assumes an Ontario labour market and recognizes the importance of Hydro One as an Ontario employer ▪ **Industry:** General Industry *(excluding subsidiary Retail and Consumer Products)* ▪ **Geography:** Ontario-based employers ▪ **Size**: Private sector: >$500M, Public sector: >$100M & Subsidiaries: >$1B ▪ **Ownership:** All structures

A detailed company listing of both peer groups are noted in Appendix I

Background and Context

Willis Towers Watson was engaged by Hydro One to benchmark its represented roles. This report provides competitive market data for Hydro One's Society represented roles. Willis Towers Watson benchmarked over 80% of Hydro One's Society workforce in this review, encompassing roles across a majority of the levels and steps

Society Segment	N count	% of Society Incumbents benchmarked
Core Services	**372**	**26%**
Operations	**1071**	**74%**

Over **80%** of all Society represented staff are in jobs included in the benchmarking analysis

The prevalence of represented roles matched to Willis Towers Watson's compensation surveys varies significantly across the segmented peer groups

Hydro One Peer Group	Prevalence of Annual Incentive Plan (AIP)*	% of unionized roles in the survey
Core Services	60%	**7%**
Operations	80%	**51%**

Broad based AIP s are common among western based utility comparators as a means to remain competitive with the oil & gas sector

Salary surveys are typically used as a means to review the competitiveness of an organization's non-represented workforce. A higher proportion of unionized roles are prevalent in the operations peer group (a reflection of the nature of work)

* Represents the percentage of peer companies offering a broad-based AIP

Compensation Benchmark Results Presentation

- Compensation for represented Society jobs is administered across a range of salary levels and step progressions. Market benchmarking results provide some indication as to the differences
- At a high level, a summary of the typical titles and types of roles matched by schedule and segment are summarized below:

Society Level	Typical Titles by Society Schedule	
	Operations	Core Services
MP6	Meter & Relay Services Manager Team Leader/Senior Advisor	Communications & Community Relations Advisor Network Architect
MP5	Sr. Network Management Engineer/Officer Senior P&C Engineer Specialist	Senior Network Specialist Process & Data Representative
MP4	Network Management Engineer/Officer Senior Protection and Control Engineer	Sr Telecom Engineer/Officer Senior Accounting & Financial Analyst
TMS05	FLM - Forestry FLM - Lines	Fleet Maintenance Supervisor Logistics Operations Supervisor
MP3	Shift Control Engineer/OfficerEnvironment Planner/Engineer	Distribution/Transmn Forester Indigenous Relations Coordinator
TMS04	FLM - Lines Regional Line Supervisor	-
MP2	Assistant Network Mgmt Engineer/Officer Protection & Control Engineer/Officer	Accounting & Financial Analyst ITMC Telecommunications Engineer/Officer

Benchmarking Methodology

- Society jobs within each level have been matched to a comparable job within Willis Towers Watson's Compensation Database, based on segmented peer groups outlined on page 2
- The following pages outline market comparisons as follows:
  - **Operations Segment -** aligned to the agreed operations peer group
  - **Core Services -** aligned to the agreed core services peer group
- All market data is presented on a base salary and total target cash compensation basis as follows:

Compensation Element	Hydro One Society	Market
Base salary	Actual 2018 salary of incumbents in benchmark roles	2018 actual base salary
Total target direct compensation (TDC)	Actual 2018 salary + actual share grant plan award for eligible employees	2018 actual base salary + target bonus + long-term incentives (if applicable) of incumbent in benchmark roles

Executive Summary

- Market compensation benchmark results have been provided on a segmented basis for the benchmarked Society roles, covering 84% of the Society represented workforce
- On an overall basis, Hydro One's target total direct compensation is, on average positioned 10% above its 50th percentile target market reference

Hydro One Segment	% +/- Target Market Positioning		Employee Distribution
	Base Salary	Target Total Direct Compensation (TDC)	
Operations	10%	4%	74%
Core Services	45%	36%	26%
Overall	**17%**	**10%**	**100%**

Over **80%** of all Society represented roles are in jobs included in the benchmarking analysis

Note: Overall market positioning represents an incumbent weighted average spanning both employee segments

Compensation Element	Hydro One Society	Market
Base salary	Actual 2018 salary of incumbents in benchmark roles	2018 actual base salary
Total target direct compensation (TDC)	Actual 2018 salary + actual share grant plan award for eligible employees	2018 actual base salary + target bonus + long-term incentives (if applicable) of incumbent in benchmark roles
Market data were sourced from Willis Towers Watson's 2018 General Industry and 2018 Energy Services, Middle Management, Professional and Support (MMPS) database		

Overview

Compensation Analysis Results

Competitive Positioning

Detailed Summary of Level

Society Schedule	Employee Dist. %	Average Competitive Positioning vs. Market Median					
		Operations & Core Services		Operations		Core Services	
		Base Salary	Total Direct Comp. (TDC)	Base Salary	Total Direct Comp. (TDC)	Base Salary	Total Direct Comp. (TDC)
MP6	**1%**	20%	4%	3%	-13%	34%	20%
MP5	**21%**	14%	5%	8%	0%	41%	30%
MP4	**45%**	13%	5%	6%	-1%	35%	25%
TMS05	**0.3%**	18%	10%	10%	2%	54%	45%
MP3	**6%**	28%	19%	24%	15%	38%	30%
TMS04	**21%**	2%	-3%	2%	-3%	-	-
MP2	**5%**	36%	31%	21%	18%	64%	56%
Overall	**100%**	17%	10%	10%	4%	45%	36%

***Note**: Overall market positioning represent an incumbent weighted average spanning both employee segments*

Appendix I

Peer Groups by Segment

Peer Group - Operations

For role requiring an industry focus

Utilities Peer Group (n=18)		
Alberta Electric System Operator	Enbridge Inc.	Nova Scotia Power
ATCO Ltd.	ENMAX Corporation	Ontario Power Generation
BC Hydro Power & Authority	EPCOR Utilities Inc.	SaskPower
Bruce Power LP	FortisAlberta Inc.	Toronto Hydro Electric
Capital Power Corporation	Hydro Quebec	TransAlta Corporation
Emera Inc.	Newfoundland Power Inc.	TransCanada Corp.

Percentile Satistics	Revenue	Assets
25th Percentile	$2,005,600,000	$5,293,375,000
50th Percentile	$2,995,500,000	$10,331,000,000
75th Percentile	$5,695,000,000	$31,102,750,000

Hydro One	**$5,990,000,000**	**$25,701,000,000**
Percentile Rank	*78P*	*68P*

Ownership Structure	% of Total
Government Agency	44%
Joint Venture	6%
Public Parent	33%
Wholly Owned Subsidiary	17%

Peer Group – Core Services

General Industry focus

Core Services Peer Group (n=99)			
AIG Insurance Company of Canada	Compass Group Canada	Kal Tire	Restaurant Brands International Ltd. Partnershp
Aimia	CPP Investment Board	Kinross Gold Corporation	RGA Life Reinsurance Company of Canada
Air Canada	Element Fleet Management	Lafarge Canada Inc.	RioCan Real Estate Investment Trust
Allstate Insurance Company of Canda	Entertainment One Canada	Ledcor Group of Companies	Samuel Son and Co.
Amazon.com Canada	Ernst & Young Canada	LifeLabs	Scotiabank
Apotex Inc.	Estee Lauder Cosmetics	Loblaw Companies Ltd.	Stantec Inc
Apple Canada	Export Development Canada (EDC)	LoyaltyOne	Sun Life Financial
Aviall Services, Inc.	Facebook, Inc (Canada)	Magna International Inc	TD Bank Financial Group
Bank of Montreal	Federal Express Canada Corporation	Manulife Financial	TELUS Corporation
Barrick Gold Corporation	FGL Sports Ltd.	Maple Leaf Foods	The Co-operators Group Ltd.
BASF Canada	Four Seasons Hotels and Resorts	Mark's Work Wearhouse	The Empire Life Insurance Company
Bayer Inc.	General Dynamics Land Systems - Canada	McCain Foods Ltd.	The Stars Group
Bell Canada	General Electric Canada	Metrie	TMX Group Ltd.
Bunge Canada	Gerdau Long Steel North America	Microsoft Canada	Toronto Hydro Electric
Cadillac Fairview Corporation Ltd	Goodyear Tire and Rubber Canada	Morgan Stanley	Torstar Corporation
Canada Post Corporation	Great-West Lifeco Inc.	Munich Life Management Corporation	Travelers Insurance Company of Canada
Canadian Imperial Bank of Commerce	Holt Renfrew	NAV Canada	Treasury Board of Canada Secretariat
Canadian Tire Corporation	HP Canada Co.	Nissan Canada, Inc.	Veolia North America
Capital Group	Husky Injection Molding Systems Ltd.	Northbridge Financial Corporation	VIA Rail Canada Inc.
Capital One Canada	iA Groupe Financier	Ontario Pension Board	WestJet Airlines Ltd.
Celestica Inc.	Intact Financial Corporation	Ontario Power Generation	Winpak Portion Packaging Ltd.
CH2M Hill Canada	InterContinental Hotels Group	Parmalat Canada	Workplace Safety & Insurance Board
Chartwell Retirement Residences	Ivari	PepsiCo Canada	Xerox Canada
Cisco Systems Canada Co	Johnson and Johnson Canada	Pfizer Canada Inc.	York University
CNH Industrial Canada	Johnson Controls PLC	Purolator Inc.	

Percentile Satistics	Revenue	Assets
25th Percentile	$1,217,600,000	$3,815,525,000
50th Percentile	$2,094,000,000	$13,272,792,000
75th Percentile	$5,677,885,745	$34,290,713,360

Hydro One	**$5,990,000,000**	**$25,701,000,000**
Percent Rank	*76P*	*62P*

SEC INTERROGATORY #6

Reference:

Interrogatory:

Please provide summaries of all internal audit reports conducted since 2017, related to any aspect that directly or indirectly relates to Hydro One's transmission business, their findings, recommendations, and the status of any actions that are to be taken.

Response:

Witness: All Witnesses

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
SF6 Gas Management (Bruno Jesus) Review and assess the processes and controls related to SF6 gas inventory and emissions management to minimize greenhouse gas impacts, and to assist in closing any gaps to ensure accurate regulatory reporting.	2017-08	Some key aspects of the SAP Asset registry related to SF6 filled equipment are incomplete and/or inaccurate.	Review and update the SAP Asset Registry to ensure all SF6 equipment in the transmission and distribution system, including MVGIS, gas carts, puffer packs and storage tanks (pigs), are accurately captured.	Station Services and Engineering to create a plan to update and cleanse SAP Asset Registry data relating to all SF6 equipment in the transmission and distribution system.	COMPLETE
	2017-08	Some key aspects of the SAP Asset registry related to SF6 filled equipment are incomplete and/or inaccurate.	Review and update the nameplate capacities for SF6 equipment in SAP and ensure that the values are populated accurately in the "Weight of SF6 (kg)" data field.	Engineering (accountability now transferred to Planning) and Station Services to update and reconcile the nameplate capacities for SF6 equipment in SAP.	COMPLETE
	2017-08	Some key aspects of the SAP Asset registry related to SF6 filled equipment are incomplete and/or inaccurate.	Develop Gas Compartment Diagrams in NODS for MVGIS switchgear currently installed in the field.	Engineering will develop detailed compartment drawings for MVGIS switchgear and publish in NODS. Grid operations will also be involved in this process.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-08	Some issues related to accurately tracking, estimating and reporting SF6 gas emissions at the equipment and corporate level to satisfy Ontario Regulation 143/16 – Quantification, Reporting and Verification of Greenhouse Gas Emission regulatory reporting requirements.	Re-assess the feasibility to accurately report the 2016 SF6 GHG emissions using the mandated format and methodologies to satisfy the O. Reg. 143/16 regulatory requirements.	Direct Method vs. Mass Balance will be evaluated in calculating SF6 emissions and the most appropriate method will be identified, by stakeholdering with all applicable LoB Directors to satisfy the O. Reg. 143/16 regulatory requirements for accurate and timely reporting of SF6 GHG emissions. A process map will be developed documenting the reporting steps and LoB accountabilities for reporting SF6 GHG emissions.	COMPLETE
	2017-08	Some issues related to accurately tracking, estimating and reporting SF6 gas emissions at the equipment and corporate level to satisfy Ontario Regulation 143/16 – Quantification, Reporting and Verification of Greenhouse Gas Emission regulatory reporting requirements.	Develop an action plan to mitigate reporting risks and/or implement actions to address control gaps to satisfy the regulatory reporting requirements.	For current year and going forward, reports to external stakeholders and SF6/GHG related non-financial reporting (i.e., Corporate Social Responsibility and Carbon Disclosure Project) appropriate disclosure statements will be incorporated to address any estimation uncertainties or potential misrepresentations. For chosen SF6 GHG reporting methodology, Directors will	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
				identify required improvements to accurately estimate and report SF6 emissions in 2018 and assign accountability to the appropriate LoB Director. Environmental Services will assess the current process for identifying and tracking emerging environmental legislation and enhance the process to ensure comprehensive business impact analysis is conducted and appropriate compliance plans are developed and deployed.	
	2017-08	Some key aspects of the SAP Asset registry related to SF6 filled equipment are incomplete and/or inaccurate.	Review and update the SAP Asset Registry to ensure all SF6 equipment in the transmission and distribution system, including MVGIS, gas carts, puffer packs and storage tanks (pigs), are accurately captured.	Environmental Services to co-ordinate sample data review to determine general data quality.	COMPLETE
	2017-08	Some key aspects of the SAP Asset registry related to SF6 filled equipment are incomplete and/or inaccurate.	Standardize the SF6 equipment templates to ensure the class characteristic to capture the nameplate capacity of the equipment is described as "Weight of SF6 (kg)" and Measuring Point - "Weight of SF6 Added" is included.	Transmission and Distribution Asset Management to ensure SAP equipment templates are updated to facilitate the upload equipment nameplate capacities and gas top-ups records. Enterprise Information Technology will be engaged in	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
				template creation.	
	2017-08	Some key aspects of the SAP Asset registry related to SF6 filled equipment are incomplete and/or inaccurate.	Enhance the change management process to ensure systematic and timely updating of the SAP Asset Registry when physical changes to location and equipment status are made.	Transmission and Distribution Asset Management, Engineering Services and Station Services to communicate to their respective teams the importance of and the expectation for timely and accurate updates provided to responsible parties to maintain the SAP Asset Registry.	COMPLETE
	2017-08	The direction provided in the SF6 governance framework requires clarification in order to effectively manage and report SF6 emissions.	Clarify the overall framework across the organization relating to the overall strategy, processes and related procedural documentation to effectively manage of SF6 emissions and accurately report SF6 emissions, giving consideration for the following: • Review, rationalize and streamline the overall governance framework and work procedures (i.e., ordering, handling, testing, storage, tracking and reporting) to enhance	Environmental Services, working with LoB stakeholders, to: a) Review the existing SF6 related HODS documentation (including GHG and overall Climate Change governance), b) Develop overall document framework and hierarchy, and c) Streamline /update/revise related policies and work procedures. Note: Interim measures will be implemented to ensure	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
			understanding of the expectations; • Reduce the redundancies and remove overlapping of content between Greenhouse Gas Management policy and SF6 Management Plan. • Ensure coordinated effort and adequate stakeholdering across all affected business units. • Establish a working group and/or subject expertise to ensure all elements of the overall management of SF6 gas are aligned and moving forward that technical knowledge and/or expertise is maintained to ensure effective execution of the overall strategy to minimize SF6 emissions.	accountabilities and expectations are managed during this transition. Put in place a working group to facilitate and monitor the implementation of the action plans.	
	2017-08	The operational effectiveness and work management required to meet the SF6 emission reduction and major leak repair objectives and targets, established by the Planning Division, needs improvement.	Enhance work management and maintenance practices to identify, repair and/or replace leaking SF6 equipment to reduce the amount of SF6 emissions to satisfy the SF6 leak reduction strategy and to meet the stated major leak repair objectives and targets. Suggested areas of focus should include: • Enhancing the BI report to provide a 52 week or yearly rolling view	Transmission Asset Management to: a) Review and update SF6 leak reduction strategy to ensure the accountabilities are current and the defined objectives and targets are executable. b) Update Key Performance Indicators for evaluating effectiveness of the SF6 gas management program and leak	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
			rather than a segmented quarterly view. • Incorporating a metric to capture number of times SF6 equipment has repeatedly leaked. • Clarifying the Key Performance Indicators used to evaluate the effectiveness of the SF6 gas management program and ensure it aligns with the overall leak reduction strategy. • Establishing mechanisms by which planners and operation staff can leverage Business Intelligence reports to enhance their ability to make informed decisions relating to the repair and/or replacement of repeat leaking equipment.	reduction strategy. c) Enhance the reporting process and BI report to gain better visibility to SAP data to identify repeat equipment leaks and for establishing SF6 equipment performance trends. This report will be made available to all planners involved in managing and maintaining SF6 assets. d) Update the SAP asset registry with SF6 gas handling equipment to enable and schedule preventive maintenance, track potential defects and maximize return on these assets. Reinforce to Stations staff the importance of accurately reporting SF6 top-ups for equipment in SAP and the need to identify and advise Asset Management of repeat/chronic leaking equipment.	

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
Power Quality Management (Bruno Jesus) Provide assurance that the key controls related to the management of power quality are effective. Our review focused on the control environment necessary to manage power quality related issues which affect the quality of power delivered to our customers.	2017-13	It was identified that some key stakeholders were unaware of the power quality strategy and implementation plan.	Review and update the power quality strategy and implementation plan documents, review with senior management and key line of business stakeholders involved in the process to ensure a common understanding of the strategy to efficiently and effectively address power quality issues raised by our customers.	Review the existing power quality strategy and implementation plan documents; determine existing and new initiatives that should be part of these plans going forward with input from key stakeholders. (incl.: Customer Service, Provincial Lines, NOD)	COMPLETE
Investment Plan - Governance - Delivery - Follow-up (Bruno Jesus) Provide assurance that Hydro One has completed the committed actions and addressed all the audit recommendations and mitigated the associated risks.	2017-14	Roles and accountabilities need to be better defined to identify emerging risks.	Develop and implement a process with accountabilities to identify emerging risks and periodically incorporate the results of risk workshops into an overall Planning business risk register for appropriate tracking by specifying business objectives, risks, risk owners, mitigating actions, and target completion dates.	The requirement to conduct risk assessments on the annual Investment Plan will be added to the overall Investment Planning deliverables each year. Any recommendations/action items resulting from the risk assessment will be added to the Planning Division's tracker for action items (Internal Audit, AEI, etc.)	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-14	It was identified that some policies and directives were outdated.	Review and formalize existing management direction, presently being delivered as part of Investment Planning training, into governance documents (policies, processes, procedures, standards, guidelines, etc.) and decommission outdated governance documents (including draft policies and process documentation within ARIS).	Appropriate governance documents (policy, process, procedure, standard or guideline) will be established taking the existing Investment Planning training material into account. All other existing draft documentation that no longer applies will be removed (e.g. ARIS).	COMPLETE
	2017-14	Outcomes and metrics for the end-to-end investment planning process must be better defined.	Establish and implement appropriate measures and targets for the Investment Planning Scorecard (specifically for non-accomplishment related measures such as estimate quality, Potential Need (PN) notifications that are actioned/accepted, etc.). Track "go to green" action plans for management to achieve the targets either for the current or future Investment Planning cycles. Document the results of quality assurance reviews performed by management and feedback given to planners.	Key performance indicators (KPI) for the investment planning process will be developed and incorporated into 2018 scorecards for impacted directors as per the recommendation.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-14	Requirements identified in the Asset Analytics workshops have not been fully implemented.	Continue to identify and correct issues with Asset Analytics input data and risk factor algorithms that will affect the degree to which the output results can be used to influence investment decisions.	Plans related to data required for Asset Analytics will be developed and key steps and milestones to address the recommendation will be tracked in the Divisional Scorecard.	COMPLETE
	2017-14	Data needed for Asset Analytics & Asset Investment Planning tools are not consistently gathered.	Review and establish appropriate funding and actual implementation plans for the enhancements identified in the Asset Management Tool Integration Roadmap.	Management will review the tool enhancement roadmap, to determine necessary enhancements taking into account cost/benefit with decisions to keep, defer or discard items.	COMPLETE
Investment Planning Support Tools (Donna Jablonsky) Provide assurance that key controls are in place for the effective use of the Asset Analytics and Asset Investment Planning tools to support the investment planning process.	2017-17	Currently, there are no measures in place to periodically monitor consistent and effective use of Asset Analytics (AA).	Develop and implement suitable measures to periodically monitor consistent and effective use of AA within Planning.	We will review the existing use of AA tool capabilities and develop measures for its effective use that can be tracked as part of the Planning Scorecard.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-17	Asset Analytics Algorithms require improvement to be effective.	Ensure that the identified needs for changes to data and algorithms for asset risk index calculation are prioritized and implemented on a timely basis.	As per our current plan, we will monitor the implementation of a) enhancements related to existing ARI algorithms and existing data and b) enhancements related to existing ARI algorithms requiring new data enhancements by end of 2018. We will look for opportunities to expedite this work along with c) Enhancements related to new ARI algorithms and new data.	COMPLETE
	2017-17	There are some data from source systems that are used as inputs to the Asset Analytics (AA) tool with some quality issues which resulted in unreliable Asset Risk Index calculations/outputs from the tool.	Ensure that appropriate mechanisms are in place for periodic monitoring, escalation for follow-up and correction of known data quality issues with the owners of the supporting data systems.	We will discuss source system data quality issues with the system owners and then implement periodic monitoring and correction of identified issues by the system owners.	COMPLETE
	2017-17	There is a lack of specific documented expectations or guidelines on how the Asset Analytics data and tool analytical capabilities and features are to be used for the Investment Planning process.	Develop and communicate appropriate guidelines to ensure consistent and effective use of available AA data and tool capabilities for investment planning assessment needs.	We will review and formalize the current Asset Risk Assessment process in our policy documents along with revision and/or development of suitable processes, procedures, guidelines and training on consistent use of AA data and tool capabilities.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-17	Currently AA is primarily used for sustainment capital projects and not for development projects or maintenance programs.	Review the current use of the AA tool capabilities and determine which are required for on-going use. Perform a cost/benefit review of features to determine their continued use. Provide the required training and support for capabilities that are available (such as ad-hoc BOBJ Reports).	We will initiate a review of the AA tool features and capabilities with the intent to specify and reinforce which features and capabilities are to be used for what purpose. We will perform a cost/benefit review of features prior to determining if any should be decommissioned.	COMPLETE
Work Scheduling - Stations (Andrew Spencer) Provide assurance that the key controls related to the management of station work scheduling function are effective.	2017-20	Currently there is no clear schedule change management process or prioritization criteria established for station work.	Document, stakeholder, and implement a schedule change management process with defined prioritization criteria to manage schedule changes for efficient work execution.	Work Program Management will facilitate the stakeholdering and implementation of a work prioritization process and establish prioritization criteria, with inputs from Asset Management, Station Services, and Project Delivery, to facilitate the change management of station work schedules.	COMPLETE
	2017-20	There are no specific measures currently in place for periodic monitoring of scheduling efficiencies.	Develop and implement suitable measures to periodically monitor work scheduling efficiency trends to drive continuous improvements of the scheduling function.	Work Program Management will develop and implement appropriate measures, with input and support from Station Services, to periodically monitor the effectiveness of station work scheduling to improve efficiency of the scheduling function.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-20	A training program was developed in 2015; however it has not been implemented. Currently, newly hired scheduling staff is expected to job shadow an experienced scheduler for an unspecified period of time for required knowledge transfer.	Formalize and implement a training program for station schedulers (Planning & Scheduling Technicians and Maintenance Schedulers) to further develop and retain staff capabilities, and to drive consistent work practices for the work planning and scheduling functions.	Station Services will develop and stakeholder an implementation plan on a formalized training program for all station schedulers (Maintenance Schedulers and Planning & Scheduling Technicians) to improve staff's knowledge of the station work planning and scheduling functions and to drive consistency of work practices across all zones.	COMPLETE
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-23	System Control had recently participated in the North-American Transmission Forum (NATF) Survey on the subject of "Black Sky" events where several mitigating actions were under consideration. Federal Energy Regulatory Commission (FERC) had issued a report related to the subject of "Black Sky" events in June 2017 with several recommendations to utilities, which were reviewed by System Control management with recommended further actions but no clear progress has been made.	Assess Black Sky event risks and make progress in identifying and implementing of mitigating action(s) recommended by the NATF and FERC reports on transmission resiliency.	Participation in the NATF forum will continue to develop and implement mitigating actions that are suitable for the Hydro One transmission and distribution systems. A risk registry has been developed which is reviewed annually for new threats. Provisions are in place to update the registry prior to annual review should new risks to operations are identified.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Transmission Reliability Strategic Plan (Bruno Jesus) Provide assurance that controls and processes were in place to support a transmission reliability strategy that provides governance, clear accountability and direction to support a reliable transmission system.	2017-24	There is no strategic plan document that describes how the company will achieve its operational targets for transmission reliability, however management shared with us their Journey to Operational Excellence, COO Roadmap and Operating Mode which identifies the vision, goals and initiatives within	Develop and implement an overarching transmission system reliability strategy to align with corporate strategic objectives and achieve operational reliability targets. The implementation should include formally defined roles and responsibilities, including lead accountability for the overall plan, communication of the plan to the Operations organization along with change management.	Work to create a transmission reliability strategy is already underway and aligns with the corporate operational roadmap. This work will be continued along with the implementation of the strategy as recommended.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
		Operations including the initiative to develop an Asset Management Strategy.			
	2017-24	There is a no clear association between the key transmission reliability metric identified in the Journey to Operational Excellence Scorecard and the corporate risk tolerance, risk profile and corporate priorities.	Establish reliability metrics that address all of the key functions of the transmission system in alignment with corporate risk tolerances, risk profile and corporate priorities (i.e. bulk transmission capabilities, load serving to all customers, customer needs, Hydro One's presence in the North American marketplace).	Additional reliability metrics will be established to address the recommendation including the following: a) Targets will be established for TxSAIDI and TxSAIFI to include both Single and Multi-circuit supplied delivery points. b) Existing reporting of events resulting in reliability and power quality disruptions at specific delivery points will be enhanced. c) Reliability assessments will be enhanced to enable benchmarking throughout North America.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-24	Although a Maintenance Plan and Work Standard Document Review process document is in place, it does not prescribe a maintenance strategy or approach to be applied when determining maintenance plans for equipment.	Establish a standard asset maintenance methodology to efficiently and effectively support the achievement of reliability targets.	A standard asset maintenance methodology in alignment with ISO 55000 will be established.	BEHIND SCHEDULE
	2017-24	Leading metrics linked to potential impact to reliability have not been established which may create the risk of the accumulation of deficiencies over time that would result in system reliability deterioration.	Identify leading asset performance-based metrics that would serve as early indicators before changes to transmission reliability would be detected by the selected TxSAIDI metric.	Trending of equipment based trouble calls and deficiency reports for tracking of degradation of assets over time will be established. This will highlight, at an early stage, any broad based deterioration of equipment performance that might affect transmission reliability over the long term.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
Warranty Claims Procedure (Rob Berardi) Assess the effectiveness of controls over the new warranty claims process, including the warranty clause inclusion in the purchasing agreements with vendors; warranty and claim identification, assessment and communication to the stakeholders as well as tracking and monitoring of the warranty claim to its collection (or resolution).	2017-25	There are varying degrees of knowledge and familiarity with respect to the new warranty procedure. The Supply Chain role is clear in the process, but the roles and accountabilities pertaining to the other stakeholders have not been clearly articulated and communicated.	Update the existing warranty procedure and associated flowcharts to more clearly articulate the roles and accountabilities that are assigned to the stakeholders other than Supply Chain throughout the process.	A RACI chart will be documented to add additional clarity and consistency. An enhanced communication plan will be developed and executed which will continue to reinforce the Warranty and Claims Management Procedure in 2018.	COMPLETE
Utility Work Protection Code - Controlling Authority - Ontario Grid Control Centre (Godfrey Holder) Review the processes and controls in place to ensure effective preparation and execution of the UWPC permits issued by System Control as the Controlling Authority at the OGCC to Hydro One permit	2017-29	The existing Utility Work Protection Code process documentation pertaining to the preparation and execution of work protection packages at the Ontario Grid Control Centre (OGCC) are out of date and do not reflect the current state.	1. Document and analyze the current state of the UWPC processes at the OGCC to identify the process breakdowns/gaps, handoffs, key deliverables, critical timelines/deadlines, roles, accountabilities, interdependencies with other processes, tasks and tools and identify process improvements. 2. Revise and update the PC1 Standards document so that it reflects critical timelines within the	1.1 Operating Planning and Networks' work flow will be reviewed and clarified. Directly impacted documents will be updated accordingly and pending documents will be removed from System Operations' active document repository. 1.2 PC1 Standards document will be reviewed and revised as required to reflect any changes associated with the recommendation.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
holders.			UWPC application process to enable effective study and review of the work protection and outage packages.		
	2017-29	Inadequate tracking of outage packages (containing UWPC forms) to assess completeness and accuracy.	Establish a formal tracking and monitoring mechanism to record defects, re-work, short notice or missing information to identify deficiencies in the planning and/or executing processes so that corrective actions can be taken internally within System Control and where required, communicate externally to other Lines of Business.	2.1 The team will develop and review a single mechanism to monitor churn of Work Protection Documents, identify and resolve deficiencies internal to System Control and work with the field management staff to resolve any issues concerning incoming applications.	COMPLETE
	2017-29	System Control is relying on compensating controls to manage uneven UWPC work volumes.	1. Establish a review process to determine acceptable volumes and thresholds for reviewing UWPC packages in a safe and effective manner, based on available resource levels.	3.1 The team will review the volumes of work protection processed in the control room and work to align expectations with other LoBs. We will work with field management staff to	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
				develop a balanced work week for processing work.	
	2017-29	System Control is relying on compensating controls to manage uneven UWPC work volumes.	2. Communicate to Lines of Business (such as Stations, Construction, Lines, etc.) required timelines for UWPC applications according to PC1 Standards document along with the need for a balance of UWPC work applications throughout the work week.	3.2 Upon completed review of the PC1 Standards document and any required changes, communicate the changes and expectations to impacted LoBs.	COMPLETE
	2017-29	Inadequate Change Management Process for updating and maintaining UWPC Forms and Application database content (i.e., isolation points) using TIPs (Template Isolation Points).	1. Determine reasonable timelines for Lines of Business to provide information to the UWPC Transmission Change Control department.	4.1 Operating Planning will review the overall In-Service Package timelines required for information and will work with the other LoBs to develop acceptable and documented timelines.	COMPLETE
	2017-29	Inadequate Change Management Process for updating and maintaining UWPC Forms and Application database content (i.e., isolation	2. Communicate timeline expectations to Lines of Business requesting changes and/or updates to isolation templates.	4.2 Coordinated timelines will be communicated across all affected LoBs as agreed during establishment of overall expectations.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
		points) using TIPs (Template Isolation Points).			
	2017-29	Inadequate Change Management Process for updating and maintaining UWPC Forms and Application database content (i.e., isolation points) using TIPs (Template Isolation Points).	3. Establish a succession plan to ensure adequate resourcing to implement changes to the isolation templates.	4.3 Operating Planning will review the staffing plan for In-Service Package group to ensure proper staffing resources to implement changes to isolation templates and develop a succession plan.	COMPLETE
	2017-29	Nightly self-assessment mechanism performed by on-shift Controllers for review of deficiencies is informal.	1. Formalize and establish prescribed criteria for assessment of the completed/executed UWPC outage packages.	5.1 Operating Networks will review the overall expectations of the nightly work protection audit (local review). We will document and formalize this process.	COMPLETE
	2017-29	Nightly self-assessment mechanism performed by on-shift Controllers for review of deficiencies is informal.	2. Conduct a quality assurance review of the UWPC packages reviewed by the Controllers on the night shift to determine the effectiveness of the process.	5.2 We will review the UWPC packages to examine the quality of the night shift Controller's review to determine effectiveness of the program.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-29	OGCC's Single Point of Contact program for assisting in better planning and execution of the staged outages and related work protection for capital brown-field and green-field projects needs improvement.	Working with the Project Implementation team, formalize Operating Planning and Networks SPOC program for capital projects by establishing clear guidelines and assessment criteria requiring assignment of OGCC Controllers. In addition, the SPOC roles, accountabilities and expectations for their involvement should be documented and participation of individuals in the program should be tracked systematically.	6.1 Operating Networks and Operating Planning will formalize the role of the Single Point of Contact for complex projects, outlining when required, expectations and accountabilities including a formal tracking mechanism.	COMPLETE
Polychlorinated Biphenyls Management (PCB Management) (Donna Jablonsky) Review and assess the adequacy and alignment of corporate strategy, business plans, and work programs within Distribution Lines, Distribution Stations, Transmission Stations, and Facilities for ensuring compliance with the Canadian Environmental Protection Act - PCB	2017-31	There is a lack of communication strategy to effectively manage Environment Canada relations and internal / external inquires related to potential PCB regulatory non-compliance.	Develop and implement a communication strategy to effectively manage Environment Canada relations and internal / external inquires related to potential PCB regulatory non-compliance.	Environmental Services working with other Lines of Business will prepare a communications strategy to manage Hydro One's relationship with the regulator.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
Regulations 2009 and 2025 End-of-Use deadlines, and the Company's PCB Management Plan.					
	2017-31	There are SAP Geographic Information System (GIS) Integration interface (commonly referred to as SGI) issues related to the design and implementation that are creating a backlog of required changes in SAP and the GIS software application.	Enhance the overall performance of the SGI Interface by giving consideration for: • Identifying the root cause(s) with the SGI Interface that are causing data errors in the two system of records (i.e., SAP and GIS); • Developing a remediation plan to resolve the defects; and • Outlining a timeline for implementing the necessary upgrades and/or fixes.	ISD will initiate a discovery into the SGI interface issues to identify root causes. The deliverable for this will be a remediation plan with milestones. The remediation plan may require a combination of new requirements as well optimizing existing SGI requirements.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-31	There were inconsistencies on information related to PCB Measuring Points in the SAP registry.	Conduct a review to verify, validate and eliminate duplicate and/or incorrect PCB Measuring Points in the SAP registry to ensure PCB analysis test results are stored in a correct manner to address the audit observation.	Distribution and Transmission Planning will work with ISD to address the issue of duplicate measuring points.	COMPLETE
	2017-31	It was identified that there is an insufficient oversight, monitoring and tracking of Hydro One's PCB phase-out progress against PCB regulatory compliance requirements.	Establish an appropriate framework to ensure the tracking, monitoring and reporting of the overall progress of the PCB Management Plan moving forward and maintain appropriate level of knowledge continuity and expertise. Consider leveraging a key LoB stakeholder group, similar to the Environmental / Operational working group, to accomplish this oversight framework.	Environmental Services will establish monthly and/or quarterly meetings by Q1 2018 and in collaboration with the Lines of Business we will develop and document a framework for tracking overall progress and identify key teams and/or individuals involved in the PCB phase-out program.	COMPLETE
	2017-31	Hydro One's PCB governance document needs to be revised to clarify the Company's internal PCB phase-out criteria, LoB accountabilities and End-of-Use Deadlines.	Clarify the limits for classifying acceptable level of PCB concentration as well as the pre-1985 criterion for Hydro One's assets in the various Lines of Business.	Environmental Services will work with the Lines of Business to clearly establish Hydro One's internal limits for acceptable levels of PCB concentration and pre-1985 criterion.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-31	Hydro One's PCB governance document needs to be revised to clarify the Company's internal PCB phase-out criteria, LoB accountabilities and End-of-Use Deadlines	Update the PCB Management Plan, to reflect the clarified internal criteria, revised LoB accountabilities, and corrections to Table 3 End-of-Use deadlines.	We will review and revise the document and address the observations highlighted in this observation.	COMPLETE
	2017-31	Hydro One's PCB governance document needs to be revised to clarify the Company's internal PCB phase-out criteria, LoB accountabilities and End-of-Use Deadlines.	Communicate revisions to affected Lines of Business to ensure they are incorporated into the relevant strategies, business plans, progress reports and dashboards.	Upon review and/or revision of PCB Management Plan, we will communicate the changes to ensure staff are provided with clear direction.	COMPLETE
	2017-31	The Company may be at risk of being found non-compliant with Environment Canada's PCB Regulation - 2009 End-of-Use deadline due to the potential existence of Distribution system padmount transformers and Transmission system capacitors that may contain PCBs ≥ 500 ppm.	Based on the results of the capacitor bank survey, develop and implement a program to establish an appropriate timeline to achieve regulatory compliance, and decommission and/or discard non-compliant units to achieve the PCB Regulation's End-of-Use deadline for equipment with PCBs ≥ 500 ppm.	The survey pertaining to the capacitor banks has been completed in 2017. The results will be analyzed and a remediation plan will be developed for any suspect equipment.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
ISOC Requirements Traceability (Godfrey Holder) Provide assurance that the processes and methodology being followed to capture the various LOB requirements into the Project's scope and detailed designs were effective, properly reviewed, approved and monitored and that adequate recordkeeping was in place.	2017-43	Controls over document storage and distribution, which are especially relevant in relation to project designs, have not been established.	We recommend adopting information classification and handling standards for major documents related to ISOC, particularly the compiled drawings. As the project approaches the RFP phase, the project leadership team need to ensure that adequate document control requirements are followed by the vendors during the tendering process.	Provisions in the Non-Disclosure Agreement for the RFP will be provided to all proponents, and additional security features will be applied to project documents.	COMPLETE
	2017-43	The contingencies for both the overall Class A Estimate and the construction budget by NOD were not the result of a detailed risk assessment based on the project's requirements.	A risk-based approach should be adopted to calculate project contingencies. The contingencies should be linked to defined project risks, as identified by all key stakeholders.	The contingencies were calculated based on industry experience by RLB LLP. The contingency will be revisited after the RFP phase and if necessary re-estimate them based on a risk assessment conducted with the stakeholders.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-43	Project costs may exceed the initial budget defined in the Project Charter which is dated June 2016. The initial budget was based on a Class C estimate; whereas a "Class A" estimate was recently concluded.	We recommend revising the current estimate and ensuring a Project budget to be based on the Class A Estimate following its revision if required.	The most accurate budget will be prepared as a result of the offers received from the contractors. Once the offers are received and as necessary, we will revise the project budget, which will be presented to the Board of Directors and be used as the official budget for future assessment, monitoring, and control.	COMPLETE
Construction - Site Inspections (Andrew Spencer) Provide reasonable assurance that controls related to Site Inspection in relation to the creation of the Plans, monitoring performed by Burns & McDonnell, and completion of corrective actions are effective.	2017-44	We noted inconsistencies in the review and approval of the project-specific Plans.	Portfolio Management, in coordination with Project Delivery, needs to ensure that all project-specific plans are developed and properly reviewed by the specialized area at Hydro One. Furthermore, contractors need to reflect Hydro One's requirements in all the project-specific plans.	Portfolio Management will work with Project Delivery to ensure that the plans are submitted by contractors for all contracted projects with proper reviews by Hydro One specialized areas. Contractors will update the plans based on Hydro One's feedback and Site Inspectors will review the plans in accordance with the Field Operations Manual.	COMPLETE
	2017-44	The Site Inspectors do not verify if the commitments assumed by the contractors in the project specific health and safety plan are being properly	Portfolio Management, in coordination with H&S, needs to ensure that Site Inspectors monitor contractors' compliance with the PSHSP and the Occupational Health and Safety Act (OHSA) regulations.	Quality Assurance group will conduct regular oversight of Site Inspectors to ensure that they are monitoring the contractors' compliance with the PSHSP and OSHA regulations which will be	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
		performed.		documented in the daily inspection reports.	
	2017-44	We noted a lack of evidence that Site Inspectors were monitoring the contractors' compliance with the Environmental Management Plan (EMP) which is approved by the Environmental Group as required by the Field Operations Manual.	Portfolio Management, in coordination with the Environmental Group, needs to ensure that Site Inspectors review and comply with the EMPs during the project lifecycle.	QA Group and Project Delivery will work with the Environmental Group and Burns & McDonnell to ensure that Site Inspectors will review, monitor, and document contractor compliance with the EMPs during the project lifecycle and that any environmental issues will be highlighted in the daily inspection reports.	ON SCHEDULE
	2017-44	Not all Project Managers support the site inspection process, demonstrate knowledge of the requirements as detailed in the Field Operations Manual (FOM), or monitor the Site Inspectors to ensure compliance with the FOM.	Management needs to ensure that Project Managers support the site inspection process, understand the requirements of the Field Operations Manual, and monitor the Site Inspectors' compliance with the requirements of the Filed Operations Manual.	QA Group will work with Project Delivery to update Project Manager's roles and responsibilities within the FOM to be consistent with the Contract Management Process and RACI, providing training to Project Managers focused on understanding the requirements of the Field Operations Manual, and reinforce the importance of the site inspection process.	IN PROGRESS

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-44	Although the Project-Specific Quality Plan (PSQP) includes detailed methods for the quality inspection and tests to be performed by the contractors via Inspection Testing Plans (ITPs), there is no formal way to ensure that the Site Inspectors are checking the accuracy and completeness of the ITPs prepared by the contractors, nor are they gathering any evidence that the PSQP is being properly followed.	We recommend that the QA Group in coordination with the Project Managers monitor and ensure there is sufficient evidence of the completion of all required tests and inspections, as per the relevant PSQP and ITPs, in an effective and timely manner.	Management advised that the ITPs were implemented during 2017 and accordingly it was expected that some projects would not provide ITPs according to HONI's current requirements. Kick off meetings between Project Manager and QA Group including Site Inspector are currently in effect and have a formalized agenda. The daily inspection reports will include references to specific PSQP and ITPs' tasks that were observed by the Site Inspectors on the same day; and site inspectors will acknowledge completion of key documentation (testing and inspections).	COMPLETE
	2017-44	The Task Safety Observation form was developed and implemented by Burns and McDonnell to list safety aspects required to be verified by the Site Inspectors on a daily basis. During our review, we observed that the TSOs were not developed by	The QA Group needs to work with Burns and McDonnell to ensure that TSOs and daily inspection reports are developed on a daily basis for all projects (unless agreed otherwise with the Project Manager) and distributed to the intended audience (QA Group, Project Manager, H&S) and stored in the corresponding SharePoint folder.	QA Group will determine with input from H&S how the Health and Safety observations should be tracked (whether through TSOs or otherwise) and modify the FOM accordingly.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
		Site Inspectors on a daily basis. We also noted that the TSOs are only distributed to the Project Managers and QA Group on a monthly basis, in a consolidated document.			
	2017-44	During the project construction phase, the issues identified by the Site Inspectors are reported through the daily inspection reports and TSOs, but there is no consistent tracking process for their resolution.	Portfolio Management, in coordination with Project Delivery and Burns & McDonnell, needs to define how the issues identified by the Site Inspectors and their resolutions will be tracked including corrective actions, responsibility, original and any revised completion dates, current status, etc.	Portfolio Management will work with Project Delivery and QA Group to define and implement an effective way to track resolutions for issues identified in the daily inspection reports. The tracking will be focused on use of the ongoing project Deficiency List as a means to record issues, action issues, and identify disposition. The Deficiency List may include areas for documenting Quality, Safety and Environment issues. Project Manager will ensure that Deficiency List be reviewed at project meetings with the contractor.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-44	The Field Operations Manual (FOM) lists the required training for the Site Inspectors, which should be taken prior to performing any job on site. However, the QA Group and Burns and McDonnell were unable to provide evidence that Site Inspectors were trained accordingly.	The QA Group in coordination with Engineering needs to ensure that Site Inspectors receive the required trainings, understand the applications of the ITPs, and realize the ultimate benefits for their use. Evidence of provided trainings needs to be documented. We also recommend updating the CN Form in order to include all trainings mentioned in Field Operations Manual.	QA Group will ensure that: 1. Training will be provided to the Site Inspectors in relation to the Generic Minimum ITPs and relevant Hydro One policies as part of their orientation; 2. The Field Operations Manual will be updated to reflect the most current training requirements; and 3. Evidence of training will be documented by storing records on the QA SharePoint site.	COMPLETE
Construction - Site Inspections (Andrew Spencer) Provide reasonable assurance that controls related to Site Inspection in relation to the creation of the Plans, monitoring performed by Burns & McDonnell, and completion of corrective actions are effective.	2017-44	It were identified inconsistencies related to Specific Health and Safety Plans related to the development and following through of specific plans by contractors and opportunities for improvements related to the Hydro One's internal templates.	Portfolio Management, in coordination with H&S, needs to ensure that Site Inspectors monitor contractors' compliance with the PSHSP and the Occupational Health and Safety Act (OHSA) regulations. Safety and other issues noted in the Task Safety Observations need to be reflected in the daily inspection reports. Furthermore, the Field Operations Manual needs to be validated by H&S, and define when a Health & Safety professional is required to be present on site by the contractors. We also recommend that H&S provides oversight of the work performed by the Site	QA Group will work with H&S and Burns & McDonnell to ensure the following: 2. Review and validation of the Field Operations Manual by H&S; 3. Gather recommendations on appropriate oversight; 4. Define criteria where a Health and Safety Professional is required on projects.	ON SCHEDULE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
			Inspectors in relation to safety.		
	2017-44	We noted a lack of evidence that Site Inspectors were monitoring the contractors' compliance with the Environmental Management Plan (EMP).	Portfolio Management, in coordination with the Environmental Group, needs to ensure that Site Inspectors review and comply with the EMPs during the project lifecycle. We also recommend that the Environmental Group improves the coordination with the Site Inspectors, provide guidance as needed, and rely more on their services as they are available daily on site. In coordination with the Environmental Group, all	QA Group and Project Delivery will work with the Environmental Group and Burns & McDonnell to ensure the following: Based on the project execution plan, and the review of contractors' EMP, the Project Manager will have the responsibility to coordinate accountabilities between Environmental Group and Site Inspector to define when Subject Matter Expert (from Environmental Group) involvement is necessary and	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
			observations during the environmental checkpoints by Site Inspectors need to be noted in the daily inspection reports.	what reporting is required.	
Construction Contract Monitoring - Major Contracts 2017 (Andrew Spencer) Provide reasonable assurance that the key controls related to contract monitoring are effective in relation to the compliance to key contract terms as they relate to Environmental, financial, legal, and regulatory aspects of the Contractors' work.	2017-46	The Contract Management Guidelines and their respective Forms are outdated and do not include guidance on major contract monitoring functions including compliance with legal requirements, schedule monitoring, milestone approvals, etc.	Update the Contract Management Guidelines, ensure consistency with the Site Inspection process, and improve Project Managers' compliance with the Guidelines.	Portfolio Management will work with Project Delivery and Transmission Lines to ensure updating and formally adopting the Contract Management Guidelines, Contract Management Forms Guide, and respective forms. Positions, roles and responsibilities will be updated.	ONGOING

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-46	The Guidelines do not define the criteria to be followed by Project Managers in order to verify that a milestone was achieved, which is currently based on the Project Manager's discretion. Project Managers do not consistently issue the Certificates of Payment and Change Orders that should be used to approve contract changes.	Milestone payment acceptance criteria need to be created by Portfolio Management and included in the Contract Management Guidelines for every milestone type in order to be used by the Project Managers.	Portfolio Management will work with Project Delivery and Subject Matter Experts to define the appropriate milestone payment acceptance criteria, define project specific milestones and the respective acceptance criteria at the beginning of every project, ensure the compliance of Project Managers with specific guidelines including the consistent issuance of the Certificate of Payment and Change Orders when needed, and identify a specific milestone for clearing the Category B deficiencies following the achievement of the Substantial Completion, which will be shown in the contract's milestones schedule.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-46	Project Managers do not consistently monitor the completion of "Form 13 - Contract Partial or Final Inspection" by Site Inspectors, which are required to ensure the Substantial Performance or Total Completion of a contract.	The updated Contract Management Guidelines need to be disseminated to all those involved in the contract monitoring process, including but not limited to: Project Managers, Site Inspectors, HONI Environmental Team, Contract Managers/Specialists, etc. Additionally, Project Delivery needs to reinforce that the Project Managers comply with the Contract Management process, including the use of the Contract Management forms.	Following the update and final adoption of the Contract Management Guidelines, Portfolio Management, in coordination with Project Delivery, will ensure Project Managers comply with the Guidelines including the required site inspection forms that ensure the Substantial Performance and Total Completion of a contract.	COMPLETE
	2017-46	When there are offsite disposals of hazardous material, Project Managers do not consistently obtain evidence from the contractor that confirms the disposal was appropriately managed as mandated in the contract or required by the Environmental group.	Project Managers need to consistently obtain evidence from the contractor ensuring that offsite disposals were appropriately managed when required. Identify who is responsible to request and review these documents. The responsibilities of the Site Inspector and Hydro One's Environmental Team to support Project Managers in offsite disposals need to be clearly identified in the Contract Management Guidelines and reinforced at the beginning of every project.	Portfolio Management will coordinate with Project Delivery and the Environmental team to ensure the consistent monitoring of offsite disposals when required for all projects. Project Managers will be clearly identified as the accountable party to monitor offsite disposals with the support of Site Inspectors and the Environmental team at Hydro One, and the Contract Management Guidelines will be updated accordingly.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2017-46	The current Contract Management Forms Guide instructs the user to only release holdbacks after all deficiencies (Category A and B) have been cleared, which seems not to be aligned to the Construction Lien Act.	The guidance on Holdback Policy in the Contract Management Guidelines and the Forms need to be updated considering the Construction Lien Act's requirements. Portfolio Management needs to seek legal advice to ensure that the policies in the Forms are consistent with the Construction Lien Act.	Portfolio Management, in consultation with the Legal department at Hydro One, will update the guidance on the Holdback policy in the Contract Management Guidelines and Forms to ensure consistency with the Ontario's Construction Lien Act.	COMPLETE
In-service addition Process Review (Andrew Spencer) Provide assurance that appropriate oversight and controls are in place to ensure that the in-service additions are budgeted, forecasted and added to the rate base in a timely manner such that capital assets meet regulatory conditions for being included in the rate base.	2018-06	Deviations from budgeted in-service additions and associated approvals are not documented. Deviations between budget and actual transmission in-service additions were observed for which rationale at the project and program level was neither documented nor approved.	Reinforce the month-end reporting process to keep track, document and approve deviations from budgeted in-service additions at project and program level.	Management has established plans to track, document and approve rationale for deviation from budget to actual in-service additions at the specific project and program level as part of the now-established redirection process. These will assist management in explaining any significant deviation from the annual level committed to the customers and the regulator.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2018-06	Decision criteria to determine costs and assets being declared in-service are not clearly documented. Rules for allowing "partial in-servicing" of project work and journal transfer of related costs are unclear as per the existing Report of Equipment In-Service (REIS) process. Untimely or incorrect capitalization of assets in the current year could lead to a cascading effect on future in-service additions.	Review the existing documentation to ensure that controls relating to "partial in-service" are clear so that only appropriate costs are capitalized after confirming that assets are actually being used for "intended purpose" from field operation.	Management will clarify and monitor consistent application of rules for declaring assets in-service then capitalize relevant costs as per the existing Report of Equipment In-Service (REIS) process. Portfolio Management will continue to seek clarification from Finance to ensure that in-servicing of assets or costs are completed as per the documented capitalization policy. Extraordinary items will be appropriately discussed with clear documentation of decisions with rationale.	COMPLETE
	2018-06	Heightened efforts in Q4 are expended to achieve the transmission in-service additions corporate year-end target. Heightened efforts near year-end to meet in-service addition targets may lead to increased operational inefficiencies and/or operational risks.	In addition to the in-service additions corporate scorecard dollar value measure, ensure that tracking of other performance factors are taken into account, including completion of budgeted work, adherence to plan (actual cost less than planned cost) and management of operational risks.	Management will initiate a review of the portfolio level metrics (such as cost and schedule adherence and milestone achievements) to complement the existing portfolio metrics around adherence to capital expenditure and in-service additions budget, to further drive best-in-class project and program-level reporting and demonstrate value to	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
				stakeholders.	

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
Fleet Services - Management, Maintenance and Administration (Rob Berardi) Provide assurance that appropriate oversight and controls are effective to support business objectives of Fleet Services. The scope of this review included the oversight processes regarding third party management, fleet costs, inspections and repair work completion, asset safeguarding and disposal during 2017.	2018-09	On a monthly basis, ARI will invoice Hydro One the total cost of fleet transactions within a number of invoices broken out by fuel, maintenance, administration and fleet type. Management will perform a high level reasonability review of these costs that is based on the their understanding of overall fleet activity, seasonality and specific program activity. The design of this review may not be granular enough to identify unauthorized expenses or potential areas of savings. As a compensating control, authority limits have been established for individual transaction approval of fuel costs and maintenance, and exception reports are monitored to identify instances of non-	Fleet Services should collaborate with stakeholders to define a repeatable review process that may include the following: • Cross checks that tie invoice data to work orders. • Key assumptions/understanding of underlying business activity be documented to support reasonability assessments. • Define key areas of focus within underlying data that supports invoices (e.g. fuel cost/litre, litres/odometer readings, life to date repair costs by make, model, or driver). • Use of data analytics tools available within Hydro One to develop customized visualizations of fleet data from various sources (e.g. ARI, Telematics) to highlight anomalies within fleet data for further review.	We will perform the following: • Collaborate as a team to determine areas of focus within the ARI invoice details to review each month and determine the level of granularity required. • Cross checks to front end data extracts. • Document key assumptions/summarize review. • Engage ARI to determine if further customized analytical reports can be provided. • Engage Internal Audit to perform a data analytics review of historical fleet costs to assist us in understanding anomalies, trends, etc.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
		compliance to these thresholds. Management places reliance on the effective operation of these controls to gain comfort that transactions are appropriately approved.			

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
Capital Project Stage Gate Review (Andrew Spencer) Provide assurance that the key process and controls related to the Transmission Capital Project Stage Gate (Stage Gate) review are effective, and validate that the defined stage gates are consistently being utilized and monitored.	2018-16	Quality of deliverables is subjective with no proper sign-off from functional Lines of Business.	Ensure that a consistent mechanism for quality assessment of deliverables is implemented and sign-off for each deliverable under the entry criteria is consistently obtained.	A quality metric for the assessment of all deliverables will be defined and implemented. This would include sign-off on deliverable quality from functional Line of Business.	COMPLETE
	2018-16	"Go/No Go" criteria are undefined for 2 of the 6 Stage Gates ("In-service" and "Project Closure") which are not yet fully matured; and Stage Gate presentations are not consistently provided to the Stage Gate Panel 3 days in advance of the meeting, as required by the process.	Ensure that the "Go/No Go" Criteria are defined for "In-Service" and "Project Closure" Stage Gates with clear rationale for Project Manager's assessment of each criterion. Ensure that Stage Gate presentation of acceptable quality is consistently made available to Panel Members at least three days prior to Stage Gate meeting as required by the process.	Process requirement will be reviewed with Chair and Panel as to strictness compliance of the 3 days pre-send out and how to address exceptions. The "In-Service" and "Project Closure" Stage Gate templates will be reviewed to reflect that there is no "Go/No Go" criteria. The Stage Gate presentations will be issued to the Panel Members at least 3 days prior to the Stage Gate meeting.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2018-16	There is inconsistent tracking of Actions and Conditions in the Tracker and there was no escalation of items with expired due dates. There was no independent confirmation of completed actions and conditions as reported by Project Managers. The Stage Gate Minutes of Meeting contained no reporting/discussion on previously identified actions and conditions.	Ensure that: 1. Actions and Conditions are accurately entered in the Tracker for timely follow-through 2. Expired actions and conditions are escalated with appropriate update of forecast dates 3. Completed actions and conditions are independently reviewed and confirmed as complete with appropriate documentation of their completion.	Actions and conditions will be consistently entered in the tracker with updated forecast dates and proper supporting documentation once an action or condition is marked complete. Expired actions and conditions will be escalated through regular management review.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
Employee and Contractor Time Review (Sabrin Lila/Andrew Spencer) Evaluate the design and effectiveness of processes and controls related to employee and contractor timekeeping within Transmission and Stations. Audit focus was placed specifically on employees who submit weekly timesheets for approval and contractors who are compensated on a time and materials basis.	2018-17	Overtime hours are sometimes incorrectly allocated in system which may result in payroll errors.	Transmission & Stations needs to work with Enterprise IT in order to develop automated checks in SAP where the major union rules are applied for every employee based on his/her union affiliation, which help in reducing the possibility of errors before the timesheet approval is requested. Data analytics can be utilized and training needs to be provided for approving Managers where errors frequently occur.	Transmission and Stations will work with Enterprise IT and HR to update the functional requirements of the "Employee Central Pay Project" which will be kicked off in Q4 2018. T&S will also engage with Corporate Projects to ensure that our management needs and requirements are communicated in the scope definition of the project since T&S is an existing stakeholder of this project. Data analytics will be included as a requirement by T&S.	COMPLETE
	2018-17	Maximum allowed hours of work on a daily and weekly basis in case of emergency are not defined.	T&S needs to determine and monitor the limit on the total daily and weekly hours an employee can work during an emergency situation. The audience for the monitoring is the Director/VP levels which will be distinguished from any existing monitoring that may be in place for supervisors and other approvers.	T&S will work with Health & Safety to define the maximum number of hours an employee can work in a day or week (cumulatively) in case of an emergency situation. We will also work with Enterprise IT to produce monthly reports flagging outliers. A framework for tiered management approval for hours worked (including overtime) will	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
				be established which will cover alternative shifts.	
	2018-17	There is a lack of defined guidelines for the review and approval of hours in timesheets in addition to few automated controls, high volume of timesheets, and existence of multiple sets of overtime rules.	Define the guidelines that should be followed by Mangers while approving employee timesheets including: Compliance with ESA, accuracy of reported hours, correct allocation of hours to Network Numbers or Work Orders, and the correct use and allocation of other job codes (Sick days, Jury duty, travel time, etc.); Ensure that all approving Managers are trained and consistently aware of the rules; For managers with high number of timesheets (ex: more than 20), define the sampling methodology and criteria that need be followed to approve timesheets.	We will work with Human Resources, Labor Relations, Enterprise IT, and other areas under T&S in order to: Define what needs to be monitored in relation to compliance with ESA, accuracy of reported time, correct allocation of hours, and correct use of job codes; Standardize and implement training related to the above; Define the sampling methodology and criteria to be followed by approving Managers who have a high number of timesheets to approve per week.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2018-17	Time & Material invoices approval process is not defined.	Transmission & Stations needs to define the requirements to validate the accuracy of Time & Material invoices including: The hours billed in the invoice related to professional services or equipment to have proper supporting documentation (i.e. timesheets) with matching values; All subcontractor amounts to have proper supporting documentation; The tracking of equipment usage and charged rental hours. Clients / end users to approve equipment rental invoices.	We will work with Supply Chain and other areas under T&S to define the requirements for validating the accuracy of contractor Time & Material invoices including: The hours billed to consistently have supporting documentation (timesheets) which equal the respective invoices; Subcontractor amounts to have proper supporting documentation; The tracking of equipment usage and charged rental hours. Documented approval by clients / end users for equipment rentals.	COMPLETE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
Work Program - Cost Management and Reporting (Andrew Spencer) To review program work cost management processes and controls to ensure timely, complete and accurate forecasting, cost reporting and work accomplishment tracking against the approved annual Transmission and Stations business plan.	2018-19	Accurate planning and costing requires an understanding of the body of work that can be reasonably accomplished with available resources. Whilst Planning has established a process to request unit price updates and confirm executability of planned work program, a more consistent approach is needed in the execution of this process. And, although variances net out to zero for the overall approved programs budget, Management has committed to improving processes to support the accuracy of unit prices and the executability of the proposed work plan.	Establish a more consistent approach to confirm unit prices and executability of planned and budgeted work. 1)Program Managers should Review and confirm unit prices and scope for the program they manage including documentation of rationale for any changes. 2) Work Program Portfolio Management should formalize the work acceptance process for program work (similar to capital projects) following adjustments to planned funding and accomplishments through the investment planning lifecycle.	Unit prices will be confirmed and rational for changes will be documented by accountable Program Managers or change programs that cannot be unit priced to projects. At the beginning of each year, we will review and confirm that the funding and accomplishment levels for each program is consistent with what was agreed to with Planning during the Enterprise Engagement and gain approvals for any changes using Program Variance Approval process.	NOT STARTED

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2018-19	Management conducts monthly meetings to review program cost and accomplishment variance root causes and related commentary that are captured in the centralized "PP-191" report. However, the quality of variance commentary to explain the reasons for the variance and remedial actions that were taken is inconsistent. Management has committed to improving variance commentary in order to provide a more effective decision trail and to provide enhanced feedback.	Enhance the quality of program cost and accomplishment monitoring and forecasting commentary. To enhance the effectiveness of the monthly cost monitoring and forecasting process, it is recommended that Management: 1) Define a consistent process and tools (e.g. PP-191 reports) to be used by Program Managers in both WPM and PD. 2) Clarify roles and responsibilities for Program Managers along with required support from Finance and executing LOBs (such as Construction, Station Services, Distribution Lines, etc.). 3) Provide guidance and direction to Program Managers for documenting clear and consistent variance explanation with required details of further action/follow-up.	The tools and process followed by WPM and PD will be reviewed to ensure continuous improvement. Roles and responsibilities for Program Managers and support personnel will be in executing program work. We provide guidance and direction and continue to monitor the quality of program variance explanations with targeted training to enhance quality as required.	NOT STARTED

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2018-19	Decisions endorsed by the Redirection Committee are not consistently approved at an individual program level nor consistently communicated to the accountable Program Managers. Actions have been established to improve communications and enhance the ability of the Program Managers to effectively manage their program(s).	Establish a more formal approach to communicate program redirection decisions. To support the formalization of the Redirection communication and approval process, the following is recommended: 1) Review the new redirection process with Program Managers to clarify any expectations related to Program Manager's role in providing forecast and rationale for the redirection recommendations being made by Management to the redirection committee. 2) Work with Finance to ensure consistent documentation and approval of forecast changes which are below redirection thresholds. 3) Communicate redirection decisions to the impacted Program Managers following the redirection review.	Redirection process overview training will be provided to Program Managers. We will continue to develop a month end reporting package that will require formal signoffs at various levels of review and engage Finance to provide feedback on the current Project/Program Variance Approval process to highlight issues encountered and discuss approaches to allow for timely approvals. We will define communication protocol for Program Mangers to be informed of redirection decisions in a timely manner.	NOT STARTED

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
Post Event Investigation Process Review (Bruno Jesus) Provide assurance on the control design effectiveness of the post event investigation (PEI) process in reducing the risk of future occurrence on failures to our network and key assets.	2019-03	Criteria to determine the criticality level of events have been substantially established but have not been consistently utilized to define the appropriate level of investigation.	Management should review the criteria (per SP1938) to ensure that the appropriate triggers are established and adequately populated to help define the criticality of the investigations and to facilitate trending analysis on key assets with repeated failures.	The PEI Standing Committee will review and establish the appropriate triggers necessary to define the criticality level of investigations. The Reliability and Analytics team will ensure the data fields are populated in the spreadsheet in order to facilitate trending analysis of repeated failures on key assets.	COMPLETE
	2019-03	Rationales to substantiate the PEI Standing Committee's decision on the criticality level of an investigation are not being consistently documented.	Management should document the rationale to support PEI Committee decisions on the criticality level of investigation in cases where it differs from the criteria ratings.	The rationale on the criticality level of investigations will be captured during the triage meeting with the PEI Standing Committee.	COMPLETE
	2019-03	There is no formal mechanism in place to preserve evidence and gather data for investigations.	Management should finalize and stakeholder the PEI policy and procedure with field personnel to establish a consistent level of awareness on the need to preserve evidence. Furthermore, establish a mechanism to define, communicate and follow-up on the evidence and data required for each criticality levels of investigations.	The Reliability & Analytics team will finalize, issue and stakeholder the policy and procedure and use it to educate personnel to make them aware about the importance of evidence and data. The procedure will define evidence and data required for high and medium level investigation to be captured by field crews	ON SCHEDULE

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
Meter Service Provider Functional Review (Bruno Jesus) Provide assurance that key controls are in place for Hydro One to meet its obligations as a registered Metering Service Provider as per the Ontario Market Rules and its Metering Service Provider (MSP) Agreement with the Independent Electricity System Operator (IESO).	2019-09	Unclear centralized authority to oversee successful execution of MSP function by LoB stakeholders. A review of overall MSP function governance identified the following issues: • governance documents (policies, processes, procedures, job aids, etc.) are currently in place to communicate MSP expectations and timelines to stakeholders but many are outdated in the evolving organization or remain in draft form (unapproved). • Key stakeholder LoB accountabilities are generally understood but not formally documented and communicated. • A centralized authority to provide updated directions, clarify	1. Establish a centralized oversight authority to ensure consistent understanding of MSP requirements, accountabilities and expectations among stakeholder LoBs and to manage known issues, risks and performance. 2. Establish a mechanism to track, review, create/update, stakeholder, approve, communicate and decommission MSP governance documents on a timely basis to ensure compliance with market rules.	1. The Director, AMIO will be the governance oversight authority including documentation of the responsibilities of stakeholder LoBs to ensure compliance with Market Rules and the MSP Agreement obligations. 2. We will establish a Statement of Work with input from each of the stakeholder LoBs defining the activities and a mechanism for MSP Governance document management.	NOT STARTED

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
		accountabilities, and manage known risks, issues and performance is not in place. No clear accountability matrix or inter-LOB Service Level Agreements are in place to ensure clarity of expectations, service quality, performance measures, etc. • A centralized and active tracking of action to close communication gaps is not in place.			

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2019-09	Lack of mechanism to ensure staff sufficiency and capability (training matrix and records) A review of controls related to MSP qualifications identified the following issues: • Informal, on-the-job training is currently in place within each stakeholder LoB for staff performing MSP function. • AMIO Roles and Responsibilities for MSP function are well-defined along with a skills matrix for AMIO staff (Success factor) but there is no MSP function related training matrix or tracking in place for some LoBs • Assessment of having sufficient staff to meet MSP workload is performed by each LoB as part of their annual business plan but this is not formally declared or	1. Assess and document staff capacity needed for each LoB to meet the anticipated MSP workload with corrective actions to address any identified capacity issues. 2. Establish staff competency requirements (skills, knowledge and experience) as well as training requirement. Create and maintain appropriate records to demonstrate compliance with the MSP Qualifications listed in Market Rules Chapter 6, Appendix 6.4 as well as MSP agreement, articles 3.5 to 3.8.	1. We will work with the stakeholder LoBs to establish and ensure that their resource capacity is sufficient to perform the required MSP work. 2. We will work with the stakeholder LoBs to establish and ensure that their training requirements are in place along with a mechanism to periodically verify that each stakeholder LoB has qualified and trained staff with documented training records.	NOT STARTED

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
		confirmed.			

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
	2019-09	Ineffective Quality Assurance review for deliverables being submitted to IESO Market rules require a number of deliverables to be submitted to the IESO on a timely basis for meter point registration, commissioning, maintenance and trouble calls. These deliverables have been rejected by the IESO on multiple occasions due to completeness and quality issues, requiring rework and resubmission.	1. Establish a quality assurance process to ensure that all deliverables being submitted to the IESO are of required quality and meet the submission timelines. This will minimize the number of errors and/or rejections and required rework. 2. Establish accountabilities and mechanism to identify, track and action any deteriorating quality performance as reported monthly by the IESO (e.g. timely submission of Site Registration Reports, Engineering Unit Reports, commissioning reports, etc.)	1. We will work with the stakeholder LoBs to establish and ensure that Quality Assurance requirements and performance measures are in place. 2. We will review deficiencies identified during past IESO meter point audits to identify root causes and identify and monitor to resolution the corrective actions to address similar deficiencies for all other meter points.	NOT STARTED
Health and Safety - Apprenticeship Training (Sabrin Lila, Andrew Spencer) Review the adequacy of mechanisms in place for embedding and integrating safety into Hydro One's Apprenticeship Training program to enable the development of safety	2019-11	Despite having a mature and highly structured program, the apprentice workforce has a higher rate of Recordable Injuries compared to the non-apprentice workforce. There has been limited, ad hoc trending and analysis of apprentice incidents in the past. Currently, apprentice incidents are	1. Conduct a detailed analysis of apprenticeship safety incident data to gain greater insights into potential root cause and/or causal factors contributing to apprentice incidents and the higher Recordable Injury rate.	1. Health, Safety & Environment (HSE) will conduct a detailed analytical review of apprenticeship safety incident data.	NOT STARTED

Audit Name	Report #	Observation	Recommendation	Action Plan	Status of Action Plan
competencies and behaviours within its apprentice workforce.		not being analyzed and reported on separately from other employees.			

SEC INTERROGATORY #7

Reference:

EB-2016-0160, J8.1, Attachment 1-2

Interrogatory:

Please provide a detailed chronology of material events in Hydro One's transmission planning process for the capital plan included in this application similar as to provide in Undertaking J8.1 in EB-2016-0160.

Response:

The timeline below includes material events in Hydro One Transmission's Investment and Business Planning processes.

Date	Activity Category	Activity
Feb 9/10, 2017	Customer Engagement	Customer engagement with 88 First Nations communities
Spring 2017	Customer Engagement	Customer engagement content developed
May 3, 2017	Customer Engagement	Final customer engagement survey submitted
May 11 – June 15, 2017	Customer Engagement	Customer engagement field survey
May 13, 2017	Customer Engagement	Customer engagement with 29 Metis Councils
May 31, 2017	Customer Engagement	Interim customer engagement report
June 9, 2017	Customer Engagement	Customer engagement survey concluded
July 2, 2017	Customer Engagement	Final customer engagement report
Summer 2017	Investment Planning	Initial enhancements made to investment planning process
December 8, 2017	Strategic Decision	Hydro One Board approved 2018-23 Business Plan
February 12, 2018	Strategic Decision	Discussion with Hydro One Board on filing of a 5-year Tx application for the 2019-23 period in late April 2018
February 21, 2018	Customer Engagement	Customer engagement with 88 First Nations communities
December 2017 – May 2018	Benchmarking	Special studies and benchmarking results: - Asset hazard curves / degradation rates - Asset replacement practices / expected service life - Investment planning process - Asset analytics and reliability risk modeling

Witness: Bruno Jesus, Joel Jodoin

February 2018	Strategic Decision	2018 Corporate Priorities announced
March 16, 2018	Strategic Decision	OEB letter regarding expectation to file a joint Tx/Dx application for 2023-27 period, requiring a change to planned regulatory filing
Spring 2018	Investment Planning	Enhancements to investment planning process, incorporating findings from investment planning process review
April 2018	Investment Planning	Investment Planning Context Setting phase initiated
May-June 2018	Investment Planning	Planners input candidate investments into AIP tool
June 28, 2018	Business Planning/ Investment Planning	Executive Leadership Team review of initial envelopes
Late June	Investment Planning	Management review of individual candidate investment proposals
Early July 2018	Investment Planning	Investment Calibration
August 14, 2018	Strategic Decision	New Board of Directors announced
August – September 2018	Investment Planning	Prioritization and risk optimization of candidate investments and challenge trade-off sessions
October 1, 2018	Transmission Application	Discussion with new Hydro One Board on filing 1-year inflationary increase for 2019 rates followed by a 3-year Custom Incentive Rate application.
October 2018	Investment Planning	Operational stakeholder (“enterprise”) engagement on preliminary list of prioritized investments.
Late October – early November	Business Planning/ Investment Planning	Final review of investment plan
October 26, 2018	Transmission Application	Hydro One files rate application for 2019 revenue requirement (EB-2018-0130)
September-November 2018	Business Planning	2019-24 Business Plan developed, using the Investment Plan, overhead information, and productivity targets, to finalize plan figures (revenue requirement).
November 30, 2018	Business Planning	Executive Leadership Team approval of 2019-24 business plan
December 14, 2018	Business Planning	Hydro One Board of Directors approval of 2019-24 business plan
March 21, 2019	Transmission Application	Hydro One files rate the Application

SEC INTERROGATORY #8

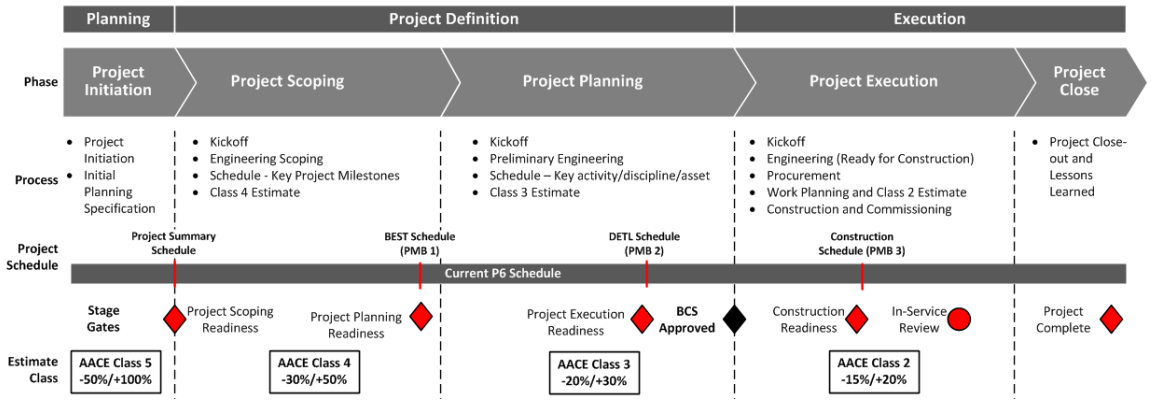
Reference:
TSP-01-01

Interrogatory:
Please provide a step-by-step explanation of how Hydro One forecasts the costs of the capital projects and programs included in the application. Please include illustrative examples for both projects and programs.

Response:
For both projects and programs, the capital forecasting process begins with a needs assessment and scope development process as described in Exhibit B, Tab 1, Schedule 1, Section 2.1, which identifies candidate assets. Projects and programs have different approaches to develop forecast costs as summarized below.

Projects

Project cost and schedule accuracy improves throughout the capital delivery process, as detailed in Exhibit B, Tab 2, Schedule 1, pages 4 – 9 as shown below. All projects greater than $10 million follow this staged approach. Projects evolve through various planning and project definition phases, each of which results in increased maturity of the underlying project deliverables including scope definition, engineering progress, cost & schedule development, and dependencies such as delivery resources, outages, etc. These considerations improve the accuracy of cost estimates and schedules as they pass through stage-gates prior to full approval of the project. Projects included in this application exist within differing stages of the Capital Delivery Process, between Planning, Project Definition, and Execution. Individual project totals are based on the most recent available information at the time the investment plan is set for approval by the Board of Directors.



Programs

Program cost forecasts are based on the number of units requiring replacement and are costed using a unit cost approach. This is an efficient way in estimating work programs which have a generally consistent cost from one accomplishment to the next and there are a large number of accomplishment units executed on a recurring basis. These unit costs are largely based on historical internal data with adjustments made for external considerations informed by cost analysis and anticipated changes to work methods.

Example:

	Unit Cost	Units	Program Budget
	A	B	A x B
Component Replacement	$5	10	$50

SEC INTERROGATORY #9

Reference:
TSP-01-01

Interrogatory:
Please explain the process Hydro One took after receiving the EB-2016-0160 decision to revise its 2017 and 2018 capital plan.

Response:
Please refer to Exhibit C, Tab 2, Schedule 1, Attachment 1: Capital Program Performance Report, Section 4 which describes how and why Hydro One allocated capital reductions the way it did after receiving the EB-2016-0160 decision.

SEC INTERROGATORY #10

Reference:
TSP-01-01

Interrogatory:
Please explain the process Hydro One will take if the Board determines that it will not approved Hydro One's proposed 2020 to 2022 capital budget in a similar fashion as it did in the EB-2016-0160 decision.

Response:
Refer to IR I-02-EnergyProbe-13; if the Board does not approve some or all of Hydro One's proposed 2020 to 2022 capital budget, then during the DRO process Hydro One will re-engage its prioritization process for candidate investments as outlined in Exhibit B, Tab 1, Section 1, TSP Section 2.1, to determine where reductions will be made.

Witness: Bruno Jesus

SEC INTERROGATORY #11

Reference:

TSP-01-01

Interrogatory:

In its EB-2016-0160 application, Hydro One categorized its capital spending into the sustaining, operations, development and common corporate costs category. Please revise the 2016 to 2024 total capital expenditure information to allow for a comparison.

a. Sustaining – Lines
b. Sustaining – Stations
c. Development
d. Operations
e. Common Corporate Costs

Response:

2016-2024 Capital Expenditure Summary

OEB Category	Historical			Bridge	Forecast				
	2016	2017	2018	2019	2020	2021	2022	2023	2024
	Actual	Actual	Actual	F/Cast	Test	Test	Test	Plan	Plan
	$M	$M	$M	$M	$M	$M	$M	$M	$M
Sustaining – Lines	167.5	207.1	242.1	309.8	331.8	422.0	442.0	405.4	448.7
Sustaining – Stations	576.3	543.6	554.9	478.4	543.7	691.9	741.1	782.5	755.7
Development	156.1	137.1	103.2	146.0	228.0	158.2	162.7	186.2	207.5
Operations	12.2	10.8	9.6	47.6	56.4	46.5	45.7	27.4	13.2
Common Corporate Costs	74.6	55.3	57.6	56.7	32.5	-0.7	-21.6	-31.4	-55.2
Total	**986.7**	**953.9**	**967.3**	**1038.5**	**1192.5**	**1318.0**	**1370.0**	**1370.0**	**1370.0**

SEC INTERROGATORY #12

Reference:
TSP-01-03

Interrogatory:
With respect to customer engagement:

a) What percentage of the proposed 2020-22 revenue requirement is expected to be recovered from, i) LDCs, ii) transmission connected end-use customers, iii) generators, iv) others.

b) The Board in its EB-2016-0160 Decision stated that "Hydro One should have discussions with LDCs to determine practical ways to seek some input from their end users to inform Hydro One's application." (p.24). Please explain how Hydro One has met this direction.

c) Please explain why Hydro One did not engage with non-transmission connect end-use customers (i.e. customers of LDCs).

Response:
a) Based on the charge determinants forecast by customer type, it is expected that 92% of the rates revenue requirement will be recovered from LDCs, 7% from transmission connected end-use customers and 1% from generators.

b) This information is summarized in Exhibit B-1-1, TSP Section 1.3 pages 28 to 30 under the heading: "Finding 2: Include Feedback from LDC End-Users".

c) There are two primary reasons why Hydro One did not directly engage further with customers of LDCs. First, we do not maintain customer information of other LDC's customers, and could not readily obtain it, without first seeking the consent of each individual customer. Second, Hydro One does not have a direct relationship with these customers, and it would likely be confusing to the customer. Our survey had supplementary questions that can be found in Exhibit B-1-1, TSP Section 1.3, Attachment 1, pages 54-56. These supplementary questions were viewed as an opportunity for LDCs to express the needs of their direct customers.

Witness: Henry Andre, Spencer Gill

SEC INTERROGATORY #13

Reference:
TSP-01-04-13

Interrogatory:
With respect to the METSCO, Review of HONI's Capabilities in Transmission Asset Analytics and Reliability Risk Modelling – Final Report & Conclusions:

a) Please provide a copy of the retainer agreement between METSCO and Hydro One.

b) Please provide a copy of the METSCO work plan (or similar document).

c) Please provide a summary of all *other* work METSCO has done for Hydro One in the last 5 years and the total cost of that work.

d) [p.16] At each level of review, what information or documents did METSCO review.

Response:
a) Please refer to Attachment 1. This retainer has been filed in confidence.

b) METSCO's work plan may be found at Attachment 2.

c) The following table summarizes work METSCO completed for Hydro One transmission over the past five years. Only report three has been submitted in support of this Application and the cost of all of this work is below the materiality threshold. If the OEB directs Hydro One to produce this cost, METSCO has requested that it be provided in confidence as it would prejudice their competitive position.

#	Project / Initiative
1.	Station Ground Grid Testing and Design– Multiple Locations - on behalf of another third-party contractor, with Hydro One's consent
2.	Toronto Area Supply Station Condition Evaluation
3.	Review of Hydro One Inc.'s Capabilities in Transmission Asset Analytics and Reliability Risk Modelling

d) METSCO reviewed the following information in respect of its report found at Exhibit B-1-1 TSP 1.4 Attachment 13.

General Issue Area	Description
Asset Analytics Methodology	Transmission Station (TS) Condition, Criticality, Demographics, Economics, Performance and Utilization Algorithm
Conductor Health Information	AA Algorithm, Hydro One Conductor Condition Assessment Program documents, strategy document, condition scoring model, lab results, EPRI report, LineVue report
Data Input Systems	AA data diagrams
Protection and Control (P&C) Equipment	Hydro One strategy document, Condition Assessment Study, engineering work document
Station Equipment - General	Hydro One equipment criticality decision models
Circuit Breakers	Hydro One strategy and replacement documents
Power Transformers	Hydro One assessment documents, substation and risk factor presentations
Ancillary Equipment	Hydro One strategy documents, worksheets and assessment documents
Utilization Data and Documents	Hydro One AA utilization and TS utilization score documents
Underground Cables	Hydro One strategy document, work standard documents, AA worksheet.

METSCO
MAKING IT POSSIBLE

November 20th, 2017

Chong Kiat Ng, P. Eng
Hydro One Networks Inc.
483 Bay Street,
Toronto ON M5G 2P5

Dear CK:

Re: Review of Asset Analytics Methodology And Reliability Risk Forecasting Methodology

As requested, we are happy to offer our services for Hydro One Networks Inc. ("HONI"), to review, audit and analyze Hydro One's Asset Analytics Methodology and Reliability Risk Forecasting Methodology.

The following assets will be in scope for the Asset Analytics ("AA") Methodology review:

- Substation Power Transformers
- Circuit Breakers
- Protection Control and Telecom
- Station Ancillary and
- Transmission Conductors

The review will include:

- Review of the ARA process in the broader context of the decision-making process (asset needs – project scope – project justification – project prioritization – execution);
- Review each of the six criteria utilized to calculate the final asset score for flagging and ranking the assets in AA;
- Review of the methodology to calculate the final AA score;
- Review of the data inputs that are required to calculate the final asset score;
- Identification of areas for improvement and development of recommendations.

METSCO will deliver a final report ready to file to the Ontario Energy Board ("OEB") as part of the next Transmission Rate Filing application by HONI.

The analysis of the Reliability Risk Forecasting ("RRF") Methodology will result in the overall review and assessment of HONI's projection approach to the outcomes and underlying mathematical algorithms, with strengths and areas of improvement identified and documented in the final report.

The review will include:

- Review of the reliability risk forecasting approach within the broader scope of the reliability forecasting;
- Review of the failure curves (Weibull analysis) and asset demographics data utilized to forecast the reliability risk;
- Assessment of the current approach against other practices considered in the industry for the reliability forecast;
- Identification of areas for improvement and development of recommendations.

The report will be delivered in a format ready to be filed to the OEB as part of the next Transmission Rate Filing application.

Both reports will be made available to HONI as final drafts by March 1, 2018. The final reports will be delivered by March 31, 2018.

Our rates would be as following which are same as in Master Service Agreement with Hydro One:

Title/Position	Experience	Description of Position	Hourly Rate
Principal/Expert	More than 10 years	Project Manager	[redacted]
Senior Engineer	5-10 years	Task Leader	
Engineer	P.Eng.	Project Engineer	
Technologist		Drafting - Data Analysis	

Address:
METSCO Energy Solutions
#215; 2550 Matheson Blvd.
E, Mississauga, ON, L4W 4Z1

Call:
Phone: 905-232-7300
Fax: 905-232-7405

Online:
Email: info@metsco.ca
Website: metsco.ca

Project Support Staff	Engineer in Training	Technical Analysis	[redacted]
Senior Business Consultant	More than 10 years	Project Leader from Economical Perspective	
Business Consultant	Less than 10 years	Risk Analysis, Economical Evaluations	

METSCO will provide the services on a time and material basis as per the Master Service Agreement. The cost estimate for the assignments is provided below. In case both projects are requested, METSCO estimates that the total efficiencies in delivering two projects at the same timeframe will result in appx 10% of reduced hours required to complete the assignments.

Title/Position	Rate	AA methodology		RRF Methodology	
		Hours (est.)	Cost (est.)	Hours (est.)	Cost (est.)
Principal/Expert	[redacted]				
Senior Engineer					
Engineer					
Technologist					
Project Support Staff					
Senior Business Consultant					
Business Consultant					
Total estimate, per project					
Total estimate for both projects (9.5% discount)					

Address:

METSCO Energy Solutions
#215; 2550 Matheson Blvd.
E, Mississauga, ON, L4W 4Z1

Call:

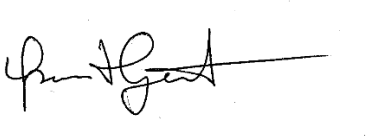
Phone: 905-232-7300
Fax: 905-232-7405

Online:

Email: info@metsco.ca
Website: metsco.ca

We look forward to assisting with this important assignment for HONI.

Yours Truly,



Thor Hjartarson
Chief Executive Officer

metsco.ca

METSCO Energy Solutions
Suite 215; 2550 Matheson Blvd. East,
Mississauga, ON, L4W 4Z1
Phone: 905-232-7300
Fax: 905-232-7405
E-mail: thor.hjartarson@metsco.ca

Project Team:

METSCO proposes this assignment be carried out by the team of key professionals:

Thor Hjartarson, MASc, P.Eng: Thor Hjartarson is an Engineering leader with over 25 years of professional experience in electrical and power engineering. He has a strong technical background in transmission and distribution engineering with leadership in innovation of asset management principles. He is one of the founders of the Health Index Methodology in utility asset condition assessment and has lead comprehensive implementations of risk based investment planning methodologies. In his previous consulting career, he had experience with over 30 well known electrical power companies around the world. He graduated from the University of Iceland, Reykjavik, and received the M.A.Sc degree in Electrical Engineering from the University of British Columbia, Vancouver, B.C., in Canada. He has authored several technical papers focusing on T&D asset management.

David Richmond, P.Eng.: David is a Professional Engineer with 45 years' experience, in Distribution Engineering and System Planning. David spent 11 years' working at the Ontario Energy Board (OEB) holding various roles relating to Distribution System Code, Licensing and Distribution System Plans. David is a Subject Matter Expert in OEB policy and practices.

Alexander Bakulev, Ph.D.: Alexander has over 14 years of experience in delivering asset management solutions and regulatory support across North America and Europe. Alexander has developed asset management plans and led regulatory filing procedures with detailed economic justification of the company's operational and capital spending. He understands in detail OEB filing requirements for Distribution System Plan (DSP) submission, reviewed numerous DSP on behalf of the OEB, and has direct experience in preparing DSP to be included in the filing application. Alexander is responsible for the Asset Management practice at METSCO. With an excellent economics background, Alexander created several unique approaches on the edge of engineering and economic fields for asset management practices in major transmission, distribution and power generation companies. He graduated from the Saint- Petersburg University, Russia and obtained his Ph.D. Economics at the Graduate School of Management, Saint-Petersburg University.

Daryn Thompson, P.Eng: Daryn has more than 27 years' experience in consulting and utility engineering with experience in transmission and distribution system planning and design, energy storage systems, energy markets, and asset management. A strong technical background in distribution planning includng; long term master plans, asset

condition assessments, reliability studies, "smart grid" systems and standards. He has written engineering standards and operating and safety procedures for utility power systems. Significant EPC/EPCM projects include substations, energy storage systems and renewables connections. Planning projects have included the development of Distribution System Plans, Asset Condition Assessments, development of the Market Rules, and Distribution Standards in Canada and the US.

Babak Jamali, P.Eng: Babak is Professional Engineer with more than 15-year experience in power systems. He specializes in system planning studies, power system modeling and analysis, substation design, protection and controls and ground grid investigations. He has intimate knowledge of substation equipment characteristics and specifications, including power transformers, circuit breakers, protection and controls. For the past eight years, he has served as the team leader for testing of major Canadian utilities' transformer station ground grids. He has significant hands-on experience in conducting power system static and dynamic simulation studies with power industry's standard software tools, including PSCAD, MATLAB, EDSA and CYME. He is fully familiar with the Canadian, American and international standards, i.e. IEEE, ANSI, NEMA and IEC. He excels in managing power system projects and has demonstrated creative problem-solving skills.

Ali Naderian, PhD, PEng, SM IEEE: Ali is a Professional Engineer with over 15 years of experience in high voltage and medium voltage asset condition assessment including underground cables, transformers, switchgears, and circuit breakers. Ali has a strong working knowledge and hands on experience in performing high voltage testing, condition assessment, and equipment root cause failure analysis. He received his BSc and MASc degrees from Sharif University of Technology in 1998 and the University of Tehran in 2000, respectively. During his studies, his employment experience included ISC (1997-1999) for the design and testing of circuit breakers and switchgears, and ITS (1999-2003) for the design and testing of power transformers. He compared commercially available RTV coatings in his PhD thesis during his research at the University of Waterloo (2004-2007). He worked as a high voltage engineer at Kinectrics Inc. (formerly Ontario Hydro Research) for 9 years on diagnostics of power transformers, high voltage cables, and circuit breakers. Ali is a member of the IEEE Transformer Committee, the chair of IEEE C57.161 Dielectric Frequency Response Task Force, and an active member of IEEE PC57.152 Transformer Field Test Guide and IEEE C57.125 Failure Analysis and Reporting Guide. Ali has published more than 35 papers in the IEEE, CIGRE, and other conferences and journals. He is a voting Member of CIGRE WG D1.51: Improvement of Partial Discharge Test for Factory and Field Testing of Power Transformers. Ali published a paper in 2009: "An approach to power transformer asset

management using health index "by IEEE Electrical Insulation Magazine which has been cited more than 30 times by other published papers. Ali is a senior member of the IEEE. He is a recognized reviewer in the IEEE Power & Energy Society, and has been since 2009. He is a co-author of the EPRI Underground Distribution Reference Book. He has been invited to talk at IEEE EIC, IEEE ISEI, IEEE PES, IEEE DEIS, Doble, CEATI, and Electricity Forum.

Address:
METSCO Energy Solutions
#215; 2550 Matheson Blvd.
E, Mississauga, ON, L4W 4Z1

Call:
Phone: 905-232-7300
Fax: 905-232-7405

Online:
Email: info@metsco.ca
Website: metsco.ca

METSCO Overview

METSCO Energy Solutions Inc. and its predecessor METSCO Inc. (METSCO) are Canadian corporations, providing services to electric utility clients since 2006. Our head office, is located at 2550 Matheson Blvd. E, Unit 215, in Mississauga, Ontario. Our major market focus resides in Canada, but through our network of associates we provide consulting services to power sector clients around the world. Our services, focused on improving the operating efficiency and financial performance of power systems, cover a broad area, including distribution system inspection and design, power system asset management, system planning, construction supervision, commissioning, troubleshooting operating problems, investigating asset failures and providing training and technology transfer. As part of our social responsibility, we provide learning and career opportunities to young engineers in Ontario with hands-on experience with diversified engineering projects.

METSCO is a rapidly growing firm that currently employs 50+ full time resources. METSCO's experts are recognized pioneers in the field of asset management, having been part of the founding committee of the Health Index methodology for asset risk assessment. Our experts provide support at the regulatory level, providing input to processes that ensure fair and proper rate filings and hearings.

Our team's hands-on experience working with utilities in asset management fields such as asset data analysis, failure curves, reliability analysis, and reliability projections has allowed them to become well-versed with the various methodologies, challenges, and strengths that exist in the industry. A diversified set of clients, including large provincial Canadian and American utilities, provide METSCO with the resources required to perform a sound AA and RRP analysis of HONI's methodologies. Our collaboration with a variety of sources, regulatory boards and utilities alike, and experience in conducting

detailed analysis on utility processes and procedures makes us the most ideal fit for supplying the requested services in a high-quality and efficient manner.

METSCO provided unique services in the following key areas:

- Asset Management Planning and Analytics: Highlighting our ability to study an organizations' assets and develop holistic strategies that feed into the development of long-term, short-term and maintenance plans.
- Regulatory Reporting and Support: METSCO has successfully defended utilities plans and methodologies in front of regulatory bodies, and has also worked with regulators in developing standards for justifying asset management plans.
- Distribution Planning and Engineering: Authoring multiple Chapter 5 DSPs in support of rate filing procedures, METSCO also specializes in system planning to meet the objectives of the client utility, including load planning, reliability, smart grid planning and capital planning.

Address:
METSCO Energy Solutions
#215; 2550 Matheson Blvd.
E, Mississauga, ON, L4W 4Z1

Call:
Phone: 905-232-7300
Fax: 905-232-7405

Online:
Email: info@metsco.ca
Website: metsco.ca

Related Industry Experience

METSCO has considerable experience providing best practice identification and benchmarking, asset management, and asset condition assessment services for a number of clients. We have worked on developing health index formulations for CEATI that are considered as standards by many North American utilities. We further worked with our clients and CEATI to connect Health Indices to failure probabilities and risk assessment to drive investment decisions.

Table 1 highlights ongoing and completed projects by METSCO that relate to ACA benchmarking and the development of common asset condition assessment practices across North America:

Client	Project Title (Date of Completion)	Project Description
[redacted]	Understanding The Key Factors, Weightings & Prioritization Factors of Health Indices (Ongoing)	To conduct a benchmarking survey for various techniques that are used to create Health Index. To provide current best practice Health Index techniques and identify those that may be out of date.
	Translating The Health Index Into Probability Of Failure For Distribution Assets (Ongoing)	To derive a condition-based failure probability function for one or more asset classes. To conduct a benchmarking survey in order to assess and determine the best-in-class techniques and methodologies for converting the health index results produced from asset condition assessment programs into a condition-based failure probability function.
	Distribution System Health Indices A Simplified Methodology (Ongoing)	To establish a Simplified Methodology to calculate a Health Index based on the most critical indicators of end of life, and the data set that most utilities already have. To prepare a ready-to-publish report an excel based tool to provide an Health Index result based on a reduced data-set of condition information.
	Guide for Asset Replacement Strategies with an Asset Management Plan Leveraging a Risk Based Approach – Phase I (2017)	Development of best-in-class guide for substation asset management replacement strategies. The work researched a connection between HI, Failure rates and Risk Assessment including a survey on ACA for substation assets.

Address:
METSCO Energy Solutions
#215; 2550 Matheson Blvd.
E, Mississauga, ON, L4W 4Z1

Call:
Phone: 905-232-7300
Fax: 905-232-7405

Online:
Email: info@metsco.ca
Website: metsco.ca

[redacted]	Station Health Index (2015)	Development of a Health Index Tool for Station equipment and the Station as a group of assets. The approach considers the condition of all assets in the substation and applies the "Gateway" HI approach to produce an aggregate HI for the entire station.
	Asset Condition Assessment and Health Indices for Distribution System Assets (2013-2015)	Development of a detailed guide for condition assessment of major distribution asset classes, including poles, conductors, insulators, distribution transformers, underground cables, pole and pad mounted disconnect switches and right-of-ways.
	Ground Grid Maintenance Guide (2013-2014)	Development of a guide for assessing the condition of grounding systems and optimizing investments into preventive maintenance based on the safety hazards.
	Asset Condition Assessment and Health Indices for Substation Assets (2008-2011)	Preparation of a guide for condition assessment strategies for substation assets, including circuit breakers of all types, circuit switchers, disconnect switches, isolators, instrument transformers, series and shunt capacitors and lightning arresters.

Table 1 – Examples of completed ACA benchmarking projects and projects related to the development of common asset condition assessment practices across North America

In practice, through our network of clients we have developed ACA frameworks that utilities use for all of their AM planning and procedures. METSCOs ACA includes analysis and optimization of inspection forms and procedures, validation of health index formulation using historical asset data and condition based failure probability curves that relate condition data to expected number of failures. METSCO also produces ACA reports suitable for regulatory filings. These reports provide a complete picture of the existing health and condition of the systems assets and provide quantitative estimates of the assets found in poor and very poor condition, requiring rehabilitation or replacement over a given time period. In addition, METSCO has performed a variety of asset management projects that include ACA and risk based analytics of distribution systems for many utilities.

These projects involve extensive data optimization and data quality improvement procedures, reliability analysis and outage management data review, utilize industry-leading probabilistic age and condition-based failure curve development and asset failure projections, customized impact and failure mode analysis, and impact analysis

of capital spending on reliability performance. Examples of projects we have conducted are summarized in Table 2.

Client	Project Title (Date of Completion)	Project Description
[redacted]	Development of Health Index Calculator (ongoing)	Development of a Health Index Tool that automates calculations based on METCOs previously identified Health Indices.
	Development of Asset Long-term Plans and Implementation of Asset Planning Framework (HI, Risk) (ongoing)	Development and implementation of an asset management methodology, including Asset Condition Assessment, failure curves and failure modes, asset risk assessment, run-to-failure projections, and long-term capital plan development.
	Asset Condition Assessment and HI Formulation Update (Ongoing)	Updating HI formulations, analyzing the condition of their assets, and recommending a replacement plan for the next 6 years.
Hydro One Remote Communities	Development of Distribution System Plan (Ongoing)	Preparation of the Distribution System Plan compliant with Filing Requirements for Electricity Transmission and Distribution Applications Chapter 5 – Consolidated Distribution System Plan Filing Requirements. Developed an age-based health index for generator step-ups and distribution transformers.
[redacted]	Development of Distribution System Plan (2016)	Preparation of the Distribution System Plan compliant with Filing Requirements for Electricity Transmission and Distribution Applications Chapter 5 – Consolidated Distribution System Plan Filing Requirements. This included assessment of condition for stations transformers, LTCs and regulators.
	Asset Condition Assessment and HI Formulation (2016)	Developed the asset condition assessment and Health Index methodologies for all distribution and substation assets, and created HI formulations, optimized inspection forms and validated outputs of analysis.
	Substation Inspections (2016)	Conducted Substation Inspections.
	[redacted] Asset Management Scorecard Measure (2016)	Worked as consultant to advise [redacted] Asset Management matters, related to Health Indices and Risks Assessment.

Address:
METSCO Energy Solutions
#215; 2550 Matheson Blvd.
E, Mississauga, ON, L4W 4Z1

Call:
Phone: 905-232-7300
Fax: 905-232-7405

Online:
Email: info@metsco.ca
Website: metsco.ca

[redacted]	Asset Condition Assessment (2016)	Development of asset condition assessment program and health index results, along with long-term and short-term investment program justification which took into consideration condition, criticality and risk results. Optimization of inspection forms and procedures and validation of ACA outputs using historical failures.
	Health Index Development (2015)	Development of Health Index for distribution assets.
	Audit of Maintenance Practices (2015)	The audit included a review of execution of maintenance work orders, outage and work coordination, change control process, inspections and supporting documentation.
	Asset Management Plan, Risk and Condition Assessment Methodologies (2005, 2014)	Development of asset management plan and methodologies to assess condition, criticality, and risk including derivation of failure curve parameters for various asset classes, for the development of short- and long-term expenditure plans in relation to the utility's rate application.
	Asset Condition Assessment and HI Formulation (2014)	Developed the asset condition assessment and Health Index methodologies for circuit breakers and transformers using a multiplicative approach.
	Asset Condition Assessment and HI Formulation (2013)	Developed the asset condition assessment and Health Index methodologies for all distribution and substation assets, and created HI formulations, optimized inspection forms and validated outputs of analysis.

Table 2 – Examples of asset condition assessment projects for utilities and regulators

METSCO has specific experience with reliability forecasting model benchmarking and development. Through its network of clients, METSCO has also developed several DSPs, where a key component of the plan revolved around the development of an accurate and justifiable methodology to score system reliability benefits through the execution of capital asset replacement and system improvement projects indicated by the utilities. In addition, METSCO has performed a variety of asset management projects that range from Asset Condition Assessment, to risk based analytics of distribution systems for many utilities. These projects involve extensive data optimization and data quality improvement procedures, reliability analysis and outage management data review, utilize industry leading probabilistic age and condition-

based failure curve development and asset failure projections, customized impact and failure mode analysis, and impact analysis of capital spending on reliability performance. These principles form the basis of an accurate and advanced framework when projecting internal reliability metrics, such as system reliability improvements achieved through proactive asset replacement programs. The selected projects with specific reliability projection experience are summarized in Table 1.

Client	Project Title (Date of Completion)	Project Description
[redacted]	System Wide Reliability Forecast Model (Ongoing)	Benchmarking survey of reliability forecasting models/approaches of North American utilities and development of a generic reliability projection model.
	Benchmarking Reliability Projection Methodology	Benchmarking the reliability projection model developed in-house, review the model algorithms and provide recommendations for further improvements.
	Reliability Projection Methodology and Model (2016))	Development of reliability projection methodology for various reliability metrics considering all recorded cause codes and sub cause codes, based on relationships between historical reliability data and various system investments, weather conditions, etc. Developed a fully functional computer model to project future reliability parameters based on detailed capital spending per asset class and system improvement initiatives, including other key external and internal drivers; forecasted developed for 10 years of reliability projection.
	Asset Condition Assessment (2016) (noted in Table 1)	Development of risk-based asset management approach and reliability forecasting approach respectively for the purposes of justifying capital investment activities.
	Development of Asset Long-term Plans and Implementation of Asset Planning Framework (HI, Risk) (ongoing) (noted in Table 1)	Development and implementation of an asset management methodology, including Asset Condition Assessment, failure curves and failure modes, asset risk assessment, run-to-failure projections, and long-term capital plan development.

Table 3 – Examples of projects completed by METSCO in relation to reliability forecasting methodologies

Answer to Question b) of I-07-SEC-13:

METSCO's Work Plan to assess HONI's Capabilities in Transmission Asset Analytics and Reliability Risk Modelling

METSCO submitted the attached work plan, attachment 2, to HONI at the project's Kick-Off meeting;

This initiative aims to review, audit and analyze Hydro One's Asset Analytics Methodology & Reliability Risk Forecasting Methodology.

- Analysis of the Reliability Risk Forecasting (RRF) methodology will result in overall review and assessment of HONI's projection approach to the outcomes and underlying mathematical algorithms, with strengths and areas of improvement identified and documented.

- Results will be published in ready-to-file report to be submitted to the OEB.

1. Review of the Asset Analytics (AA) Methodology will include:

1.1. Review of the Asset Risk Analytics (ARA) procedure in the broader context of the decision-making process:

- Asset Needs
- Project Scope
- Project Justification
- Project Prioritization
- Execution

1.2. Review of the criteria used in calculating final asset score for flagging and ranking assets within Asset Analytics, including the approach applied for asset condition assessment

- Review the methodology used to calculate the final AA score

- Review of all data inputs required to calculate the final asset score

1.3. Identification of areas for improvement and development of recommendations

2. Review of the Reliability Risk Forecasting approach will include:

2.1. Review of the approach within the broader scope of reliability forecasting

2.2. Review of the failure curves (Weibull analysis) and asset demographics data utilized to forecast the reliability risk

2.3. Assessment of the current approach against other practices considered in the industry for the reliability forecast

2.4. Identification of areas for improvement and development of recommendations."

SEC INTERROGATORY #14

Reference:
TSP-01-04-13 p.26

Interrogatory:
With respect to the METSCO, Review of HONI's Capabilities in Transmission Asset Analytics and Reliability Risk Modelling – Final Report & Conclusions, issue of data complete:

a) Please provide the Data Completeness Score at the time the TSP was developed for this application. Please provide the overall Data Completeness Score as well as the score for each major asset class.

b) Please break down the overall and asset specific Data Completeness Score requested in part(a) into the amount that is based on actual vs default data.

c) Please provide the confidence level at the time the TSP was developed for this application.

d) The Report notes that not all sub-indices are used in the generation of the completeness score. For each asset class, please provide the sub-indices which are and are not used.

Response:
a) The overall Data Completeness ("DC") Score is 88%. The DC for each major asset class is shown below. For Protection, Control & Telecommunications assets, the AA framework is not substantially utilized and thus its DC score has not been included.

	DC
Conductors	78%
Transformers	94%
Breakers	92%
UG	74%
Station Auxiliary	94%

b) The table below shows how much data is actual vs default as part of the DC score:

	Actual	Default
Conductors	100%	0%
Transformers	99.99%	0.01%
Breakers	99.59%	0.41%
UG	100%	0%
Station Auxiliary	99.77%	0.23%

c) Confidence Level is calculated at the individual asset level.

d) The table below outlines which sub-indices are used in the calculation of the DC score:

	Condition	Demographics	Criticality	Utilization	Performance	Economics
Conductors	Used	Used	Used	Used	Used	Not Used
Transformers	Used	Used	Used	Used	Used	Used
Breakers	Used	Used	Used	Used	Used	Used
UG	Used	Used	Used	Used	Used	Used
Station Auxiliary	Used	Used	Used	Used	Used	Used

SEC INTERROGATORY #15

Reference:
TSP-01-04-13 p.26

Interrogatory:
With respect to the METSCO, Review of HONI's Capabilities in Transmission Asset Analytics and Reliability Risk Modelling – Final Report & Conclusions:

a) [p.35] For all material station work Hydro One plans to undertaken between 2020 and 2022, please provide the relevant Station Assessment Document

a) [p.37] METSCO notes that Hydro One's staff was "cognizant of the current systems' limitations". What limitations did Hydro One Staff express?

b) [p.36-37] METSCO notes there is a lack of documentation of its Asset Analytics and Asset Risk Assessment functionalities which "carries a risk of being initially misinterpreted or misunderstood when explained to.....a party in a regulatory proceeding..." METSCO recommends a comprehensive explanatory manual(s). Has Hydro One created such a manual or similar document? If so, please provide a copy.

c) [p.37] METSCO notes that Hydro One was in the process of procuring professional services to enhance aspects of its Asset Analytics algorithm. Please provide details regarding what services were being procedure, and status of the enhancement.

d) [p.88] METSCO notes that "level of granularity of the [RRM] model's analytical capabilities is low relative to other industry examples known to use". Please provide a summary of other similar reliability modelling tools that METSCO is aware of, including which utility uses them, in general how they work, and if Hydro One has the necessary underlying data to adopt them.

e) [p.98-100] Please provide Hydro One's views on each of METSCO's conclusions and recommendations, including if they are going to be implemented, and if so their status.

f) [p.4] Please provide the relevant cv for each of the listed experts including a list of previous engagements and/or relevant experience that is being relied upon for the purposes of their expertise.

Response:

a) There are approximately 125 station assessment reports corresponding to investments proposed in this Application. These reports are considered during Hydro One's investment planning process described in Exhibit B-1-1 TSP Section 2.1 and the resulting Investment Summary Documents. Hydro One has provided an example of a station assessment at Interrogatory I-01-OEB-079-01. Because these reports are extensive, Hydro One proposes that this request be limited to a reasonable number of stations that SEC may be interested in.

a) At that time, there were some attributes that were not included in the AA algorithms.

b) Hydro One did not create a manual as a training guide for AA was available. Please refer to Attachment 1.

c) Hydro One hired Accenture (a service provider) to program enhancements to AA algorithms which have been completed.

d) METSCO did not assess whether other modeling tools could be adopted by Hydro One. Known modeling tools are primarily utilized for distribution system performance and may not provide the same statistically meaningful relationships between investment and performance for transmission planning that may be easier to establish for distribution planning.

e) Please refer Interrogatory I-01-OEB-78.

f) Please refer to Attachment 2.

AA Training
New User

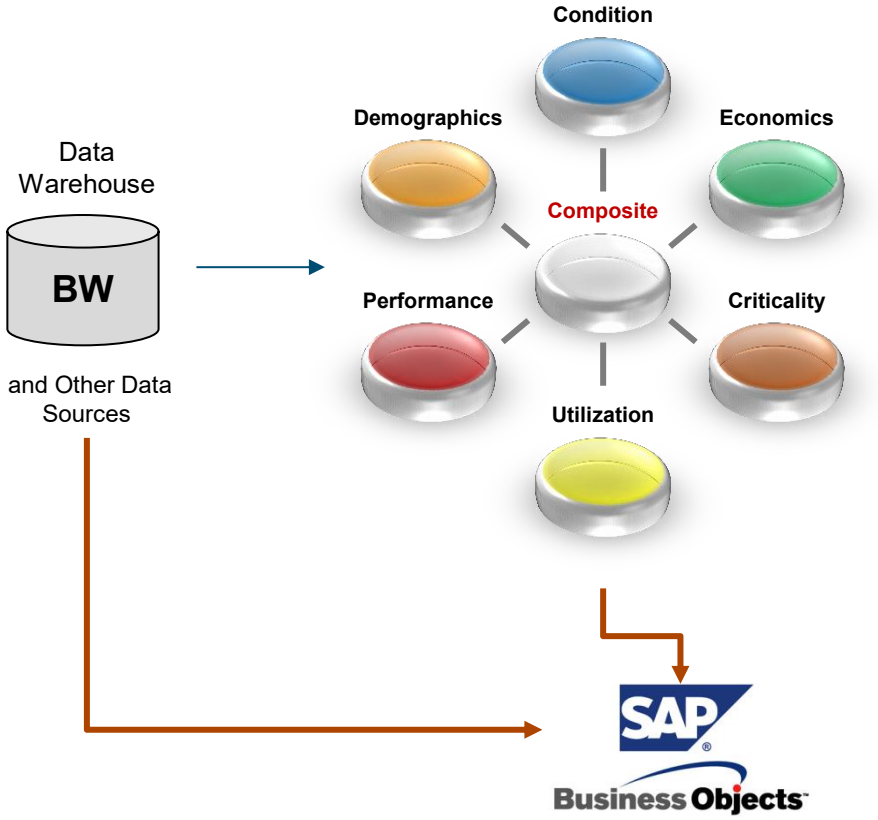
Overview of Presentation

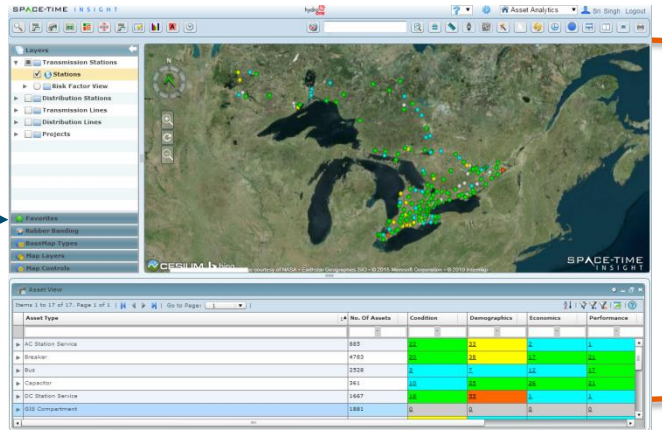
- **STI Modules**
  - [STI01] Introduction to Asset Analytics and Basic Navigation
  - [STI02] Dashboards
  - [STI03] Risk Scores and Roll-ups
  - [STI04] Additional Functionalities

STI Modules

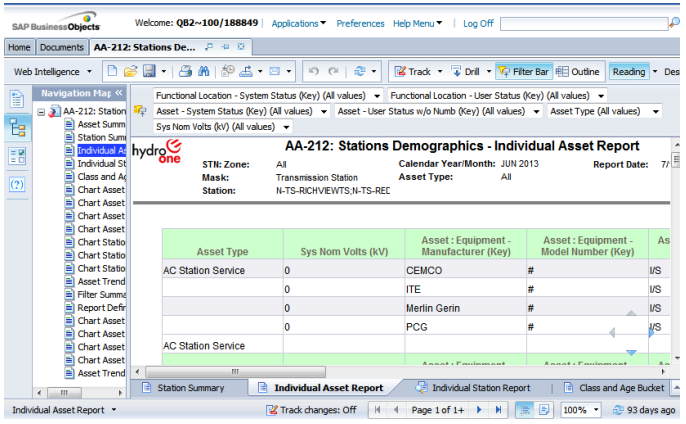
STI Modules

STI01: Introduction to Asset Analytics and Basic Navigation





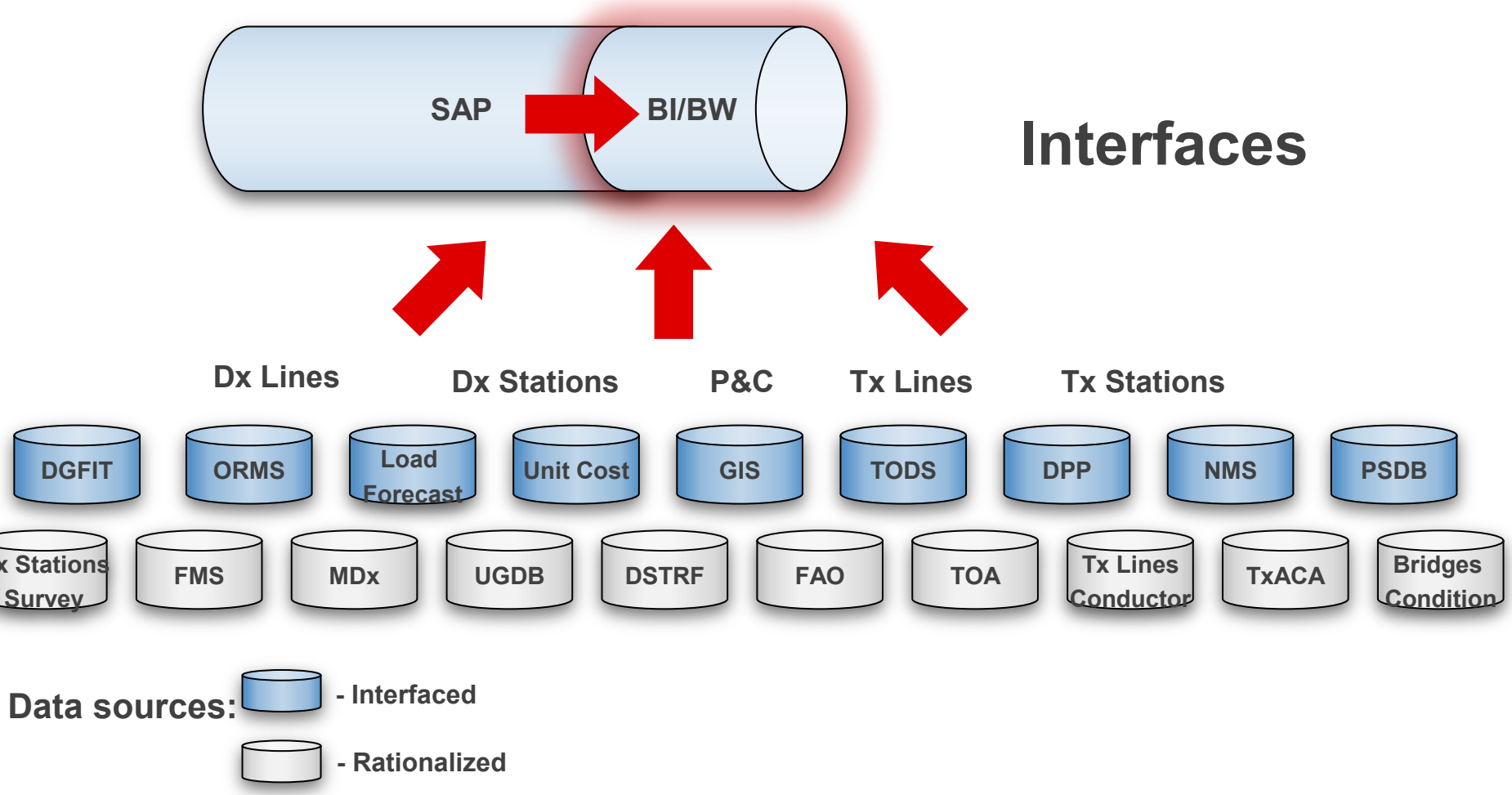
STI



BOBJ

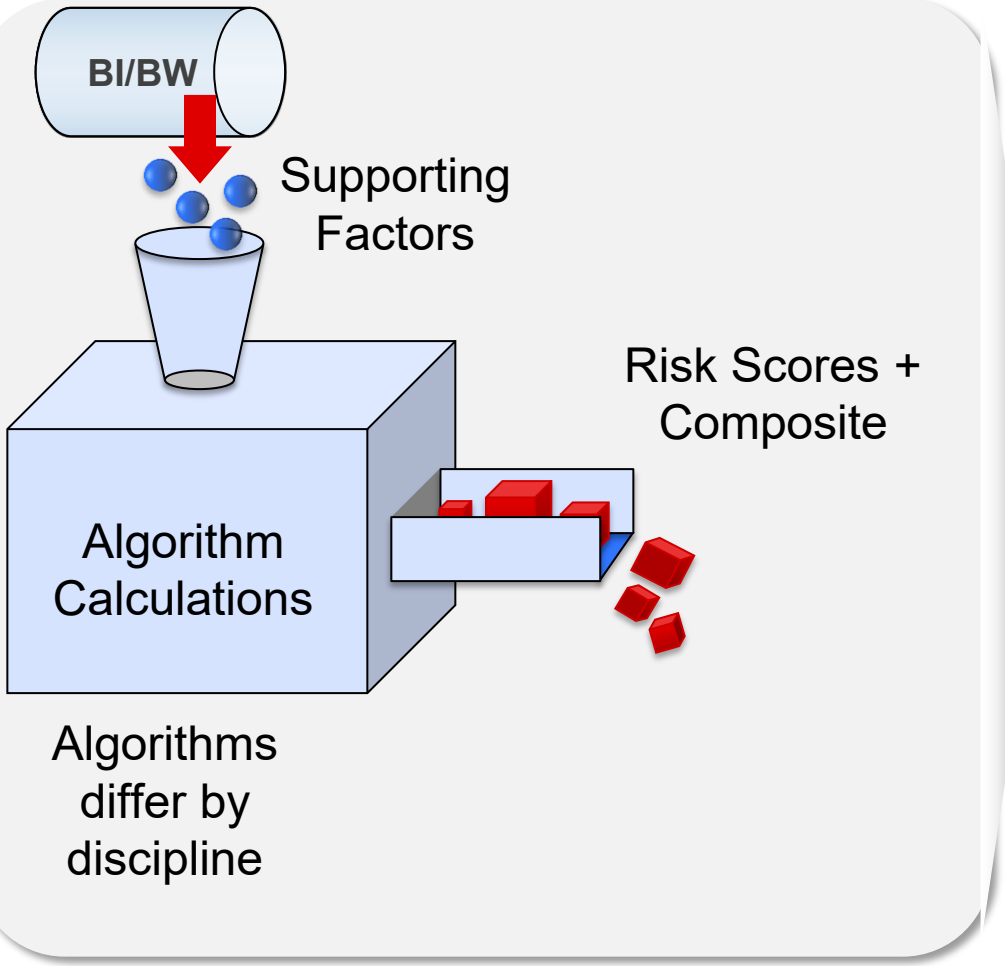
STI Modules

STI01: Introduction to Asset Analytics and Basic Navigation



STI Modules

STI01: Introduction to Asset Analytics and Basic Navigation



STI Modules

STI01: Introduction to Asset Analytics and Basic Navigation

Definitions:

Algorithm: *Each asset class has its own risk factor algorithm. Each algorithm is different and uses Supporting Factors to calculate the 0-100 risk factor score.*

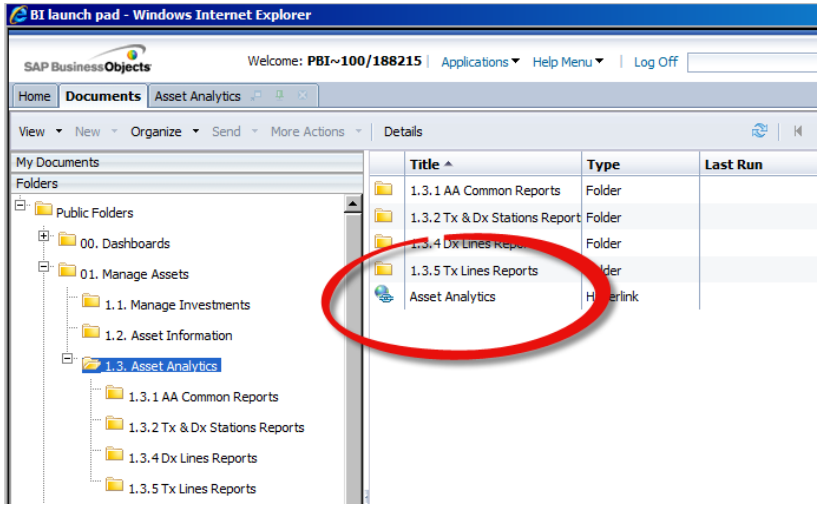
Supporting Factor: *Variables that are used in the algorithms to determine the risk factor score (e.g. Pole Top Rot, Standard Oil Tests, Notifications).*

Composite Score: *An weighted average of risk factors associated with an asset. It is designed to draw attention to high risk areas for investment planning actions.*

STI Modules

STI01: Introduction to Asset Analytics and Basic Navigation

Let's access STI…

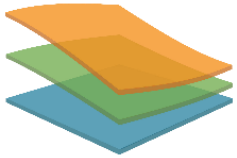


STI Functionalities (overview)

- ❑ Panels
  - ❑ Side Panel
  - ❑ Layers
  - ❑ Favorites
  - ❑ Toolbar (top panel)
- ❑ Map
  - ❑ Street View
  - ❑ Zoom in (altitude)
  - ❑ Symbology
  - ❑ Layers
  - ❑ Colors (Risk Factors)
  - ❑ Info Balloon
  - ❑ Search
- ❑ Search
- ❑ Dashboard Views/Layout

STI Modules

STI01: Introduction to Asset Analytics and Basic Navigation



Ecosystems & Layers (what you need to know about them):

- Determines what assets or attributes will be displayed on the map and in the tables
- Changing the structure of map/table based on this selection
- There are different layers within each discipline

Transmission Stations

- ☐ Stations
- ○ Risk Factor View

Distribution Stations

- ☐ Stations
- ○ Risk Factor View

Transmission Lines

- ☐ Circuits Overhead
- ☐ Circuits Underground
- ☐ Vegetation (Project)
- ☐ LineSection Overhead
- ☐ LineSection Underground
- ○ Risk Factor View
- ○ LineSection Options

Distribution Lines

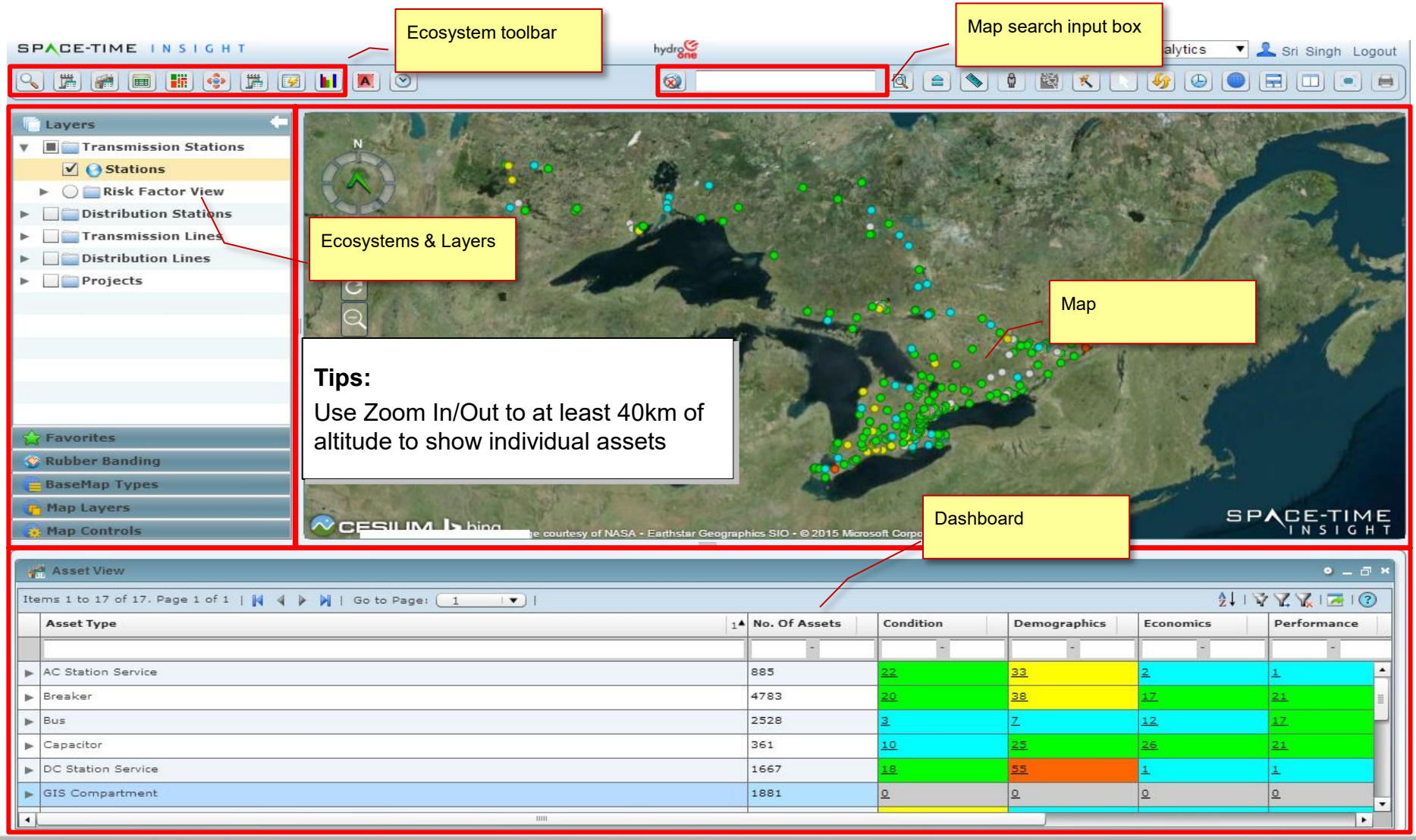
- ☐ Feeder
- ☐ Feeder Section
- ○ Risk Factor View
- ○ Selection
  - ○ Span
  - ○ Pole
  - ○ Other Equipment
  - ○ Vegetation
  - ○ Power Equipment

Projects

- ☐ Projects

STI Modules

STI01: Introduction to Asset Analytics and Basic Navigation



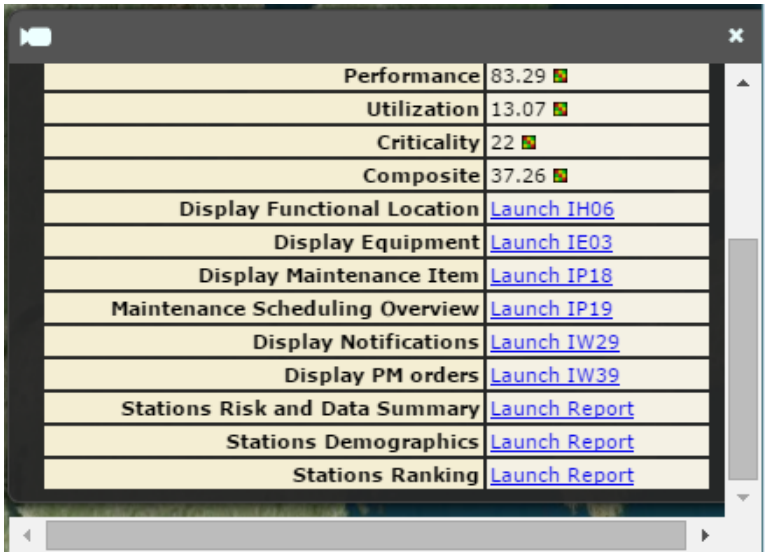
STI Modules

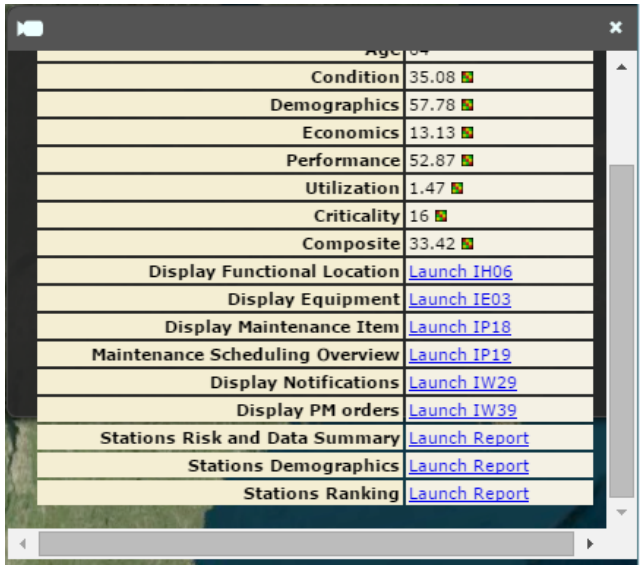
STI01: Introduction to Asset Analytics and Basic Navigation

Info Balloon Hyperlinks

Hyperlinks can be used to:

- Jump to SAP ECC to execute various T-codes and look at asset specific master data and transactional data
- Jump to SAP BOBJ and run various BOBJ reports relating to the active Ecosystem, LOB and/or asset based on user inputs
- Launch pictures and videos of TL circuit and structure assets





STI Modules

STI02: Dashboards

What do they do?

- Dashboards present Risk Factor and other data from various perspectives (Station, Circuit, Feeder centric groups; Asset centric groups and geographically grouped).
- The main dashboards are also organized in a cascading framework that allows users to drill down levels to the individual asset level.
- Interact with the map portion of the interface allowing users to see where the highlighted asset is located geographically.
- Allows you to slice and dice asset information to assist with asset analysis and decision making
- Provide spatial map and associated geo-spatial functionalities

Module Objectives

- ❑ Introduction to each of the main dashboards
- ❑ Overview of basic functionalities and dashboards

STI Modules

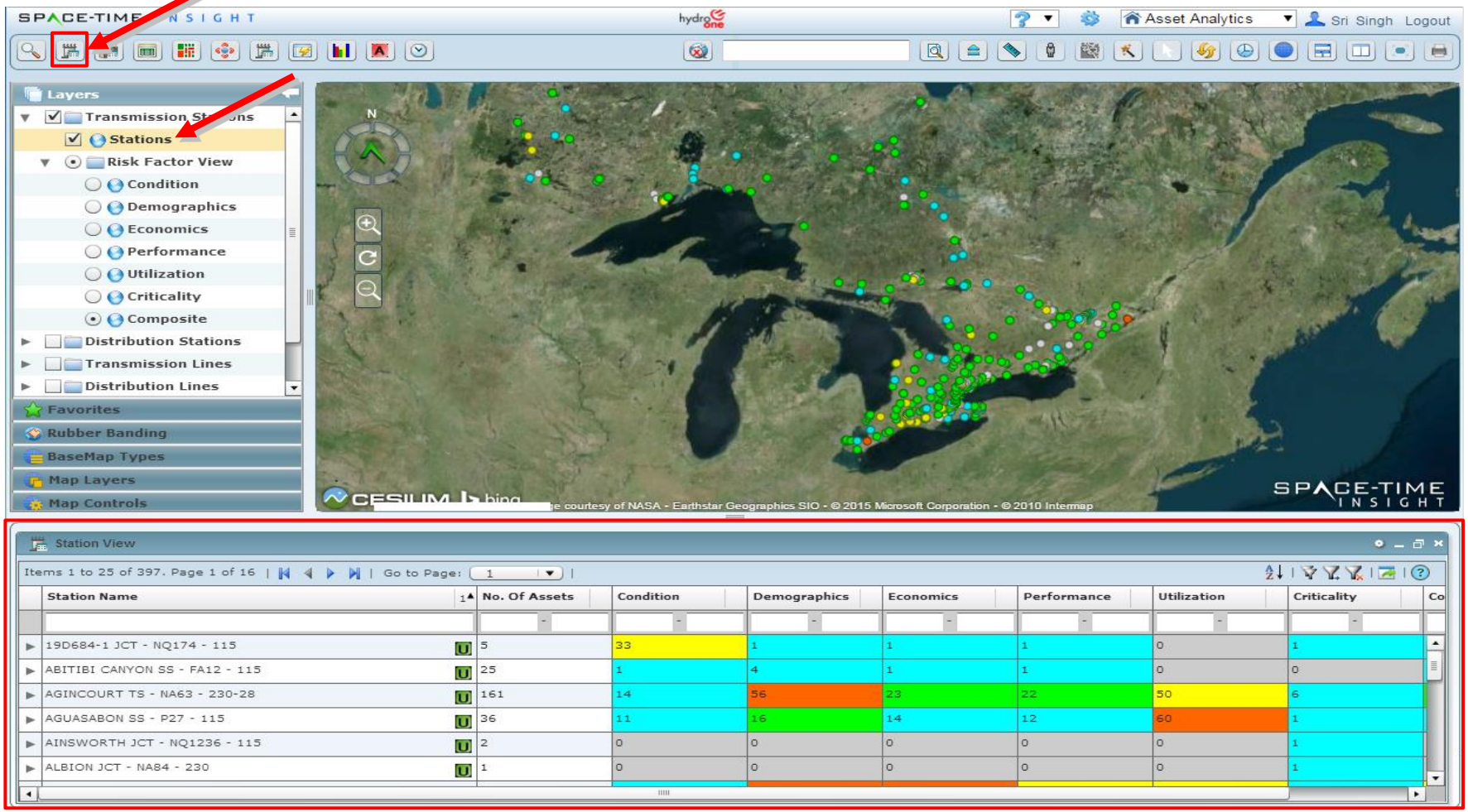
STI02: Dashboards

Dashboards	Icon	What it is…
Stations (Circuit/Feeder) View		• List of assets grouped by Station, then by asset type and class
Asset View		• List of assets grouped by asset type and class
Asset Risk Index Summary		• Starting at Zone level, allows users to cascade down through Ops Centres to Stations, Asset Type, Asset Class and individual Assets. At each level of hierarchy, summarizes the underlying assets that combine to produce the risk score
Supporting Factor Table	(click on risk factor score)	• Displays list of supporting factors based on selected risk score
Search		• Allows user to search Ecosystem Layer on various Master data and Risk Factor fields
Map View		• Displays list of assets currently in the map area and corresponding risk scores

STI Modules

STI02: Dashboards

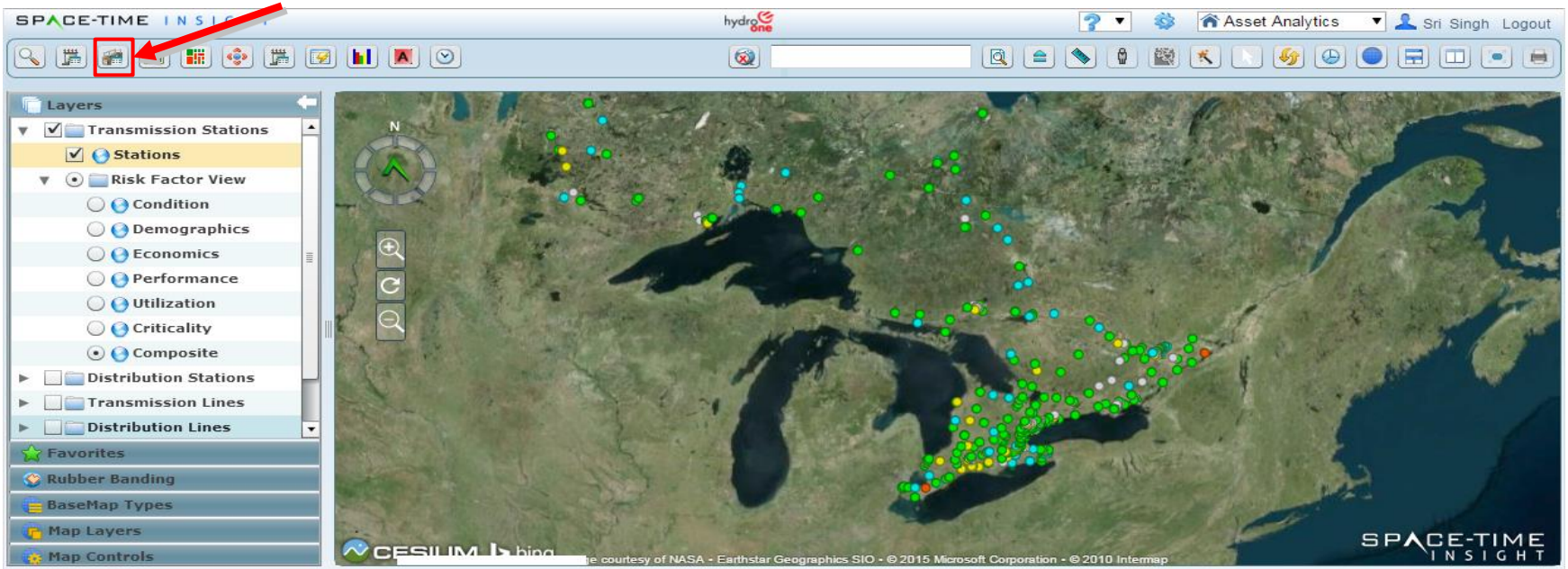
Station View



STI Modules

STI02: Dashboards

Asset View



Asset View

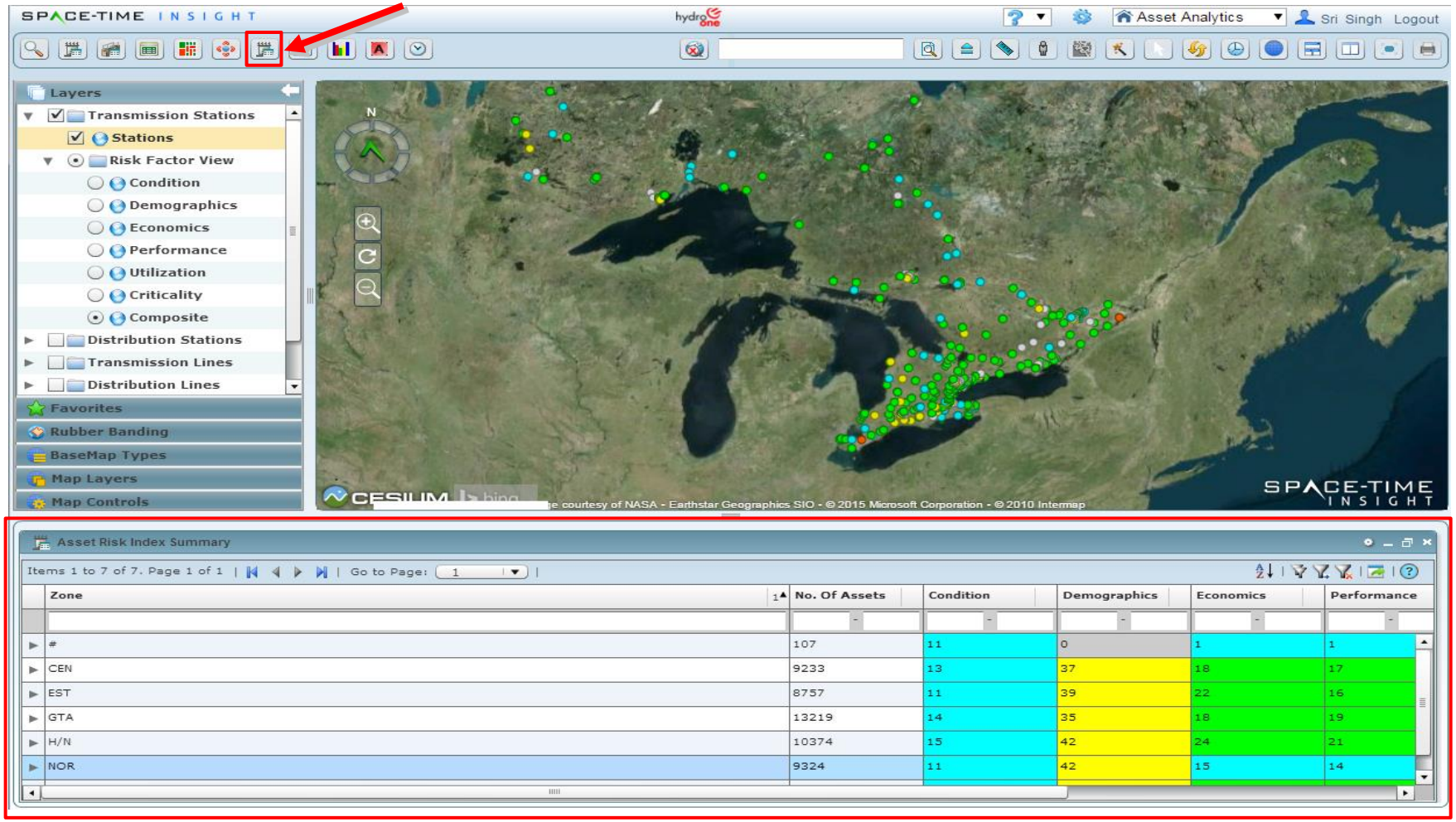
Items 1 to 17 of 17. Page 1 of 1 | Go to Page: 1

Asset Type	No. Of Assets	Condition	Demographics	Economics	Performance
AC Station Service	885	22	33	2	1
Breaker	4783	20	38	17	21
Bus	2528	3	7	12	17
Capacitor	361	10	25	26	21
DC Station Service	1667	18	55	1	1
GIS Compartment	1881	0	0	0	0

STI Modules

STI02: Dashboards

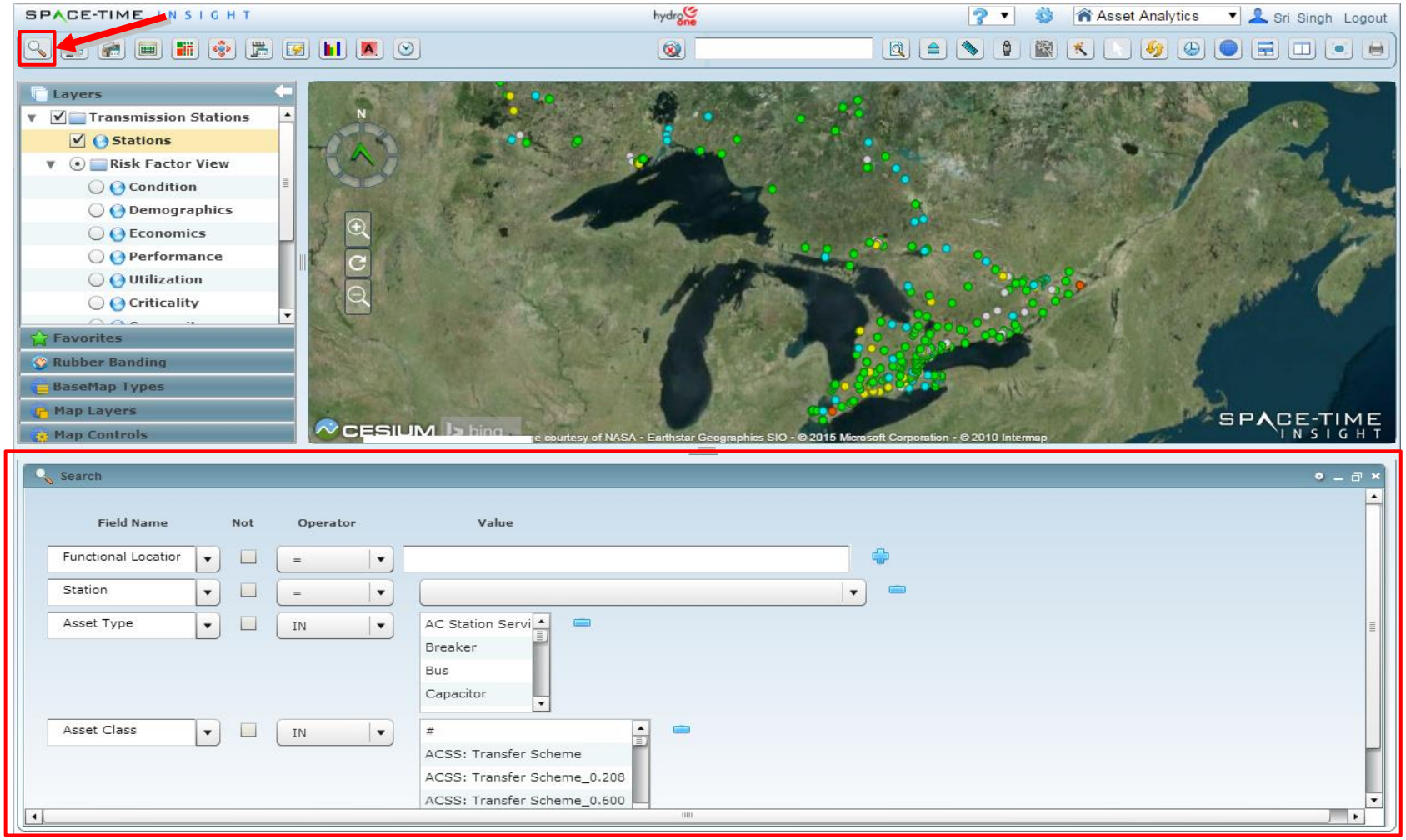
Asset Risk Index Summary



STI Modules

STI02: Dashboards

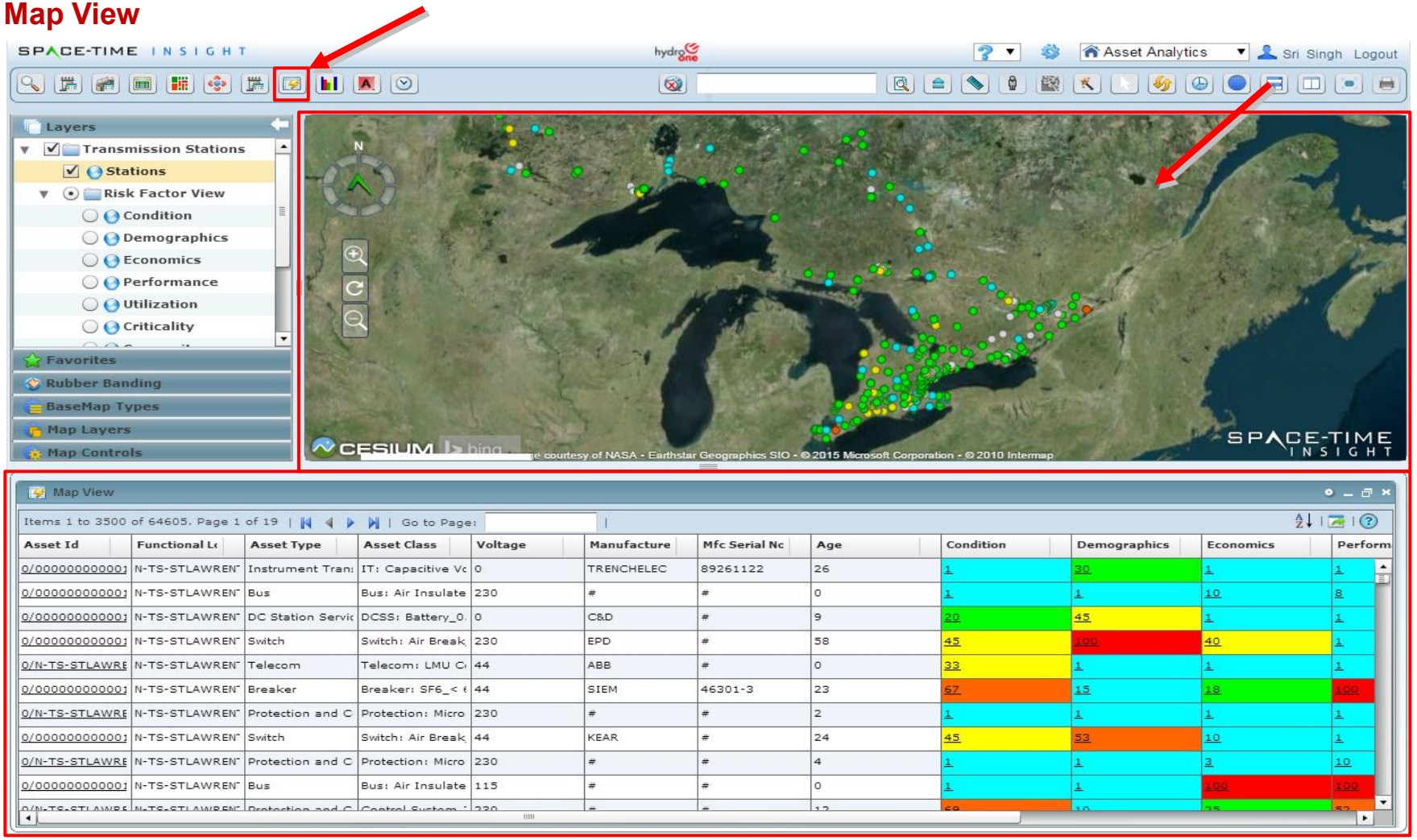
Search



STI Modules

STI02: Dashboards

Map View



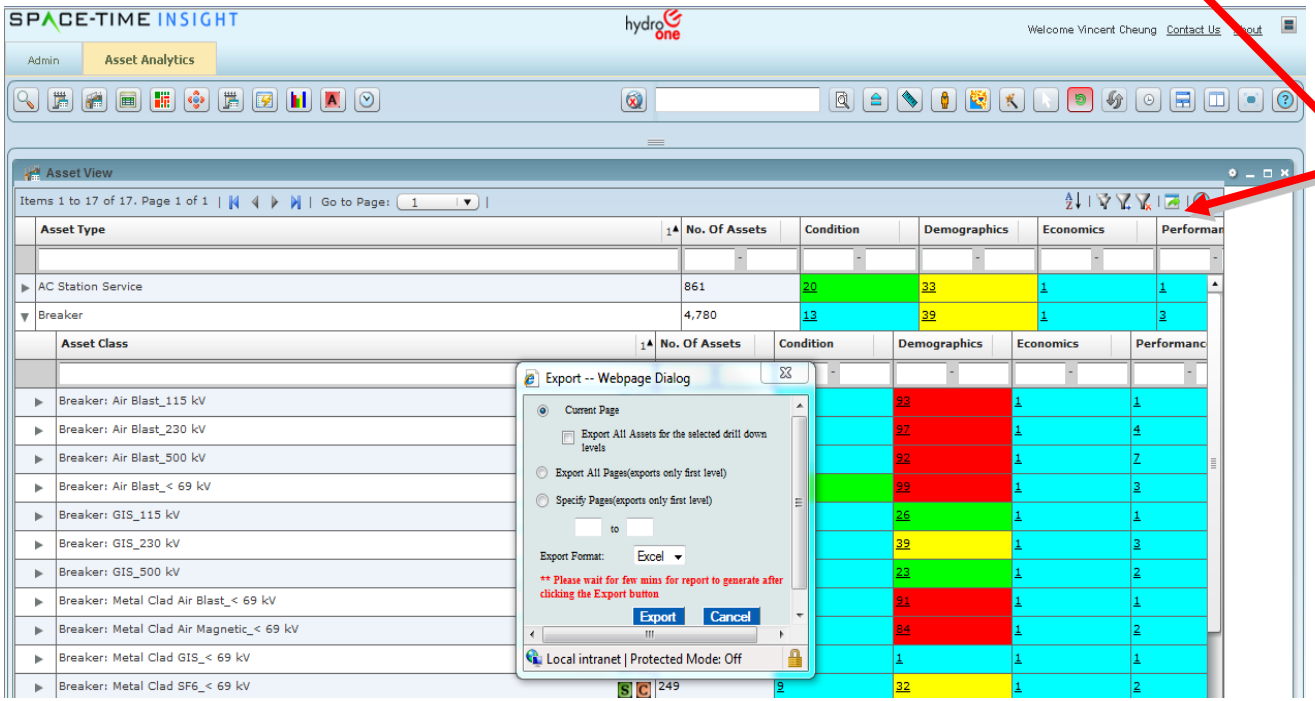
STI Modules

STI02: Dashboards

Exporting Data

Data can be exported from any of the main dashboard tables including:

- Station/Circuit/Line Section/ Project View dashboard
- Asset View dashboard
- Asset Risk Index View dashboard
- Detailed Risk Factor/Supporting Factor dashboard
- Map View dashboard



STI Modules

STI03: Risk Scores and Roll-ups

What does it do?

Risk Scores

- Presents key risk factors that have an impact on Hydro One business values combined into one risk score
- Draws attention to high risk asset areas for investment planning actions

Roll-ups

- Shows calculated Risk Scores for multiple assets based on different levels of aggregation (e.g. individual assets in a station rolled up to an overall station score)
- Draws attention to high risk aggregate areas that can investigated further at lower levels of detail

Module Objectives

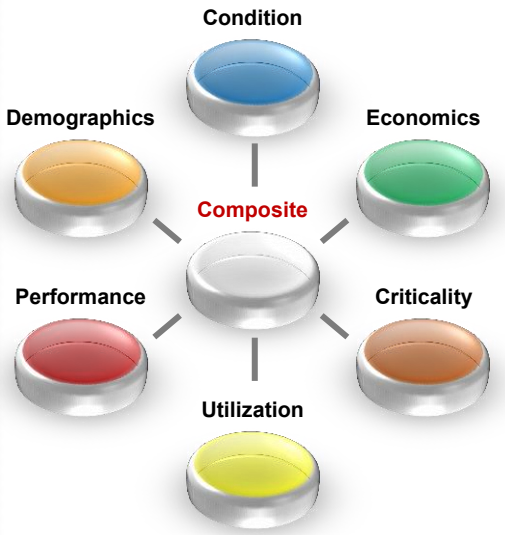
- ❑ Understand the different risk factors and scores
- ❑ Understand how they are calculated
- ❑ Understand asset roll-ups
- ❑ Understand how data completeness (% of sub-factors populated) and confidence (% weight of populated sub-factors) levels are calculated
- ❑ Understand how missing data is handled by Algorithms and Risk Scores

STI Modules

STI03: Risk Scores and Roll-ups

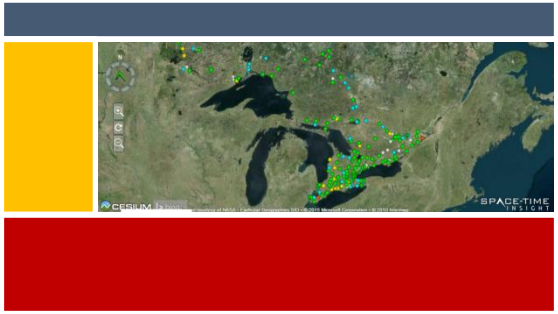
Overview

Risk Factors



- ❑ Risk Scores
- ❑ Algorithms
- ❑ Supporting Factors
- ❑ Composite score and roll-ups

Dashboards



- ❑ Asset View
- ❑ Station/Circuit/Line Section/Project View
- ❑ Asset Risk Index Summary View
- ❑ Map View

Map

- ❑ Navigation
- ❑ Info Balloons

STI Modules

STI03: Risk Scores and Roll-ups

Condition Risk Factor

- Asset types/classes have a condition risk score from 1 – 100.
- Condition risk scores are calculated from a condition algorithm which uses supporting factors.
- Supporting factors are typically Measuring Points but also contain some characteristics , PR (Preventive Report), TC (Trouble Call) and DR (Defect Report) notifications.

Demographics Risk Factor

- Age and Projected Service Life (EOL) are the only supporting factors used to calculate the demographics risk score, except for Tx Lines Vegetation Projects where Years Since Last Cleared and Clearing Cycle are used.
- For main power equipment, the demographic risk score is calculated using linear mapping once the asset reaches half of its expected service life.
- For much of the remaining equipment, the demographic risk score is calculated using linear mapping from the beginning of the asset service life.

Economics Risk Factor

- For Tx and Dx Stations and Tx Lines Underground Cables, the Economics risk score represents the costs (OM&A) required to maintain an asset, as compared to the benchmark cost for that asset type/class.
- For Dx Lines, the Economic risk score represents the replacement cost of the asset(s).

STI Modules

STI03: Risk Scores and Roll-ups

Performance Risk Factor

- Tracks the historic performance of a particular asset
- Performance risk scores are determined using TODS /ORMS and PCAUSE code data and/or DR/TC notifications.
- For Station Major Equipment Assets where TODS is used, the Laplace Transformation trend analysis is used to indicate an improving or declining outage performance.

Criticality Risk Factor

- Shows the relative importance of an asset compared to other assets of the same type.
- Criticality is calculated differently for each LOB:
    1. TS is based on the criticality of the Station, Asset Type & individual Asset
    2. DS is based on the criticality of the feeders out of the station
    3. TL is based on Circuit criticality (assets inherit the criticality of its parent Circuit)
    1) DL is based on the criticality of the Feeder (assets inherit the criticality of its parent Feeder).

Utilization Risk Factor

- Utilization is a means to detect when an asset exceeds its engineering/design capability, due to changing power system conditions and needs.
- It can be used as an indicator of future asset performance and health, based upon current performance conditions.

STI Modules

STI03: Risk Scores and Roll-ups

Composite Risk Factor

- Calculated as a weighted average of the other 6 primary Risk Factors.
- Each LOB has a specific weighting scheme.
- E.g. TS Composite calculate based on the following:

$$Composite = \sum (Risk\ Score) \times (Weighting)$$

	Risk Factor Weightings					
	COND	DEMO	CRIT	PERF	UTILIZ	ECON
Asset Categories (Asset, Class, Asset Type, Station, OP Center, Zone)	.33	.11	.07	.27	.13	.09

STI Modules

STI03: Risk Scores and Roll-ups

Rolled Up Risk Factor s

- Individual assets are rolled up at each level (Asset, Class, Asset Type, Station, OP Center, Zone) using LOB specific weighting schemes.
- For Each Risk Factor and asset category different weighting schemes are used.
- E.g. TS Roll Up Risk Factor Scores are calculated based on the following:

$$Roll\ Up = \sum (Asset\ Category\ Risk\ Score) \times (Weighting)$$

Weightings		Risk Factor					
		COND	DEMO	CRIT	PERF	UTILIZ	ECON
Asset Categories	ZONE	Unit Cost	Unit Cost	Unit Cost	Unit Cost	Unit Cost	Unit Cost
	OP CENTER	Unit Cost	Unit Cost	Unit Cost	Unit Cost	Unit Cost	Unit Cost
	STATION	Unit Cost	Unit Cost	Algorithm	Unit Cost	Unit Cost	Unit Cost
	ASSET TYPE	Unit Cost	Unit Cost	Weighted Average	Unit Cost	Unit Cost	Unit Cost
	CLASS	Unit Cost	Unit Cost	Weighted Average	Unit Cost	Unit Cost	Unit Cost
	ASSET	Algorithm	Algorithm	Derived from Station Algorithm	Algorithm	Algorithm	Algorithm

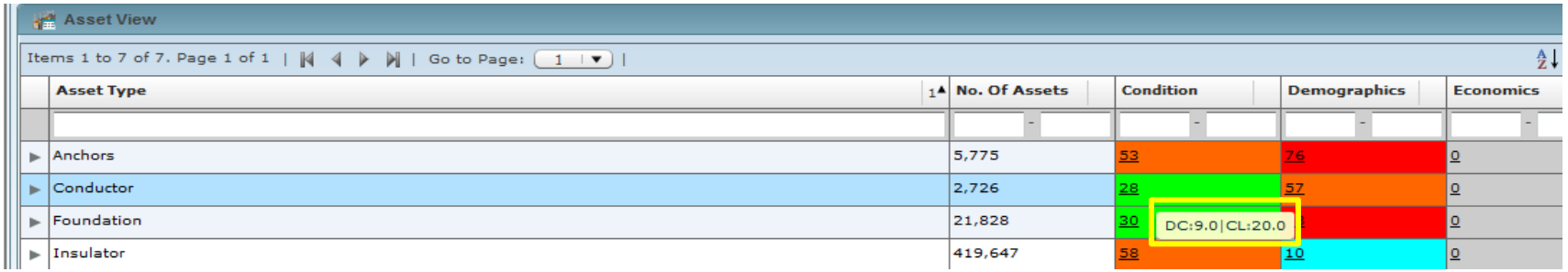
STI Modules

STI03: Risk Scores and Roll-ups

Handling Missing Data

If supporting factors are missing for a risk factor, the weightings are reallocated based on the current weight distribution and only the data that is available is used for the calculation:

- Normal: Flag given to data that is available from the data source identified in the algorithm definition
- Default: Flag given in cases where expected data is not available from the data source. A default value defined by the business is used (ex. For Asset Type MU -> Asset Class N_DS_P_MU, the Default Value is CR02)
- Missing: Flag given to data that is not available from the data source identified in the algorithm definition and business has not provided a default value
- Data Completeness (%)
    - The number of supporting factors available as Normal or Default as a % of the total number of supporting factors available
- Confidence Level (%)
    - The amount of confidence you have that the calculated risk score is accurate. It is related to the status of the supporting factors (Normal, Default, Missing) and the sum of the weights of the sub-formula groups in the main formula of the algorithm.
- Normalized Index Value: Provides the risk score after taking into account missing data



STI Modules

STI04: Additional Functionalities

Module Objectives

- **Rubber Banding**: Select assets in a specific area and exclude assets outside the area by drawing a border on a spatial view map
- **Maintain, Replace or Repair**: Be able to assess whether an asset should be considered for replacement or refurbishment
- **Duval Triangle**:
  - View transformer gas contents and view transformer change in condition over time
  - View historic transformer dissolved gas contents
- **Utilization Load Power Flow**: Identify and display utilization issues relating Tx Lines / Tx Stations assets
- **Heat Map**: Generate and interpret a heat map displaying comparative asset risks
- **Date Selection**: Display information and historical risk scores by the date of the data being shown

Link to Job Aid Explains Additional Functionalities

AA Sustainment: Process & Issues

AA Sustainment Team

The AA Sustainment Team is responsible for ensuring sustainment and enhancement of the Asset Analytics tool. As such there are a number of key areas that the team is focused upon:

- Data Quality, Accuracy and Timeliness:
  - Data quality (accuracy and completeness)
  - Data Timeliness
  - Corrective action steps: Deal with data issue at source (i.e. where the data gets collected/created)
- Asset Analytics Tool Functionality
  - Break/Fix issue resolution process: LOB AA Resource then Help One or AA Sustainment Team
  - On going Sustainment efforts (Change requests through LOB Manager to AA Sustainment Team)
  - Future Asset Analytics Tool Enhancement: Change requests through LOB Manager to AA Sustainment Team
- Asset Analytics Administration
  - New User Set up (via Service Centre Wizard)
  - AA Usage Statistics
  - AA Training & User Support

Questions

METSCO
MAKING IT POSSIBLE

Alexander Bakulev

SME in Asset Management

SUMMARY OF QUALIFICATIONS

Mr. Bakulev is a Certified Asset Management Assessor. He received his Diploma's degree (5-year full-time undergraduate education) with a specialty in Mathematical Methods of Economics and Candidate of Science in Economics (3-year full time post-graduate program) from the St. Petersburg State University, Russia in 2003 and 2007 respectively.

His area of expertise includes asset management, regulatory, financial analysis and business case development. As a Chief Executive Officer of METSCO, Mr. Bakulev contributed his extensive utility asset management and operations optimization experience to a variety of management consulting projects in the areas of asset management, asset investment planning and prioritization, asset lifecycle optimization, asset risk management, including work for major Canadian utilities, such as EPCOR, ENMAX, Hydro One, Toronto Hydro, SaskPower, Nova Scotia Power, and many other utilities.

Mr. Bakulev has provided an expert opinion on behalf of METSCO to the Ontario Energy Board in the regulatory proceedings where he was tasked to conduct assessments of distribution system plans proposed by utilities applying for Ontario Energy Board rate increases. Mr. Bakulev's involvement and testimony in the Manitoba Hydro rates proceeding will entail providing his extensive practical experience and academic expertise in the areas of quantitative analysis underlying asset investment and sustainment decisions and operational process optimization and rationalization approaches.

Prior to joining METSCO in 2014, Mr. Bakulev leveraged his extensive academic background in economics and econometrics in a variety of positions and assignments with Toronto Hydro, which included direct oversight of the company's asset sustainment portfolio planning and risk-based asset lifetime optimization processes. Mr. Bakulev also led the company-wide productivity improvement program and acted as a project manager of Toronto Hydro's inaugural five-year Custom Incentive Regulation Rate Application to the Ontario Energy Board, where he contributed to the filing strategy development and oversaw preparation of extensive benchmarking studies in the areas of asset management and operating efficiency. Prior to joining Toronto Hydro, Mr. Bakulev acted as a project manager in a management consultant company and led several large projects to implement asset condition assessment programs and risk-based life-cycle decision-making procedures in hydro generation, transmission and distribution utilities.

Mr. Bakulev is also a co-author of several publications and research papers for the Institute of Electrical and Electronics Engineers, the International Council on Large Electric Systems (CIGRE) and the Centre for Energy Advancement through Technological Innovation, related to asset management and risk-based optimization, and he made numerous presentations at industry conferences, educational courses and workshops.

Education and Certification

Institute of Asset Management

- Certificate in Asset Management, 2018

World Partners in Asset Management (WPIAM)

- Certified Asset Management Assessor, 2019

Saint-Petersburg University, Russia

- Ph.D. in Economics, 2003-2006

Saint-Petersburg State University, Russia

- Degree in Economics, Graduated with Honors, 2003
  Major: Mathematical Methods of Economics

Professional Associations

Institute of Electrical and Electronic Engineers (Member)

Other Training

Mr. Bakulev has participated in training workshops and seminars throughout his career and obtained training in financial analysis, financial modelling, strategy development, project management, time management, staff supervision, and negotiations.

CAREER HISTORY

2018 to present **Chief Executive Officer, METSCO Energy Solutions Inc.**

2014 to 2018 **Vice President, Strategy and Assets, METSCO Energy Solutions Inc.**

Responsible for asset management and management consulting practice

2014 **Manager, Regulatory Filing, Toronto Hydro**

Responsible for 2015-2019 regulatory filing application for the Ontario Energy Board

2012 to 2014 **Manager, Power System Planning and Logistics, Toronto Hydro**

Responsible for corporate-wide productivity improvement program, emergency dispatch center and crew logistics

2010 to 2011 **Team Leader, Asset Management Long-Term Planning and Strategy, Toronto Hydro**

Responsible for asset management plan, risk-based modelling and justification, asset risk management, asset records, and data quality

2008 to 2010 **Project Leader, Business Automation, Toronto Hydro**

Responsible for development of business cases for strategic initiatives and execution of the strategic projects

2004 to 2007 **Project Manager / Consultant, Strategy Partners**

Executed projects to develop asset management plans, to create strategic and financial models, to improve organizational performance.

2001 to 2004 **Consultant, Labrium Consulting**

Financial modelling, business plans, business cases, business evaluation,

and real-estate evaluation

Relevant Project Experience

Review and analysis of effectiveness of cable injection practices over the 2013-2018 period for a major Canadian distribution utility

Nova Scotia Power – expert review of asset management sustainment plan for hydro generation assets

EPCOR – Development of capital projects prioritization framework

Landsnet – Development of life-cycle costing models for transmission lines, including condition and risk assessment (Ongoing)

EPCOR – Evaluation of EPCOR's Distribution Maintenance Programs & Practices (2017-2018)

ENMAX – Evaluation of Transmission and Distribution Maintenance Practices (2018)

Toronto Hydro – Expert review of reliability forecasting model (2017-2018)

CEATI Guide to Developing Utility Asset Management Plans for Each Asset (2017-2018)

Hydro One – Expert review of asset analytics condition and risk assessment practices (2018)

Hydro One – Expert review of reliability forecasting model for distribution system (2018)

SaskPower – Transmission asset condition assessment, risk assessment, life-cycle costing, long-term plan (2016-2017)

Kingston Utilities – Development of system planning effectiveness metrics (2016-2017)

Public Utility Law Centre – Review of Manitoba Hydro's Generation, Transmission and Distribution sustainment plans in 2017/19 General rate application (2017)

Southern Power – Modelling of optimal scheduling for a combined energy storage solution with solar and gas generations (2017)

S&C Electric – Modelling of optimal storage capacity to maintain a ramp up capabilities of a combined solar and gas generations for the university camp (2017)

Toronto Hydro – RCM review of major station and distribution assets (2017-2018)

EPCOR - Development of reliability forecast model for the distribution system (2016)

CEATI Benchmarking of reliability forecasting models and approaches utilized by North American utilities, and development of a generic reliability

forecasting model (2016-2017)

Ontario Energy Board - Development of asset management performance metrics to be used by the regulator and be reported by the jurisdictional distribution companies (2016-2017)

CEATI Development of the station asset replacement guide based on asset condition and asset risk assessment principles (2016)

Hydro Ottawa - Detailed review of asset management planning software and it's compliance to key asset management principles (2015)

EPCOR – Detailed model to analyze cost-benefits of neighbourhood asset approach to asset renewal programs (2015-2016)

Review of capital mode true-up application for a major distribution company in Canada (2016)

Justification of cable replacement project by comparing various timing of replacement for each cable segment and feeder protection schemas (2015-2016)

Review of the Distribution System Plans submitted by distribution utilities to support the rate applications on behalf of the Ontario Energy Board (Ontario regulatory agency) (2015-2018)

Review of the existing Organizational Structure and implementation of the new structure of a Distribution and Transmission company in Alberta, Canada (2014-2015)

Development of the business case for implementation of real-time microgrid operating system in distribution utilities (2015)

Development of the business case model for a combined solar generation plant with the energy storage solution, in three regulated markets: Ontario / Alberta / California (2014-2015)

Development of the Asset Condition Assessment, Asset Risk Management Framework, Long-term and Short-term investment and maintenance plans for major distribution asset classes for a Transmission and Distribution company in Alberta, Canada (2014-2015)

Business Case justification for the Regulatory filing application for the Distribution company in Ontario, Canada (2014)

Smart Grid roadmap development for a Transmission and Distribution company in USA (2014)

Regulatory Filing at Toronto Hydro, Canada (2011, 2014)

Corporate-wide Productivity Improvement Program at Toronto Hydro (2012-2014)

Development of Risk models for the Asset Management group at Toronto Hydro (2010-2012)

Development and Execution of the GPS Mobile solution at Toronto Hydro (2008-2010)

Development and Implementation of Asset Management Capital and Maintenance Plan, including Health Indices and Risk Assessment for a Distribution company in the Central Region of Russia, 65M customer count (2006-2007)

Implementation of the new Asset Management practice, Review of the Asset Management division structure, and Development of Asset Condition Assessment Methodology and Long-term Investment Plan of the Power company in Far East Russia, 25 thousand km of T&D lines (2006)

Development of Asset Management long-term plan for hydro generation turbines, Health Indices, Risk Assessment, Replacement/Refurbishment tool in Russia for Power Generation Company, 20GW+ (2006)

Development of Financial models for a variety of projects (2003-2007)

"Financial modeling in MS Excel" course provider (2002-2007)

Selected Technical Publications and Presentations

Robert Otal, Alexander Bakulev. Risk-based asset management optimization. 2014 IEEE PES T&D Conference and Exposition, Electronic ISBN: 978-1-4799-3656-4

Robyn Pasal, Robert Otal, Alexander Bakulev. Electrical asset replacement strategy in substations CIGRE-IEC 2016 Colloquium. May 2016, Montreal QC, Canada

Stephen Seewald ; Robert Otal ; Alexander Bakulev. Reliability Forecasting & Investment Optimization. 2018 IEEE/PES Transmission and Distribution Conference and Exposition (T&D 2018), pp. 740-745, April 2018, Denver CO, USA. ISBN: 978-1-5386-5584-9.

Strategies for Successful Asset Management Implementation
CEATI. 1st Annual SAMP Conference. Strategic Asset Management Enhancement of Effectiveness & Value. November 2017, Vancouver BC, Canada

Best Practices for Developing Utility Asset Management Plans for Each Asset
2nd Asset Management Conference CEATI. October 2018, Newport Beach, CA USA

How Regulators Measure the Success of Asset Management Plans
CEATI. 1st Annual SAMP Conference. Strategic Asset Management Enhancement of Effectiveness & Value. November 2017, Vancouver BC, Canada

Application Of Reliability Forecasting Model To Identify Capital Spending Level Required To Maintain Or To Improve Reliability
CEATI T&D Asset Management Conference. November 2017, Tampa, FL USA.

Workshop: Optimize Risk Management for Operational Success
The 2nd Summit on the Future of Canada's Utilities. May 2016, Toronto, ON Canada

Asset Management: Customer's Value And Total Life Cycle Costing
WEI Operations Conference. March 2016, San Diego, CA, USA

Developing Asset Management Plan in Utilities
7th Public Sector LCC Asset Management course. February 2015, Toronto, ON, Canada

How to Add Significant Value to the Raw Data Assets in Possession of the Utilities
European Utility Week. November 2014, Amsterdam, Netherlands

How to Add Significant Value to the Raw Data Assets in Possession of the Utilities
Asset Management for Cities, Utilities and Transportation Summit. December 2014, Toronto, ON, Canada

Asset Management: Risk-Value Based Approach To Justify Smart Grid Projects
Asian Utility Week 2014. August 2014, Bangkok, Thailand

Asset Management: Long-term Planning
6th Public Sector LCC Asset Management course. March 2014, Toronto, ON, Canada

Grid Analytics Through Smart Meters
Smart Grid Asia 2013. March 2013, Kuala Lumpur, Malaysia

Risk-Driven Business Case: Evaluation of Capital Projects
DistribuTech 2013. January 2013, San Diego, CA, USA

Robert Otal

P. Eng.

Director, Asset Management & Analytics

SUMMARY OF QUALIFICATIONS

Robert Otal is a Professional Engineer with over 10 years of experience working in the areas of asset condition assessment, asset management, risk management, strategic long-term and short-term investment planning. Mr. Otal has extensive experience working with utilities to justify and deploy U/G cable replacement programs in order to target high-risk cable assets such as direct-buried XLPE and "leaking" PILC cable types. Mr. Otal led the development of a risk-based analysis of U/G cables, in order to prioritize those cables with the most elevated risks within distribution systems for replacement. Mr. Otal also has extensive experience with comparative intervention analysis for U/G cable assets, taking into consideration splicing (repair), replacement and rehabilitation (cable injection) options, and developing recommendations on the most ideal intervention strategies for utilities to execute on the basis of economic analyses.

As part of his role at Toronto Hydro, Mr. Otal has worked hands-on in developing and optimizing Toronto Hydro's Distribution System Plan, which included the justification of U/G cable maintenance, replacement and cable injection programs. Part of this role also included failure curve calibration and failure mode development for U/G cables. He previously worked at Horizon Utilities where he assisted with the implementation of their Asset Management Plan and condition assessment system to evaluate asset health on a wide variety of distribution system assets, including U/G cable assets. Mr. Otal obtained his B.Eng. in Electrical Engineering from Ryerson University, and is also a registered Professional Engineer in Ontario. His areas of interest include risk based analysis and optimization of distribution systems. Robert takes an active role in the Engineering profession and is a member of IEEE.

CAREER HISTORY

Education **Ryerson University, 2005**

- Bachelor of Engineering (B.Eng.), Electrical Engineering

Professional Associations

Licensed Professional Engineer, Ontario, Canada
IEEE Power & Energy Society (PES)

2015 to Present **Director, Asset Management & Analytics, METSCO Energy Solutions Inc.**

- Managed the development of distribution and transmission system plans for utilities, and have provided expert witness testimony to support the development of these plans
- Managed the development and integration of Asset Management Risk Frameworks for a series of utility organizations
- Managed the development and integration of Asset Condition Assessment programs, including the development of health indices for a variety of utility organizations.
- Developed and derived failure probability and failure impact parameters as part of a risk framework development exercise
- Performed alignment between risk frameworks and asset management standards including PAS 55 and ISO 55000
- Provided regulatory support to utilities when developing long-term capital and distribution system plans

2014-2015 **Supervisor, Strategic Analytics, Toronto Hydro**

- Managed the development and completion of Toronto Hydro's 5-Year Distribution System Plan (DSP), including the development of the documents' architecture such that it aligns to all requirements as well as the development of optimized processes to coordinate the production of standardized evidence.
- Managed development of decision-support tools and processes used support Toronto Hydro's 2015-2019 Electricity Distribution Rates (EDR) application, including the derivation of 5-year capital investment forecasts.
- Management of risk and reliability-driven decision support systems used to proactively identify investment opportunities.
- Managing the development of business case evaluation (BCE) processes and systems used to produce quantified justification for capital investment programs and projects.
- Managing the development of AM planning process improvements in order to introduce efficiencies and productivity improvements, including the development of geospatially-driven planning solutions for investment planning presentment and analysis.
- Management of engagement & contribution programs, including training, internal and external stakeholder engagement sessions.

2008 to 2011 **Supervisor, Systems, Risk & Reliability, Toronto Hydro**

- Lead development of the business case evaluation (BCE) procedure, to allow for capital programs to be evaluated using quantitative metrics including net present value.
- Developed procedure for the execution and evaluation of distribution automation (DA) projects – procedure allowed for optimal placement of DA-enabled switches, such that future customer impacts could be

substantially reduced, thereby maximizing benefit of projects
- Developed and calibrated age-based and condition-based failure probability curves and failure modes as part of enhancements to Feeder Investment Model (FIM)
- Management of system-level reliability planning processes, including tracking, reporting and forecasting.
- Management of risk management systems development and reporting processes.
- Managing the development of long-term capital plans, investment strategies and regulatory justification.
- Managing the development of systems and tools to aid in planning, decision-making and justification.

2008 to 2010 Risk & Analytics Engineering Lead, Toronto Hydro

- Lead development of Engineering Intelligence (EI); a geospatially-driven planning solution that will allow planning engineers to identify worst-performing assets & locations, perform simulations & scenario analyses, create capital project scopes and produce qualitative and quantitative justification as part of a business case evaluation procedure.
- Lead development of the Feeder Investment Model (FIM); a risk-based decision support tool utilized by planning engineers to identify and prioritize high-risk assets and to perform business case evaluations for capital project scope justification.
- Developed Quantified Risk Evaluation Framework for substation assets, including power transformers and switchgear assets. Existing substation and protection & control designs were incorporated and evaluated as part of this framework. Outputs included the identification of high-risk substation configurations and action plans to mitigate these risks.
- Lead development of Electrical Distribution Capital Plan (EDCP) - a ten-year capital plan which highlights challenges across the distribution system and includes key programs and initiatives to mitigate system risks and improve reliability. EDCP represented a key regulatory document submitted as part of EDR filing.
- Produced capital project scopes to drive asset renewal activities and improve reliability. Scopes included design requirements, business case evaluation and justification.
- Developed long-term distribution plan and assessments for 4.16kV distribution system, including evaluation and analysis of aging rear-lot infrastructure, load transfer & contingency analysis, fuse coordination studies, loading and capacity calculations.
- Current-state manual processes and data gaps were assessed and prioritized as part of strategy aimed at developing new turn-key automation solutions in order to optimize asset management efficiencies. Plan identified key responsible parties and change management requirements.

2006 to 2008 **Engineer-in-Training, Horizon Utilities**

- Lead development of asset risk scoring framework, to prioritize assets based upon their probability & impact of asset failure.
- Lead development of asset condition assessment (ACA) program, to quantify asset health and prioritize assets using health index metrics.
- Developed Asset Management Plan, to document key programs and methodologies applied to maintain and renew asset infrastructure.
- Involved in regulatory filing processes, including the preparation of materials/justification to support planning programs and provide current state assessment of asset infrastructure.
- Developed designs and requirements for capital projects to renew existing asset infrastructure and support new customers.

Selected Technical Publications and Presentations

R. Otal and A. Bakulev, "Risk-Based Asset Management Optimization", T&D Conference & Exposition, 2014 IEEE PES, pp. 1-5, Internet: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6863414&isnumber=6863147. 2014.

R. Otal and T. Hjartarson, "Sustainment Actions Take a New Direction", Transmission & Distribution World Magazine, pp. 27-34, October 2010.

R.Otal and C. Kerr, "Toronto Hydro's Asset Management Planning & Evaluation Process", DistribuTECH 2014, Internet: http://s36.a2zinc.net/clients/pennwell/dtech2014/Public/SessionDetails.aspx?FromPage=&SessionID=6973. February 2014

R. Otal and A. Bakulev, "Risk-Driven Business Case Evaluation of Capital Projects", DistribuTECH 2013, Internet: http://s36.a2zinc.net/clients/pennwell/dtech2013/Public/SessionDetails.aspx?FromPage=Calendar.aspx%20&SessionID=3650, February 2013

Relevant Project Work

Client	Project Description	Year
Waterloo North Hydro	Implementation of METSCO's proprietary ENGIN risk-based asset management software.	2019-ongoing
Chemtrade Inc.	Transformer Asset Condition and Risk-Based Planning Study.	2018-2019
Hydro One Sault Ste. Marie	Transmission line and Transmission Station Asset Condition Assessment and Transmission System plan. Created multi-factor health indices for nearly all of the asset classes which included all major station and line equipment operated by utility.	2018

Hydro One Networks Inc.	Review of HONI's Capabilities in Transmission Asset Analytics and Reliability Risk Modelling	2018
Landsnet, Iceland	Asset condition and risk assessment of 66kv transmission lines	2018-2019
SaskPower	Development of Asset Risk-Based Planning framework for the transmission system (power transformers, circuit breakers, line structures, and line conductors). Created health indices, asset risk profiles, and developed asset life-cycle strategies and plans outlining investment needs for the next 10 years.	2017
CEATI International	Guide for Asset Replacement Strategies with an Asset Management Plan Leveraging a Risk Based Approach	2017
City of Medicine Hat Electrical Distribution	Development of an asset management plan for each asset and asset risk framework	2015-2016
EPCOR Transmission & Distribution Inc.	Development of an asset management plan for each asset class and asset risk framework	2014-2015

Dmitry Balashov
MBA, MPA.

Director, Utility Strategy and Economic Regulation

SUMMARY OF QUALIFICATIONS

Dmitry Balashov is a utility strategy professional with nearly of decade of experience, spanning government policy development, utility regulation, and management consulting. Dmitry's areas of focus include utility regulation, strategy, and productivity and performance optimization of capital asset management, supply chain, and back office operations. Prior to joining METSCO, Dmitry held senior advisory positions at Toronto Hydro and the Ontario Ministry of Energy. Over the last decade, he has contributed his knowledge and passion to over 20 high-profile energy regulation proceedings in Ontario, Manitoba and Alberta. Most recently, Dmitry's focus has been on METSCO's growing Utility Strategy practice area, where he works with clients to develop and integrate into existing operations, new performance measures, tools and processes designed to optimize operating performance and shareholder returns, while complying with regulatory guidance. Dmitry has recently graduated at the top of his class with an Executive MBA at University of Toronto's Rotman School of Management, where he concentrated on energy project finance, strategy and operations efficiency. While at Rotman, Dmitry was retained as an instructional advisor for an Electric Utility Productivity Capstone Course for the Full-Time MBA Students.

CAREER HISTORY

Education

University of British Columbia, Vancouver

- B.A. Political Science, 2005

Queen's University School of Policy Studies, Kingston

- MPA, Energy Policy, Trade Policy, 2008

Rotman School of Management, Toronto

- MBA, Strategy and Operations Management, 2018

Employment

History

May 2017 to Present — **Director, Utility Strategy and Economic Regulation, METSCO Energy Solutions Inc.**

Providing expert advisory services to select electric utility, oil and gas, and financial institution clients in the areas of risk-based asset management, economic regulation, benchmarking and utility sector productivity.

- Led a major due diligence review exercise for ENMAX ahead of its acquisition of Emera Maine. Review covered the areas of capital plant condition, asset management capabilities and field operations.
- Leading an ongoing project to enhance quantitative asset management capabilities for electrical T&D plant at Suncor Inc. Developing frameworks for quantitative health indices, risk-based asset failure probability models, station criticality prioritization.
- Led a Smart Grid Feasibility Study for Yukon Energy and ATCO Electric Yukon.
- Co-led the development of an Asset Condition Assessment and Transmission System Plan for Hydro One Sault Ste. Marie.
- Led preparation of a framework of capital asset performance measures for a mid-sized Canadian utility client.
- Acted as a third-party expert in the area of asset management in a Manitoba Hydro 2017/2018 General Rate Application.
- Developed multiple reports and research studies in the areas of reliability forecasting, capital asset management and analytics.
- Lead internal knowledge management, performance effectiveness, and capacity building exercises.

March 2015 to May 2017 — **Lead, Regulatory Process and Analytics, Toronto Hydro**

Led a team of legal, finance and policy professionals in preparation and prosecution of applications for regulated tariffs for the largest municipal electric utility in Canada.

- Facilitated the development and implementation of compliance programs in the areas of customer care, operations management and investment coordination and planning.

- Oversaw the research and development of policy advocacy submissions to the Ontario Energy Board (OEB) in areas of customer care, cost of capital, and reliability.

- Collaborated with internal subject matter experts on development and implementation of business planning process enhancements and productivity programs.

- Supported senior leadership in preparation and delivery of strategic planning and advocacy documents, including executive and Board of Directors briefings.

May 2013 to March 2016 **Regulatory Affairs Consultant, Toronto Hydro**

Led research, analysis, planning and drafting of performance measurement, productivity and OM&A evidence for Toronto Hydro's 2015-2019 tariffs application.

- Conducted inter-jurisdictional research and proposed frameworks for CIR ratemaking model and productivity evidence presentation;

- Coordinated preparation, research and drafting of Interrogatory and Undertaking responses on the subjects of productivity, OM&A and performance measurement;

- Coordinated work of four expert working groups tasked with development of complex and strategically significant evidence (Productivity, KPIs, ERP, Operations Support);

- Liaised with Provincial Government officials and OEB staff on a range of ongoing policy consultations, mutual undertakings and logistical matters;

2011 to 2013 **Senior Policy Advisor, Regulatory Affairs and Strategic Policy, Ontario Ministry of Energy.**

Led the Government's analysis of Hydro One's ratemaking strategies, capital investment plans and business planning assumptions. Conducted financial analysis of the impact on the Province's fiscal plan of policies and

programs contemplated by Hydro One and Ontario Power Generation.

- Contributed to planning and governance policy development and drafting of the Ontario Electricity System Operator Act, 2012;
- Led options development and advised senior officials on potential changes to content and appearance of consumer electricity bills, and transition to fixed distribution billing;
- Provided strategic analysis of key stakeholder submissions to the Ontario Distribution Sector Review Panel;
- Regularly liaised with Hydro One staff and Executive Officers to provide the Ministry's feedback on key regulatory and financial issues.

2008 to 2011 **Policy Analyst, Transmission and Distribution Policy, Ontario Ministry of Energy.**

Researched and drafted policy papers, briefing materials, and cabinet submissions on a variety of topics, including network upgrade planning and grid investment incentives.

- Led and supported government consultation activities with the First Nations and Metis communities affected by contemplated energy infrastructure projects;
- Prepared communications documents for senior civil service and political staff to communicate complex concepts in simple and effective manner;
- Conducted analysis of customer rate impacts of anticipated regulatory decisions by the OEB and procurement programs by the Ontario Power Authority (OPA);
- Advised stakeholders on technical issues and legislative/regulatory tools that govern development and approvals of transmission projects;
- Participated in drafting of the Green Energy Act, 2009 and the development of the Ontario Feed-In Tariff grid connection rules.

Relevant Project Work

Client	Project Description	Year
Suncor Energy Inc.	Asset Lifecycle Cost Management System design and implementation for Transmission and Distribution plant supplying the Oilsands.	2018-ongoing
ENMAX	Pre-M&A Due Diligence Review: Emera Maine's Physical Plant Condition, Performance, Organizational Asset Management Capabilities, Field Operations Efficiency and Future Capital Investment Upside.	2019
Yukon Energy and ATCO Electric Yukon	Smart Grid and Advanced Rate Feasibility Study	2018
CEATI International	Systematic Approach to Evaluate and Compare Asset Renewal and Capacity Upgrade Projects	2018-2019
Hydro One Sault Ste. Marie Inc.	Asset Condition Assessment and Transmission System Plan Development.	2018
Hydro One Networks Inc.	Review of HONI's Capabilities in Transmission Asset Analytics and Reliability Risk Modelling	2018
CEATI International	Evaluation of Online Monitoring Technologies for Distribution Assets-Technology Watch	2018
Manitoba Hydro 2017/2018 General Rate Application	Independent Expert Study on the proposed Capital Sustainment forecasts and underlying Asset Management methodologies.	2017-2018
Mid-Sized Canadian Utility (Confidential)	Custom Capital Performance Measures Development Study	2017-2018
CEATI International	System-Wide Reliability Forecast Model Study	2017-2018
EPCOR	Evaluation of EPCOR's Maintenance Programs & Services Study	2017
Ontario Energy Board	Technical Review of several Distribution System Plan Submissions by Ontario Utilities	2017
Toronto Hydro-Electric System Limited	Preparation of Asset Management, Productivity Benchmarking, and Performance Measurement Evidence for the 2015-2019 Custom IR Application.	2014-2016

SEC INTERROGATORY #16

Issue from Draft List:
[Issue Group]

Reference:
TSP-01-04-14

Interrogatory:
With respect the BCG, Assessing Hydro One's Investment Planning Process – Final Report:

a) Please provide a copy of the retainer agreement between BCG and Hydro One.

b) Please provide a copy of the BGC work plan (or similar document).

c) Please provide a summary of all *other* work BCG has done for Hydro One in the last 5 years and the total cost of that work.

d) [p.3] Please provide a list of 'peer utilities' that BCG is comparing Hydro One to. Please provide the source o the information for these 'peer utilities'. [CHECK AGAINST APPENDIX]

e) [p.3, Exhibit 1] Please provide the 'Benchmarked peer group performance' score for each aspect to the planning process included in the exhibit. Is the amount the average or median peer performance of the peer group.

f) [p.9] Please explain what information BCG relied upon to review the planning processes of the peer utilities.

g) [p.9] Who is the ISO-55000 implementation expert and 'Former Ontario Energy Board panel member' that BCG consulted and for what purpose.

Response:

a) Please refer to Attachment 1. This engagement was not subject to an RFP. Hydro One has provided this agreement and the associated work plan in confidence per the terms of the agreement.

b) Please refer to Attachment 1.

c) Please refer to EB-2017-0049, Oral Hearing Undertakings J2.4 and J7.1. The total cost of transmission work performed by BCG over the past 5 years is approximately [redacted].

d) Please refer to Exhibit B-1-1 TSP Section 1.4 Attachment 14 Exhibit 2 on p 8
Please refer to part f) below.

e) Benchmarked peer group scores were based on BCG subjective assessment of the peers on each of the dimensions; number is median give nature of the exercise.

f) BCG leveraged a variety for sources, including but not limited to: Expert interviews, regulatory filings, BCG experience across utilities, and BCG experience around planning best practices across other industries.

g) The former OEB panel member was Karen Taylor; the purpose of the interview was to align on general context for the broader regulatory environment in Ontario, given how critical it is to how a utility operates.

BCG

November 13, 2017

Mr. Bruno Jesus
Director, Strategy & Integrated Planning
Hydro One Networks Inc.
483 Bay Street, North Tower, Toronto, ON M5G 2P5

Re: BCG support for Investment planning process review

Dear Bruno,

Thank you for the opportunity to support Hydro One Networks Inc. ("Hydro One") on its review of its investment planning process. This letter is meant to formalize and document BCG's proposal for project management support of the filing.

Context of this effort

Hydro One recently received a decision from the OEB on its 2017-2018 Transmission Revenue Requirement in which the OEB highlighted perceived weaknesses of several aspects of Hydro One's planning processes and required that Hydro One undertake an independent, third party assessment of its Transmission System Plan, including its asset condition assessment and capital planning processes. This report is a key deliverable for the upcoming 2019-2023 rate filing and will likely be crucial to Hydro One's ability to secure additional capital for system development and renewal in the coming years.

Prior to the OEB decision, Hydro One had recognized some of the challenges it faced in investment planning and conducted an internal assessment of its existing process, with the help of a BCG team, as part of the Good to Great program. In response to that assessment, Hydro One made a number of improvements to the planning process that were implemented in its 2018 cycle, which recently concluded as of November 2017. Describing the impact of these changes will be a critical component of the report to demonstrate to the OEB that Hydro One has been proactive in improving its process.

Developing this independent assessment will require a strong understanding of the evolution of Hydro One's planning process, including an ability to understand the scope of recent improvements and their expected impact on the next rate filing. We believe BCG is uniquely qualified to support in this effort given the depth of our experience in utility capital planning and our intimate knowledge of Hydro One's planning process given our involvement in the Good to Great program and in recently providing project management support for the 2019-2023 Transmission rate filing.

Scope of work

We propose to deliver a comprehensive assessment of Hydro One's Transmission System Plan, including:

- Assessment of investment planning process and the impact of recent improvements undertaken in the 2018 cycle as compared to prior years

- This will include benchmarking of Hydro One's processes against other major US and Canadian utilities
- Testimony before the OEB as to the findings of our assessment, as required, during the upcoming rate case for the 2019-2023 Transmission filing

1. ***Assessment of Hydro One's investment planning process***
   The primary deliverable will be a holistic assessment of Hydro One's revised investment planning process, including:
   - Reviewing Hydro One's legacy process and the results of its initial internal assessment of the need for improvement
   - Developing a framework to review and benchmark Hydro One's processes vs. past efforts and US and Canadian peers
   - Outlining the key steps Hydro One took to improve its process for 2018, and the impact of those improvements vs. prior years, including interviews with key stakeholders to understand day to day impacts of new process
   - Identifying further areas for continued improvement in future planning cycles

2. ***Testimony support***
   We commit to provide necessary support for written and oral testimony during Hydro One's upcoming 2019-2023 Transmission Revenue Requirement filing.

Working arrangements

This project will be led by Andrew Loh, David Gee and Justin Dean, Partners and Managing Directors at BCG. Julie Powers, Project Leader, will lead the day-to-day activities of the project with support from two consultants. Having contributed to the 2017-2018 Transmission filing and provided project management support for the 2019-2023 filing, Julie is uniquely positioned to continue to support Hydro One in this effort. The team will be supported by experts within BCG's Power & Utilities practice area.

We propose that support begin on November 27 and last for 6 weeks, with a two week pause from December 18-January 2 to accommodate the Christmas and New Year holidays. We would expect to deliver the report on January 19th, and would be available to provide continued support for preparation and delivery of oral testimony once the OEB hearing schedule is established. The weekly cost of this team for the six-week effort is [redacted]

If additional support is required during rate case testimony, we will charge [redacted] for up to two weeks of pre-testimony preparation and time on the witness stand [redacted]. Per your request, this rate and team is completely independent of any other work that may be taking place elsewhere at Hydro one.

We look forward to having the opportunity to support Hydro One in this effort. It is clearly a critical effort to ensure Hydro One's continued success as a privatized enterprise.

Sincerely,

Andrew Loh
Partner and Managing Director

If you agree to the terms of the proposal laid out in this letter, please sign and date 2 copies and provide one back to us for our records:

Hydro One Networks Inc.

Per: _____ Nov 23/17

Bruno Jesus
Director, Strategy & Integrated Planning

Date

Our standard terms

The following are the standard terms under which BCG has for a long time successfully worked with our clients across the globe, and under which we agree to work together with you.

Protecting Confidential Information
As a condition of this proposal, the parties have entered into a confidentiality agreement dated November 17, 2017 and attached hereto as a Schedule, which confidentiality agreement is incorporated herein by reference. Included within this confidentiality obligation shall be any information we share with you regarding our pricing or rates.

Neither of us will make public, without the other's prior written approval,that we are working with each other.

Safeguards for Companies in the Same Industry
Serving multiple companies in the same industry allows us at BCG to deepen our industry knowledge and increases our ability to take an informed view of the strategic issues facing our clients. We maintain internal safeguards that enable us to work for clients in the same industry without

compromising our commitment to protect the confidentiality of their proprietary information. Accordingly, it is our policy not to enter into exclusive arrangements with any single company in a given industry or sector.

We do, however, take special precautions when we serve multiple clients in the same industry. Specifically, we will not assign consultants who have worked with you to serve a competitor on projects similar to the one BCG has undertaken with you, for at least one year following the conclusion of the individual's work with you. The only exception is that the team providing services to you may include senior professionals who serve as BCG practice area leaders (PALs), topic experts or advisors, who specialize in an industry, specific business discipline or the use of one of our proprietary tools. The involvement of such an individual in your assignment will not preclude them from working for other clients in your industry. These individuals, like all BCG personnel, will at all times maintain the confidentiality of your proprietary information and the recommendations we make to you.

Ownership of Deliverables and Intellectual Property

We shall provide all our services to you as BCG's client, and no other party will be regarded as our client for such services. Final versions of presentations, reports, and other material that we provide to you will become your property ("Deliverables"). We retain all rights to our underlying intellectual property contained in any Deliverables. That intellectual property includes our knowledge of business principles, and those analytical concepts, approaches, methodologies, models, tools, processes, discoveries, ideas, and formats developed by BCG staff in the course of our work for you, other clients, or during our own research. Retaining ownership of our intellectual property enables us to apply our professional expertise for the benefit of all our clients.

Although we cannot assign to you outright ownership of our intellectual property, we do hereby grant you a non-transferable, non-exclusive, license to use, copy and modify the BCG intellectual property within your organization to the extent necessary to enable you to implement the ideas and recommendations that we provide. Additional license terms may be put in place with you for specific BCG tools as may be used in connection with our services to you.

You acknowledge that in the course of our work with you we may develop for ourselves or others methodologies, problem solving approaches, frameworks or other tools, benchmarks, data or information and nothing contained herein precludes BCG from developing or disclosing such materials and information provided that nothing shared or disclosed contains your confidential information.

Disclosure of Deliverables

Other than filing the Deliverables with the OEB, you agree that you will not redistribute Deliverables outside of your organization without our prior written approval, which we will not unreasonably withhold. Except as required by law and other than filing the Deliverables with the OEB, no reference

may be made to BCG in any prospectus, proxy statement, offering memorandum or similar document or materials prepared for public distribution.

Indemnity and Limitation of Liability

BCG agrees to hold you harmless from any liability, damages, costs and expense, including reasonable legal fees, arising out of any allegation by a third party that the contemplated use of the Deliverables infringes any intellectual property right. Your only recourse against BCG in relation to any such infringement (other than this indemnity) will be to require that we take one of the following actions (at our option): (i) procuring your continued full use of the Deliverables as contemplated, (ii) substituting non-infringing Deliverables, or (iii) modifying the Deliverables appropriately so that they be non-infringing. This paragraph will not apply if you are using any modified version of a Deliverable that was not approved by us, or if you use the Deliverable for a purpose beyond your intended internal use.

In any case in which we agree to your disclosing Deliverables to third parties, you agree that BCG will not be responsible for any damages incurred or claims made by you or any third party as a result of or in connection with such disclosure, or the third party's use of, or reliance on, our work. You agree to indemnify, defend and hold us harmless against any and all actual or threatened claim, loss or expense incurred by BCG, including as a party or witness, arising from or related to such disclosure, use or reliance. We also require that any third party receiving a copy of BCG materials, except for the OEB, first sign BCG's standard form of non-reliance letter. We will provide you with a copy of this form upon your request to disclose Deliverables.

Sometimes BCG is required to produce documents, testify or otherwise serve as a witness in the context of legal disputes between our clients and other parties and/or governmental investigations. You agree that, in such event, you shall pay all reasonable costs and fees that BCG must incur to satisfy these obligations, including but not limited to reasonable fees for the retention of legal counsel to aid our compliance with such obligations.

Our indemnification obligations to each other shall be contingent upon us providing each other with prompt written notice of any claims we seek to have indemnified; *provided, however,* any failure to so notify shall not limit any of the obligations under this section except to the extent such failure materially prejudices the defense of such claims. Either of us seeking an indemnity shall give the other sole authority to defend or settle the relevant claim and provide, at the other's expense, such information and cooperation as may be reasonably necessary. However we each agree that no settlement agreement will be entered into on terms that would impose liability on the other or increase its obligations hereunder, without prior written consent of the other (not to be unreasonably withheld). Our respective indemnification obligations do not apply to the extent any claim, loss, expense or the like is caused by the party seeking indemnification (or its subsidiaries, affiliates, shareholders, directors, officers, employees or agents).

NOTWITHSTANDING ANYTHING TO THE CONTRARY CONTAINED HEREIN, EXCEPT IN THE CASE OF BREACH OF CONFIDENTIALITY, THE LIABILITY OF EITHER OF US TO THE OTHER FOR DAMAGES CONCERNING OUR PERFORMANCE OR NONPERFORMANCE UNDER THIS AGREEMENT, AND REGARDLESS OF WHETHER THE CLAIM FOR SUCH DAMAGES IS BASED IN CONTRACT, TORT, STRICT LIABILITY, OR OTHERWISE, SHALL NOT EXCEED THE AMOUNT OF FEES PAID BY YOU FOR THE SERVICES UNDER WHICH LIABILITY AROSE. EXCEPT IN THE CASE OF BREACH OF CONFIDENTIALITY, IN NO EVENT SHALL EITHER OF US BE LIABLE TO THE OTHER FOR ANY INDIRECT, INCIDENTAL, SPECIAL, PUNITIVE OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION DAMAGES FOR LOST DATA OR LOST PROFITS, EVEN IF WE HAVE BEEN ADVISED AS TO THE POSSIBILITY OF SUCH DAMAGES.

This does not limit your liability to pay us agreed upon amounts for services we deliver.

Your BCG Team

BCG will assign a team of qualified professionals to work with you. We expect that your employees will work closely with, or be members of, a joint team. You will provide us with data, instructions and assumptions on which we will rely. The quality of our work is dependent on the completeness and accuracy of this information and instruction.

BCG believes that diversity contributes to excellence. As a matter of policy, we staff our teams with an appropriate mix of consultants from our offices around the world, without regard to gender, race, sexual orientation, religion or other protected class and/or characteristic.

BCG does not provide fairness opinions or valuations of market transactions, or legal, accounting, or tax advice that may have a bearing on our consulting services. We expect that you will retain your own experts in these disciplines as you deem necessary.

At your direction, we will work together with your experts and other professional firms. We will discuss any such work, expectations and respective responsibilities with you in detail in advance, but we will not become responsible for work done by such other parties.

We believe in a continuing and open dialogue with our clients about our successes and areas for improvement. Accordingly, please discuss with us, at any time, the quality of our team, and whether you are satisfied with our work. From our side, we ask for qualitative and quantitative feedback at the end of every major assignment, and often suggest an implementation review six to nine months after a project has been completed.

It is not our practice to recruit staff from our clients who have worked with BCG within the last 12 months without first speaking with you, and we ask the same of you in return. This restriction will not apply to individuals who, without other solicitation, respond to employment advertising in newspapers, trade publications, or other public media.

Miscellaneous

Neither of us shall be liable for any delays or failures in performance due to circumstances beyond our reasonable control.

This Agreement will be governed by and construed in accordance with the laws of the country in which the BCG office executing this Agreement is located. The parties agree to submit to the exclusive jurisdiction of the courts of that country.

The provisions of this Agreement shall be deemed severable, and the invalidity or unenforceability of any one or more of its provisions shall not affect the validity and enforceability of its other provisions. If any such provision is held to be invalid, void, or unenforceable, the remaining provisions will nevertheless continue in full force. In lieu of any invalid provision, a substitute provision shall apply retroactively which comes as close as legally and commercially possible to that intent which the parties had or would have had, according to the spirit and purpose of the Agreement.

This Agreement, together with the relevant proposal and engagement letter, contains the entire agreement and understanding by and between us with respect to its subject matter, and no representations, promises, agreements or understandings that are not set out in them (whether written or oral) shall be of any force or effect. No change or amendment shall be binding on either of us unless in writing and signed by both of us.

The senior members of the BCG team serving you will be happy to respond to any questions that you may have about these terms. We look forward to working with you.

Our signatures below will indicate our mutual agreement with and acceptance of these terms.

****

We would be happy to discuss this in further detail with you and greatly appreciate the opportunity to continue to work closely with you and the Hydro One management team on this important journey.

CONFIDENTIALITY AGREEMENT

THIS CONFIDENTIALITY AGREEMENT made in duplicate this 17th day of November, 2017, between **THE BOSTON CONSULTING GROUP OF CANADA LIMITED** ("BCG"), a corporation duly incorporated pursuant to the laws of Ontario, and **HYDRO ONE NETWORKS INC.** ("HONI"), a corporation duly incorporated pursuant to the laws of Ontario (individually also referred to as a "Party" and collectively referred to as "Parties").

WHEREAS the Parties have entered into, and/or will be entering into, one or more contracts whereby BCG ha performed, and/or will be performing, various consulting, advisory and other services for HONI (collectively, referred to as the "Project");

AND WHEREAS each of the Parties is in possession of information which it considers proprietary or sensitive but which it wishes to disclose to the other Party solely for the purposes of the Project;

AND WHEREAS each of the Parties wishes to maintain its proprietary rights to and the confidentiality of the information it discloses to the other Party solely for the purposes of the Project.

NOW THEREFORE in consideration of the mutual covenants and promises hereinafter set forth and for other good and valuable consideration, the receipt and sufficiency of which are hereby irrevocably acknowledged, the Parties agree as follows:

1. For the purposes of this Agreement, the following definitions will apply:

   (a) "Confidential Information" means all information, whether transmitted orally, electronically or in written form, relating to the business, operations, processes or technology of the Disclosing Party or any of its affiliates, which shall include but not be limited to all data, reports, interpretations, financial statements, forecasts and records containing or otherwise reflecting information concerning the Disclosing Party or any of its subsidiaries or affiliates which the Receiving Party or its Representatives may receive from the Disclosing Party in the course of discussions, including without limitation, general business and marketing strategies (including pricing policies, cost and profit information, customer information, supplier information and the like), product development plans, information relating to the design of equipment or facilities or products, trade secrets, together with other documents, which contain or otherwise reflect information regarding the Disclosing Party and/or any of its affiliates, which the Disclosing Party (and/or its affiliates) treats as confidential or proprietary. Without limiting the generality of the foregoing, Confidential Information shall specifically include the information and fact that discussions, negotiations and/or investigations are taking place between the Parties in respect of the Project, the status, terms, conditions or any other facts with respect to the Project and the fact that the Receiving Party (or any of its Representatives) has been provided with the Confidential Information;

   (b) "Disclosing Party" means the Party disclosing the Confidential Information;

   (c) "person" shall include individuals, trusts, partnerships, firms and corporations or any other legal entity;

   (c) "Receiving Party" means the Party receiving Confidential Information and such of its Representatives;

   (d) "Representative" means a person controlling or controlled by or under common control of a Party and each of the respective directors, officers, employees, consultants, agents or legal, financial or professional advisors of a Party, or such Party's Representative.

2. Recitals

The recitals in this Agreement are acknowledged as true and correct in substance and in fact and are hereby incorporated into and form part of this Agreement.

3. Exchange of Confidential Information

Pursuant to the terms and conditions contained herein, each of the Parties may disclose at its sole discretion and may receive Confidential Information for the purposes of the Project. Notwithstanding any such disclosure, the Confidential

Information shall remain the sole and exclusive property of the Disclosing Party that has disclosed the Confidential Information and the Disclosing Party shall retain all right, title and interest in and to the Confidential Information it has disclosed to the Receiving Party. The Receiving Party shall at all times maintain the Confidential Information in strict confidence and shall use the Confidential Information solely for purposes of the Project. In addition, the Receiving Party shall not, subject to section 5 below, publish, reproduce, copy, disseminate or disclose the Confidential Information to others without the Disclosing Party's prior written consent.

4. Information that is not confidential

Confidential Information shall not include information which:

(a) is previously known to or lawfully in the possession of the Receiving Party prior to the date of disclosure as evidenced by the Receiving Party's written record;

(b) is independently known to or discovered by the Receiving Party, without any reference to the Confidential Information;

(c) is obtained by the Receiving Party from an arm's length third party having a bona fide right to disclose same and who was not otherwise under an obligation of confidence or fiduciary duty to the Disclosing Party or its Representatives;

(d) is or becomes public knowledge through no fault or omission of, or breach of this Agreement by, the Receiving Party or its Representatives; or

(e) is required to be disclosed pursuant to a final judicial, governmental, or tribunal order or other legal process.

5. Disclosure to Representatives

The Receiving Party is permitted to disclose the Confidential Information only to such of its Representatives who need to know the Confidential Information for the purposes of the Project and only if such Representatives have agreed to be bound by the terms hereof. The Receiving Party hereby specifically covenants and agrees that it shall ensure that its Representatives comply with and are bound by the terms and conditions of this Agreement. The Receiving Party further covenants and agrees that it shall defend, indemnify and hold harmless the Disclosing Party and its successors and assigns, its employees, servants, agents, contractors and subcontractors from and against all suits, actions, damages, claims and costs arising out of any breach of this Agreement by the Receiving Party or any of its Representatives.

6. Compelled Disclosure

In the event that a Receiving Party, or anyone to whom a Receiving Party transmits Confidential Information pursuant to this Agreement or otherwise, becomes legally compelled to disclose any Confidential Information, the Receiving Party will provide the Disclosing Party with prompt notice so that the Disclosing Party may seek injunctive relief or other appropriate remedies and/or waive compliance with the provisions of this Agreement. In the event that the Disclosing Party is unable to obtain injunctive relief or other remedies, the Receiving Party will exercise reasonable efforts to prohibit the further transmission of the Confidential Information. In the event that both Parties are unable to prevent the further transmission of the Confidential Information, the Receiving Party will, or will use reasonable efforts to cause such person to whom the Receiving Party transmitted the Confidential Information to furnish only that portion of the Confidential Information, which the Receiving Party is advised by written opinion of counsel is legally required to be furnished by the Receiving Party to such person and exercise reasonable efforts to obtain assurances that confidential treatment will be afforded to that portion of the Confidential Information so furnished.

7. Records with respect to Confidential Information

The Receiving Party shall keep a record of all written Confidential Information furnished to it and of the location of such Confidential Information. All Confidential Information, including that portion of the Confidential Information which is contained in analyses, compilations, studies or other documents prepared by the Receiving Party or by its Representatives, is the Disclosing Party's property and will be returned immediately to the Disclosing Party upon its request and the Receiving Party agrees not to retain any copies, extracts or other reproductions in whole or in part. The Receiving Party shall not make copies of the Confidential Information unless it receives the written authorization of the Disclosing Party to make such copies.

8. Liability of Disclosing Party

The Disclosing Party shall not be deemed to have made any representation or warranty as to the accuracy or completeness of any Confidential Information furnished hereunder. The Disclosing Party shall have no liability to the Receiving Party resulting from its use of the Confidential Information, unless such liability is created under some further contractual obligation between the Parties. Further, each Party agrees that it shall assume full responsibility for all conclusions it derives from the Confidential Information, and neither Disclosing Party nor any of its Representatives shall have any liability with respect thereto.

9. Remedies

The Receiving Party agrees that Disclosing Party would be irreparably injured by a breach of this Agreement and that the Disclosing Party shall be entitled to equitable relief, including a restraining order, injunctive relief, specific performance and/or other relief as may be granted by any court to prevent breaches of this Agreement and to enforce specifically the terms and provisions hereof in any action instituted in any court having subject matter jurisdiction, in addition to any other remedy to which the Disclosing Party may be entitled at law or in equity in the event of any breach of the provisions hereof. Such remedies shall not be deemed to be the exclusive remedies for a breach of this Agreement but shall be in addition to all other remedies available at law or equity.

10. Assignment

Neither Party may assign this Agreement or any of its rights and obligations hereunder without the prior written consent of the other Party, which may be unreasonably withheld. Subject to the foregoing, this Agreement shall extend to, be binding upon and enure to the benefit of the Parties hereto and their respective successors and permitted assigns.

11. Term

This Agreement shall be effective as of the date written above and shall remain in force for a period of seven (7) year(s) from the date on which Confidential Information was most recently disclosed between the Parties, unless otherwise mutually agreed by both Parties.

12. Notices

Notices required or permitted to be given under this Agreement shall be in writing and shall be deemed to have been properly given five business days after dispatch by registered or certified mail, one day after dispatch by facsimile transmission, addressed to the Party to whom it was sent at the address, or facsimile number, of such Party set forth below or at such other address or facsimile as the Party shall subsequently designate to the other Party by notice given in accordance with this paragraph or on the date of actual delivery if delivered by hand or by courier.

In respect of **THE BOSTON CONSULTING GROUP OF CANADA LIMITED**
Brookfield Place
181 Bay Street
Suite 2500
P.O. Box 783
Toronto, Ontario
M5J 2T3

Attention:	Andrew Loh
Title:	Partner and Managing Director
Email:	Loh.Andrew@bcg.com

In respect of **HYDRO ONE NETWORKS INC.**
483 Bay St.
South Tower, 8th Floor
Toronto, Ontario
M5G 2P5

Attention:	James Scarlett
Title:	Chief Legal Officer
Email:	jscarlett@hydroone.com

13. Severability

If any provision of this Agreement shall be held, declared or pronounced void, voidable, invalid, unenforceable or inoperative for any reason by any court of competent jurisdiction, government authority or otherwise, such holding, declaration or pronouncement shall not affect adversely any other provision of this Agreement which shall otherwise remain in full force and effect and be enforced in accordance with its terms and the effect of such holding, declaration or pronouncement shall be limited to the territory or jurisdiction in which made.

14. No Waiver

The failure of either Party to exercise any right, power or option or to enforce any remedy or to insist upon the strict compliance with the terms, conditions and covenants under this Agreement shall not constitute a waiver of the terms, conditions and covenants herein with respect to that or any other or subsequent breach thereof nor a waiver by the Party at any time thereafter to require strict compliance with all terms, conditions and covenants hereof, including the terms, conditions and covenants with respect to which the Party has failed to exercise such right, power or option. Nothing shall be construed or have the effect of a waiver except an instrument in writing signed by a duly authorized officer of the Party which expressly or impliedly waives a right, power or option under this Agreement.

15. Announcements

Except as required by law, no public announcement, press release, or other public disclosure concerning this Agreement or the Confidential Information provided pursuant to this Agreement shall be made by either Party, without the consent and approval of the other Party. Either Party may take such actions as it deems necessary to prevent such disclosure if in its sole opinion such disclosure is not mandatory. Neither Party shall make any statements or submissions on behalf of the other Party concerning this Agreement, the Confidential Information or the Project, without the express written consent of the other Party.

16. No Partnership

The Parties hereby acknowledge and agree that this Agreement does not create a licence, partnership, joint venture, agency or any other relationship between the Parties.

17. Entire Agreement

This Agreement constitutes the entire agreement between the Parties respecting the subject matter hereof and supersedes all prior negotiations, representations, understanding or agreements, written or oral, between the Parties.

18. Amendment

No amendment, modification or supplement to this Agreement shall be valid or binding unless set out in writing and executed by the Parties with the same degree of formality as the execution of this Agreement.

19. Applicable Law

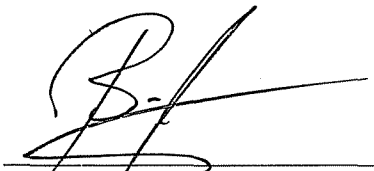
This Agreement shall be governed by and construed in accordance with the laws of the Province of Ontario and the laws of Canada applicable therein, and the Parties hereto irrevocably attorn to the exclusive jurisdiction of the courts of the Province of Ontario in the event of a dispute hereunder.

20. Counterparts

This Agreement may be executed in one or more counterparts and/or by fax, each of which shall be deemed an original and together shall constitute one and the same agreement.

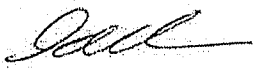
IN WITNESS WHEREOF the Parties hereto have caused this Agreement to be executed, as of the date first written above, by their respective representatives duly authorized in that behalf.

HYDRO ONE NETWORKS INC.



Name: Bruno Jesus
Title: Director, Strategy & Integrated Planning
I have authority to bind the corporation.

THE BOSTON CONSULTING GROUP OF CANADA LIMITED



Name: Andrew Loh
Title: Partner and Managing Director
I have authority to bind the corporation.

SEC INTERROGATORY #17

Reference:
TSP-01-04-14 p.28

Interrogatory:
The BCG, A BCG, Assessing Hydro One's Investment Planning Process – Final Report, states that: "Hydro One conducts a combination of qualitative and quantitative analysis to evaluate among different capital spending options and among capital and OM&A options. For transformers, NPV models are used to assess capital vs. OM&A tradeoffs, while for other types of stations assets, qualitative analysis is conducted to evaluate the risks and benefits of different capital and OM&A scenarios." Please provide a copy a sample analysis used for transformer assets, other station assets, and all other assets in which Hydro One conducts a quantitative tradeoff analysis. With respect to each analysis provided, please ensure the tradeoff methodology is clear within the document, and if not, please provide a separate explanation.

Response:
Please refer to OEB-019, part f, subsection a).

SEC INTERROGATORY #18

Reference:
TSP-01-04 p.20-23

Interrogatory:
For each study/report key finding, please provide Hydro One's view, as well as if applicable, if, when and how Hydro One will incorporate the finding into its capital planning process.

Response:
Exhibit B-1-1 TSP Section 3.2.4 describes how the plan reflects the surveys and audits Hydro One undertook. The "Key Findings" of this work found in Exhibit B-1-1 TSP Section 1.4 at pages 20-23 provide Hydro One with insight about its practices, but there is no action recommended. The table below describes the general approach Hydro One is takings regarding these findings:

Table 1 - Key Study Findings of PTX Analysis of Hydro One's Transformer Fleet

#	Key Study Findings	Study Reference	Hydro One's View
1	EPRI's PTX methodology has identified 129 transformers with elevated Normal Degradation Index (NDI) within Hydro One's fleet of transformers	Section 3 (Page 3-1)	NDI is an acceptable parameter to assess transformer condition; however, it shall be used in conjunction with other parameter such as DGA results. Hydro One's SME's reviewed the identified units by PTX, using other factors such as DGA and planned for replacement accordingly.
2	EPRI's PTX methodology has identified 88 transformers with elevated Abnormal Index that could consist of abnormal thermal, electrical and/or core problems within Hydro One's fleet of transformers	Section 3 (Page 3-1)	Abnormal indices are acceptable parameters to assess transformer condition. Hydro One's SME's reviewed the identified units and considering other factors such as tap changer oil influencing the test results and prepared the replacement plan.

3	A single transformer can have multiple indices at elevated levels within a single PTX analysis	Section 3 (Page 3-2)	Hydro One agrees.

Table 2 - Recommendations of PTX Analysis of Hydro One's Transformer Fleet

#	Recommendations	Study Reference	Hydro One's View
1	A transformer with a high abnormal index rating should be assessed / re-assessed in the short term.	Section 2 (Page 2-2)	Hydro One agrees.
2	A transformer with a high normal degradation index rating should be assessed for long term needs	Section 2 (Page 2-2)	Hydro One agrees. Provided other factors are also assessed.

Table 3 - Derivation of Transmission Substation Transformer Hazard Functions Key Study Findings

#	Key Study Findings	Study Reference	Hydro One's View
1	An updated methodology has been provided by EPRI to use a "prior distribution" to forecast probable number of replacements over a five year time period.	Section 3 (Pages 3-8, 3-17, 3-26, 3-35)	Hydro One agrees
2	Hazard curve function analysis suggests that the removal rate of Hydro One's fleet can be categorized in 2 regions, where Region 1 can closely approximate Hydro One failure rate.	Section 2 (Page 2-6)	Hydro One agrees
3	Hazard curve function analysis suggests that the removal rate in Region 2 is largely due to discretionary removal (planned replacement)	Section 2 (Page 2-6)	Hydro One agrees

Table 4 - Derivation of Circuit Breaker Hazard Functions Key Study Findings

#	Key Study Findings	Study Reference	Hydro One's View

1	Methodology is provided for using a "prior distribution" to forecast probable number of replacements over a five year time period.	Section 3 (Pages 3-9, 3-18, 3-27, 3-36, 3-45, 3-54, 3-63, 3-72, 3-81, 3-90, 3-99, 3-108, 3-117, 3-126)	Hydro One agrees.
2	Hazard curve function analysis suggests that the removal rate of Hydro One's fleet can be categorized in 2 regions, where Region 1 can closely approximate Hydro One failure rate.	Section 2 (Page 2-3)	Hydro One agrees.
3	Hazard curve function analysis suggests that the removal rate in Region 2 is largely due to discretionary removal (planned replacement)	Section 2 (Page 2-3)	Hydro One agrees.

Table 5 - Derivation of Overhead Conductor Hazard Function Key Study Findings

#	Key Study Findings	Study Reference	Hydro One's View
1	By applying EPRI's Weibull Hazard model, the ACSR conductor fleet median age for reaching EOL based on existing condition assessment data is about 90 years ("91 years").	Section 4 (Pages 4-3 to 4-4)	This finding, coupled with that in #2, resulted in Hydro One changing its expected service life (ESL) for ACSR transmission conductors to 90 years from 70 years.
2	By applying EPRI's Weibull Hazard model, the ACSR conductor fleet median age for reaching EOL, based on historical conductor replacements is about 90 years ("89.5 years").	Section 4 (Pages 4-3 to 4-5)	This finding, coupled with that in #1, resulted in Hydro One changing its excepted service life (ESL) for ACSR transmission conductors to 90 years from 70 years.
3	Based on Key Study Finding #1 above, an additional 2,264 km of conductor is expected to be beyond expected service life by 2024.	Section 5 (Page 5-3)	This finding supports the investments proposed in ISD SR-19 and SR-20

Table 6 – Operating Spare Transformer Requirement Assessment Key Findings

#	Key Study Findings	Study Reference	Hydro One's View
1	EPRI's independent analysis to determine the appropriate number of Operating Spare Transformers aligns with Hydro One's inventory.	Table 4-1 (Page 71)	Hydro One agrees.

Table 7 – Transformer Key Survey Findings

#	Key Findings	Report Reference	Hydro One's View
1	Around three-quarters of respondents used some formal definition of End of Life	Section 8 (Page 8-1)	This is a finding of the survey. Hydro One formally defines the estimated service life per transformer category.
2	Majority of participants expressed concerns when power transformer operates beyond 50 years.	Section 8 (Page 8-2)	This is a finding of the survey. Hydro One has different estimated service lifes for different classes of transformers.
3	Majority of participants target replacements based upon assessment of the asset using test and inspection data.	Section 8 (Page 8-3)	This is a finding of the survey, Hydro One also incorporates test and inspection data in addition to other factors such as a net present value calculation in its decision for replacement
4	Just over 50% of utilities budget for a specified number of replacements per year with the highest weights on condition of individual asset and budgetary constraints	Section 8 (Page 8-3)	This is a finding of the survey. Hydro One also considers the condition of individual assets and safety with a high weight in the replacement decision.
5	Half of utilities refurbish transformers to extend life	Section 8 (Page 8-3)	This is a finding of the survey. Hydro One does not perform refurbishment to extend life beyond ESL, Hydro One refurbishes assets to maintain a safe reliable service.
6	Majority of utilities do have a formal process or algorithm for assessing transformer condition. Nearly 75% of utilities use a risk-based approach with condition and system criticality ranking highest for their algorithm inputs	Section 8 (Page 8-3)	This is a finding of the survey. Hydro One has a formal process using a risked based approach under several categories such as Condition, Utilization, Criticality, Economics.

7	Most utilities that have a formal process or algorithm for assessing transformer condition do not allow the algorithm to automatically trigger a replacement	Section 8 (Page 8-3)	This is a finding of the survey. Hydro One employs a process to review asset analytics by SME's and then makes a final decision on replacement.

Table 8 – Circuit Breaker Key Survey Findings

#	Key Findings	Report Reference	Hydro One's View
1	Majority of respondents get concerned about breaker based on age beginning at approximately 44 years of age.	Section 8 (Pages 8-1 to 8-2)	This is a finding of the survey
2	Two-thirds of respondents do not run transmission circuit breakers to failure	Section 8 (Page 8-2)	This is a finding of the survey. Hydro One does not follow that process, we continue maintenance and assess asset condition.
3	Condition and safety are the two highest ranked criteria by respondents for replacing a breaker	Section 8 (Page 8-2)	This is a finding of the survey. Hydro One considers the condition of individual assets and safety with a high weight in the replacement decision.
4	Majority of utilities do not have a formal process or algorithm for assessing circuit breaker condition	Section 8 (Page 8-2)	This is a finding of the survey. Hydro one has a formal process.
5	Most utilities that have a formal process or algorithm for assessing circuit breaker condition do not allow the algorithm to automatically trigger a replacement	Section 8 (Page 8-2)	This is a finding of the survey. Hydro One employs a process to review asset analytics by SME's and then makes a final decision on replacement.
6	Majority of utilities do replace circuit breakers by type/family regardless of individual age or condition with decisions highly based on population condition, population ownership costs, population reliability, safety, and environmental impact.	Section 8 (Page 8-2)	This is a finding of the survey. Hydro One does not perform replacement by type/family only. Hydro One employs a process in reviewing assets using asset analytics results and SME's review.

SEC INTERROGATORY #19

Reference:
TSP-01-05 p.11

Interrogatory:
Please confirm that Hydro One did not develop a performance indicator that better reflected the satisfaction level of the ultimate end-use customer as directed by the Board in its EB-2016-0160 decision.

Response:
In its 2017 Transmission Customer Engagement Survey, Hydro One asked LDCs to identify whether or not their responses to the survey were informed by their own customer engagement activities for the purposes of their own rate applications. The LDC End-User Satisfaction section of TSP Section 1.5, pages 11, 12 and 13 also addresses the OEB's direction in EB-2016-0160.

Hydro One also contacted LDCs to solicit further approaches it could use to obtain feedback from LDC end-users, in the future. The feedback from LDCs included: (i) suggestions to continue using the account executive model to serve the needs of LDC customers, a program Hydro One has expanded as described above; (ii) that Hydro One meet with the large industrial customers of other LDCs, with Hydro One executives responding to customer concerns. Hydro One executed this suggestion and will facilitate future meetings as requested by LDCs; and (iii) that Hydro One may review LDC survey information, which it already takes into consideration during the course of its investment planning process. See TSP Section 1.3, pages 28 to 30.

SEC INTERROGATORY #20

Reference:
TSP-01-05 p.17

Interrogatory:
Please update table 6 to include 2018 actual information and forecast 2019 to 2022 information.

Response:
Please refer to SEC-022.

Witness: Bruno Jesus

SEC INTERROGATORY #21

Reference:
TSP-01-05 p.18

Interrogatory:
With respect to the proposed End-of-Life Right-Sizing Assessment Expectation measure:

a) Please provide further details regarding what is considered a right-sizing decision and an opportunity.

b) How many right-sizing opportunities occur annually, and a forecast to occur during the plan term.

c) Please explain why the measure is not simply a ratio of decisions to opportunities?

Response:
a) Hydro One considers right sizing to mean that the facilities installed are optimal or appropriate size for the requirement. Hydro One considers each end of life investment as a right sizing opportunity. Hydro One, as part of its role within the Regional Planning Process described in Exhibit B, Tab 1, Schedule 1, TSP Section 1.2, engages with the IESO and Local Distribution Companies to ensure that each investment is carefully considered. A detailed assessment of the multiple alternatives is undertaken based on several considerations, such as but not limited to, load forecast, cost, operating and maintenance flexibility, and resiliency. The decision on equipment sizing is made by the Regional Planning Study Team during the Regional Planning Process and documented in the Regional Infrastructure Plan report.

b) As mentioned in response to part (a), every end of life investment is considered a right sizing opportunity. Where forecasted demand growth or decline is identified during Regional Planning and where Hydro One is undertaking an end of life investment, considerations will be made to right-size transmission equipment, either by removing equipment in the case of decline, or upgrading equipment in the case of growth.

c) As outlined in Exhibit B, Tab 1, Schedule 1, TSP Section 1.5, pages 17 to 18, the qualitative measure of "Met" or "Not Met" for the End-of-Life Right-Sizing Assessment Expectation measure was introduced in response to the direction received by the OEB in its Decision and Order on EB-2016-0160. In this Decision the OEB requested Hydro One to consider expanding its Public Policy Responsiveness measures to include qualitative assessments of the company's response performance related to policy objectives.

SEC INTERROGATORY #22

Reference:

TSP-01-05 p.4

EB-2016-0160 B2-1-1, p.18, Table 3

Interrogatory:

Please revise Table 3 to include unit cost information for years 2016 to 2018, and forecast information for 2019 to 2022.

Response:

Please refer to the updated table below for 2016-2022 unit cost information.

Table 3: Unit Cost Metrics

Line of Bus.	Unit Metric	Actual Costs							Forecast Costs			
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Forestry	$/ brush control costs per hectare cleared	1,392	1,703	1,624	1,566	1,542	1,356	1,539	1,612	1,652	1,696	1,705
	$/ line km cleared	1,896	1,805	2,495	2,234	1,966	2,100	2,797	3,071	2,309	2,289	2,306
Provincial Lines	$/ wood structure condition assessment	510	410	400	486	342	602	365	409	375	378	381
	$/ wood structure replacement	40,432	44,158	56,370	49,806	77,348	44,208	48,565	62,164	63,766	65,042	66,278
	$/ 115 kV tower coated	*To be measured going forward*				26,496	47,739	35,897	27,089	24,733	24,880	25,028
	$/230kV tower coated								43,600	39,981	40,207	40,460
	$/Cable Locate	N/A	200	230	251	271	256	224	247	252	257	262

2018 and 2019 Line Clearing unit costs are higher than average due to Hydro One's efforts to ensure that corridors are cleared to design width and increased work requirements to maintain urban corridors to Transmission industry and NERC standards. As this work is completed, unit costs are expected to return to the historical average.

The 2019-2022 forecasted values for wood structure replacements are based on the plan to disaggregate this investment. Refer to I-01-OEB-126, answer b).

The previous cable locate unit costs only included the administrative costs of processing locate requests. It is more appropriate to report the cost per field locate. These values were tracked in detail starting in 2013.

SEC INTERROGATORY #23

Reference:
TSP-01-05-01

Interrogatory:
With respect to the Performance Reporting Governance Framework:

a) Is a team scorecard the same as the corporate scorecard? If not, please explain the difference.

b) Please provide the most recent Operational Scorecard.

Response:
Please refer to Exhibit I, Tab 12, Schedule AMPCO-19.

SEC INTERROGATORY #24

Reference:
TSP-01-06 p.2

Interrogatory:
Please provide a copy of an internal productivity framework, guide or similar document outlining how productivity savings should be calculated and/or tracked.

Response:
The description of Hydro One's productivity program and related governance is provided in TSP Section 1.6 and includes more comprehensive details from prior applications. This Exhibit explains the framework, governance process, tiered reporting structure and the methodology and review process.

See also Exhibit I, Tab 01, Schedule OEB-002.

SEC INTERROGATORY #25

Reference:
TSP-01-06 p.3

Interrogatory:
Hydro One states, "To ensure continuity in the planning process, rate filing applications, and tracking methodology, Hydro One's productivity initiatives are considered using 2015 as the baseline year for evaluating savings of legacy initiatives". Please explain what is meant by this and provide an illustrative example to show the calculation of a legacy initiative.

Response:
The creation of Hydro One's current productivity plan began with a subset of initiatives that were identified in 2015-2016 (post-IPO). The 'first set' of 'legacy initiatives' utilized 2015 data points as the baseline when measuring savings and quantifying targets. As the program evolved, Hydro One needed to manage and monitor the performance of committed initiatives, while ensuring new opportunities can be identified in the productivity plan. Legacy initiatives utilized their existing baseline while new initiatives would not be subject to the same baseline, as the benefits would have to be incremental in order to drive continuous improvement.

An example of an initiative where the legacy baseline cost (and scope) was used as the basis for monitoring savings in the current application is the Overtime Reductions initiative which is a targeted effort to reduce the number of relative overtime hours worked.

Calculation Example for 2020 Actuals:
Savings: ((% of OT on 2015 Reg hours x 2020 Reg Hours worked) - 2020 OT hours)
*Avg OT Rate

OT Hours related to Demard/Emergency work will be removed from calculation in both base and actuals.

Hydro One established this approach to ensure that it can provide consistent updates on past performance while considering the link to future performance during rate application

proceedings. Hydro One intends to set a new baseline for all initiatives in support of the joint Distribution and Transmission filing (2023-2027).

SEC INTERROGATORY #26

Reference:
TSP-01-06 p.7

Interrogatory:
With respect to 'defined' savings:

a) Please provide a table that breaks all actual and forecast productivity savings beginning in 2017 (or earlier if tracked) to 2024, by initiative.

b) Please explain how the savings for each initiative was calculated.

Response:
Please see below for response to parts a) and b).

Note: The allocation of Common initiatives to OM&A and Capital can be found in TSP Section 1.6 Table 1.

				Updated Savings								
Category		Initiative Grouping	Measurement and Expected Benefit	2016A	2017A	2018A	2019	2020	2021	2022	2023	2024
Capital	Operations	Engineering	Cost Reduction from Software Implementation *Estimated by quantifying the expected FTE reductions in Engineering through the implementation of EDM software enhancements*	$ -	$ -	$ -	$ 0.4	$ 0.9	$ 1.1	$ 1.4	$ 1.4	$ 1.4
		Fleet Telematics and Right-Sizing	Fleet Rationalization - Unit Based Capital Plan Reduction *Estimated by utilizing Telematics data on fleet utilization and then measures the expected unit based reduction in the capital plan*	$ -	$ 1.9	$ 10.2	$ 10.6	$ 11.0	$ 11.1	$ 11.4	$ 11.6	$ 11.3
		Transmission and Stations	Cost Reduction based on Historical spend *Expected Capital allocation based on historical spend for Transmission and Stations efficiencies and Temporary work HQ. Calculated by measuring expected benefit per occurrence*	$ -	$ 1.8	$ 0.6	$ 0.7	$ 0.7	$ 0.7	$ 0.7	$ 0.7	$ 0.7
		OT Reductions	Overtime Reductions *Targeted effort to reduce the number of relative OT hours worked as a % vs prior year baseline*	$ -	$ 1.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5
		Procurement	Lower Cost per Unit - Historical Baseline vs Actual *Savings are estimated at a category level based on historical spend, expected and achieved negotiated savings, and updated per business plan assumptions (Capital program spend)*	$ 1.2	$ 12.8	$ 27.9	$ 25.1	$ 30.3	$ 34.9	$ 35.8	$ 35.7	$ 37.1
		Progressive Defined	Targeted Efficiencies - Defined *Efficiencies that have been allocated to specific Operating initiatives that are not yet proven. Allocations taken in Business Plan based on preliminary estimates. Ex - Hydro Vac reduction, Temp Access Roads*	$ -	$ -	$ -	$ 5.0	$ 6.1	$ 11.6	$ 11.6	$ 10.1	$ 10.1
		Progressive Undefined	Targeted Efficiencies - Undefined *Escalating commitment of 1-3% of capital work program to be allocated to future initiatives as they are defined. Included as a Top Line capital reduction*	$ -	$ -	$ -	$ -	$ 10.9	$ 27.4	$ 49.4	$ 67.9	$ 80.9
		Scheduling Tool	Cost Reduction from Software Implementation *Estimated by quantifying the expected FTE reductions in Scheduling Staff through the implementation of software enhancements*	$ -	$ -	$ 0.2	$ 0.9	$ 0.9	$ 0.9	$ 0.9	$ 0.9	$ 0.9
		Wrench Time	Lower Cost Per Unit of Operation *Utilize unit reporting to compare like for like work in actuals vs baseline year to determine $ savings per operation.*	$ -	$ -	$ -	$ 0.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5
OM&A	Information Technology	Contract Reductions	Cost Reduction Based on Historical Spend *Lower cost resulting from Inergi IT Contract renegotiation. Measured against baseline spend for same scope of work*	$ 2.0	$ 2.3	$ 6.6	$ 6.3	$ 6.4	$ 8.9	$ 9.6	$ 9.6	$ 9.6
	Operations	Engineering	Cost Reduction from Software Implementation *Estimated by quantifying the expected FTE and contractor reductions in Engineering through the implementation of PCMIS software enhancements*	$ -	$ -	$ 0.7	$ 0.6	$ 0.6	$ 0.6	$ 0.6	$ 0.6	$ 0.6
		Fleet Telematics and Right-Sizing	Fleet Rationalization - Unit Based Capital Plan Reduction *Estimated by utilizing Telematics data on fleet utilization and then measures the expected unit based reduction in the capital plan*	$ -	$ 0.5	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -
		Forestry Initiatives	Lower Cost per KM *Estimated based on reductions in cost due to staff policy for inclement weather and expected overall unit volume reduction in trouble calls*	$ -	$ -	$ 1.3	$ 2.1	$ 2.0	$ 3.4	$ 2.0	$ 2.4	$ 1.9
		Transmission and Stations	Cost Reduction based on Historical spend *Expected OM&A allocation based on historical spend for Transmission and Stations efficiencies and Temporary work HQ. Calculated by measuring expected benefit per occurrence*	$ -	$ 0.8	$ 1.8	$ 1.2	$ 1.2	$ 1.2	$ 1.2	$ 1.2	$ 1.2
		Network Operating Efficiencies	Operational Program Efficiencies *Unit cost reduction in completing Load Transfer studies through Network Operating group*	$ -	$ -	$ 0.4	$ 1.0	$ 1.0	$ 1.0	$ 1.0	$ 1.0	$ 1.0
		OT Reductions	Overtime Reductions *Targeted effort to reduce the number of relative OT hours worked as a % vs prior year baseline*	$ -	$ 1.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5	$ 0.5
		Procurement	Lower Cost per Unit - Historical Baseline vs Actual *Savings are estimated at a category level based on historical spend, expected and achieved negotiated savings, and updated per business plan assumptions*	$ 1.8	$ 2.9	$ 1.7	$ 0.9	$ 0.8	$ 0.8	$ 0.9	$ 0.8	$ 0.8
		Scheduling Tool	Cost Reduction from Software Implementation *Estimated by quantifying the expected FTE reductions in Scheduling Staff through the implementation of software enhancements*	$ -	$ -	$ 0.2	$ -	$ -	$ -	$ -	$ -	$ -
		Wrench Time	Lower Cost Per Unit of Operation *Utilize unit reporting to compare like for like work in actuals vs baseline year to determine $ savings per operation.*	$ -	$ -	$ 1.5	$ 2.3	$ 2.3	$ 2.3	$ 2.3	$ 2.3	$ 2.3
CCC	Corporate	Corporate Initiatives	Corporate Cost Initiative *Identified reductions in vacancies and contractor and consulting spending*	$ 2.3	$ 1.2	$ 1.4	$ 20.1	$ 19.1	$ 16.5	$ 13.6	$ 11.3	$ 9.4
	Operations	Procurement	Lower Cost per Unit - Historical Baseline vs Actual *Savings are estimated at a category level based on historical spend, expected and achieved negotiated savings, and updated per business plan assumptions (Corporate Allocation)*	$ 0.1	$ 1.8	$ 5.4	$ 2.3	$ 2.3	$ 2.3	$ 2.3	$ 2.3	$ 2.3
			Total Capital	**$ 1.2**	**$ 18.0**	**$ 39.4**	**$ 43.6**	**$ 61.7**	**$ 88.7**	**$ 112.2**	**$ 129.2**	**$ 143.4**
			Total OM&A	**$ 3.8**	**$ 8.0**	**$ 14.8**	**$ 14.7**	**$ 14.7**	**$ 18.6**	**$ 17.9**	**$ 18.3**	**$ 17.8**
			Total Common	**$ 2.3**	**$ 3.1**	**$ 6.8**	**$ 22.4**	**$ 21.5**	**$ 18.8**	**$ 16.0**	**$ 13.6**	**$ 11.7**
				$ 7.3	**$ 29.1**	**$ 61.0**	**$ 80.8**	**$ 97.9**	**$ 126.1**	**$ 146.1**	**$ 161.1**	**$ 172.9**

1

SEC INTERROGATORY #27

Reference:

TSP-02-01

Interrogatory:

Please provide a table that shows both the total, and for each category of capital expenditures (i.e. system renewal, system service etc), the number of candidate investments considered/included in each stage of the investment planning process.

Response:

The total number of candidate investments considered at each stage of the investment planning process for the current application is outlined in Table 1 below.

Table 1: Number of Candidate Investments

Category	Investment Planning Process Stage			
	Candidate Investment Development	Prioritization and Optimization	Enterprise Engagement	Develop Final Plan/Review and Approval
System Renewal	80	84	85	84
System Access	348	313	319	340
System Service	41	44	44	44
General Plant	108	91	93	95
Total	**577**	**532**	**541**	**563**

SEC INTERROGATORY #28

Reference:
TSP-02-01

Interrogatory:
Please provide a table that shows both the total, and for each category of capital expenditures (i.e. system renewal, system service etc), the capital expenditure budget at each stage of the investment planning process. (Note: For reference to a similar chart from the previous proceeding, see Undertaking J8.1, Attachment)

Response:
The capital expenditures at each stage of the investment planning process are outlined in Table 1 below.

Table 1: Capital Spending Forecast (Millions)

Category	Investment Planning Process Stage			
	Candidate Investment Development	**Prioritization and Optimization**	**Enterprise Engagement**	**Develop Final Plan/Review and Approval**
System Access	87	85	63	65
System Renewal	6,326	4,989	4,992	5,512
System Service	727	1,027	1,018	883
General Plant	476	439	439	447
Progressive Productivity Placeholder	N/A	N/A	N/A	(286)
Directive Adjustment[1]	N/A	N/A	N/A	(2)
Total	**7,616**	**6,540**	**6,511**	**6,619**

[1] The Directive Adjustment reflects the impact of the directive issued by Ontario's Management Board of Cabinet on February 21, 2019 and the associated compensation framework they approved on March 7, 2019. Refer to Exhibit F, Tab 4, Schedule 1 for further details.

Witness: Bruno Jesus

SEC INTERROGATORY #29

Issue from Draft List:
[Issue Group]

Reference:
TSP-02-01

Interrogatory:
Please explain what overall budget constraints were included in the investment planning process.

Response:
As described in Exhibit B, Tab 1, Schedule 1, Section 2.1, page 8, the basis for the upfront allocation was based on the expenditure level included in the prior year's plan, adjusted for efficiency gains and new strategic directions as presented in Figure 5, which was informed by feedback received through the customer engagement process.

The budget constraints reflect an appropriate balance between rate impacts and outcomes, consistent with customer preference for Scenario C, which reflects long-term reliability performance improvement with level rate increases in the future (as opposed to higher future rate increases for example). The total 5 year capital investment plan associated with Scenario C was $6.6B from 2019-2023, or $1.3B per year on average.

SEC INTERROGATORY #30

Reference:

TSP-02-01

Interrogatory:

Please explain where rate impact is considered within the investment planning process.

Response:

Rate impacts are directly considered during the following investment planning process phases:

- Investment planning context: rate impacts are considered as part of the overall envelope setting process, informed by customer engagement feedback, risk, and consideration of asset and system needs.
- Prioritization and optimization: rate impacts are considered as part of portfolio review and trade-off discussions of investments
- Review and approval: rate impacts are considered as part of the approval of the business plan.

SEC INTERROGATORY #31

Reference:
TSP-02-01 p.39

Interrogatory:
Please provide a copy of any rubrics, guides, or similar documents that set out how the probability and consequence scores are defined.

Response:
Refer to Exhibit B-1-1 TSP Section 2.1 page 33-36.

SEC INTERROGATORY #32

Reference:

TSP-02-01 p.39

Interrogatory:

Hydro One states: "Based on the risk scores and cost estimates associated with each investment, candidate investments (broken into mandatory versus discretionary groups) are ranked according to risk mitigation achieved per dollar".

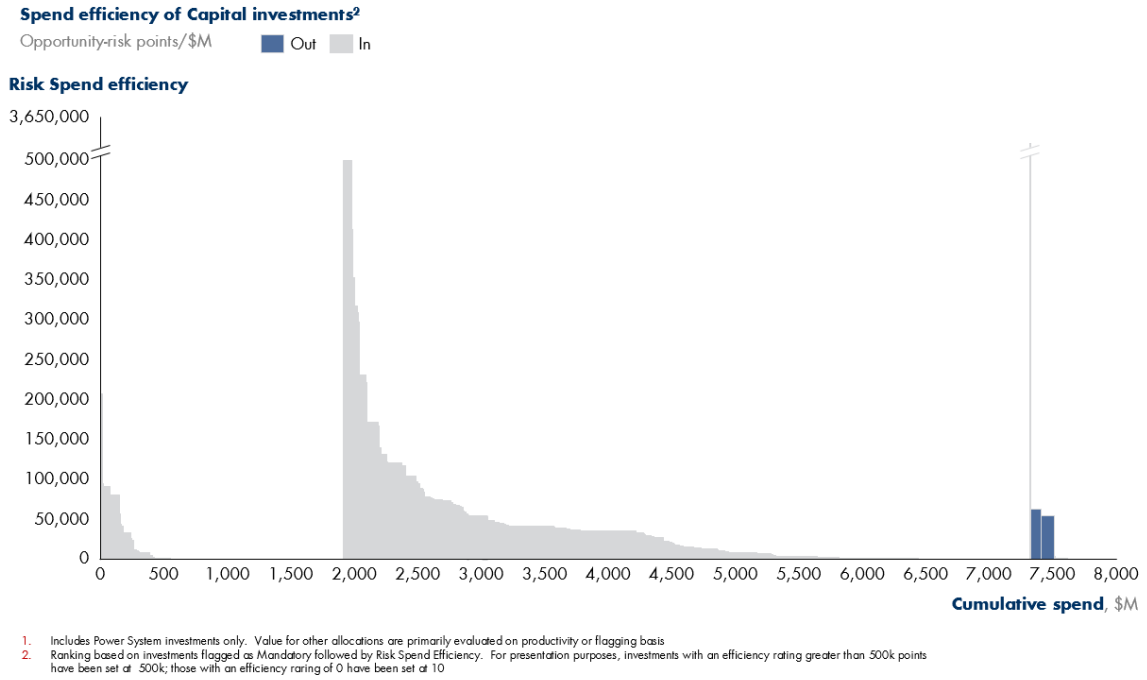
a) Please provide a copy of the described ranking.

b) Please indicate which projects are included in the final investment plan that are part of this application.

Response:

a) The figure below is a Spend Curve that depicts a ranking of power system investments by Risk Spend Efficiency (y axis) against cumulative spend in millions (x axis).

Tx Capital – Power Systems – Risk Spend Efficiency Chart



1. Includes Power System investments only. Value for other allocations are primarily evaluated on productivity or flagging basis
2. Ranking based on investments flagged as Mandatory followed by Risk Spend Efficiency. For presentation purposes, investments with an efficiency rating greater than 500k points have been set at 500k; those with an efficiency raring of 0 have been set at 10

b) Investments shown in grey are included as part of the investment plan for this rate application, while investments in blue have been excluded.

SEC INTERROGATORY #33

Reference:
TSP-02-02 p.1

Interrogatory:
Hydro One states that Expected Service Life (ESL) is determined based on manufacturer guidelines historical asset retirement data:

a) Please explain why Hydro One used manufacturer guidelines versus historic data.

b) Please provide a list of assets and their ESL. Please indicate which assets are not based on wholly historical data.

c) Is the historic asset retirement data that Hydro One uses based on the Fosters Report that has been previously filed in the EB-2016-0160 proceeding or the version filed in this application (F-6-1, Attachment 1)? If not, what is the source?

Response:
a) Hydro One uses both manufacturer guidelines and Hydro One's historical asset retirement data to estimate ESL. Manufacturers have detailed knowledge of the design and degradation mechanisms of their products, allowing them to set ESL guidelines. For assets where retirement data is limited, manufacturer guidelines are helpful in establishing and substantiating ESL values.

b) The following table summarizes the power system equipment ESL levels provided in Exhibit B-1-1 TSP Section 2.2.

Asset	ESL (years)
Overhead Conductor	
ACSR	90
Copper	70
Aluminum	100
ACSS	N/A - Relatively new conductor type to Hydro One, limited installation, ESL to be established
Underground Cables	
LPLF	70
HPLF	70

Witness: Samir Chhelavda, Donna Jablonsky

XLPE	50
Structures and Foundations	
Steel Towers	80
Steel Poles	80
Wood Poles	50
Cast-in Concrete Footings	100+
Steel Grillage Footings	80
Steel Anchors	80
Shieldwire	
Galvanized Steel	50
Alumoweld	60
OPGW	40
ACSR	90
Copperweld	N/A - ESL is not applicable to Copperweld as it is end of life regardless of age
Protection	
Solid State	25
Electro-mechanical	45
Microprocessor	20
Transformer	
Step-down	40-60
Auto	40-50
Phase Shifter	40
Regulator	40
Reactor	40
Breakers	
Oil Breaker	55
Air Blast Breakers	40
SF6 Breakers	40
GIS Breakers	40
Metalclad Breakers	40
Vacuum Breakers	40

c) Historic asset retirement data is based on actual retirement data taken from Hydro One's financial systems, and analyzed in the Fosters report filed with this application.

SEC INTERROGATORY #34

Reference:

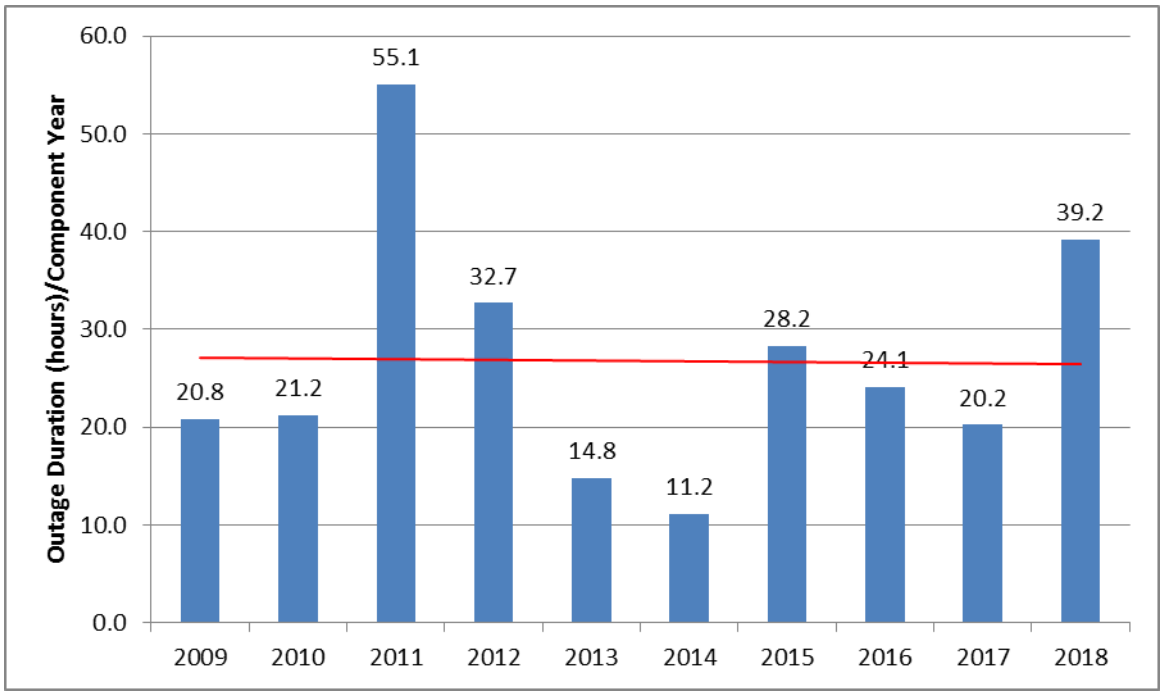
TSP-02-02

Interrogatory:

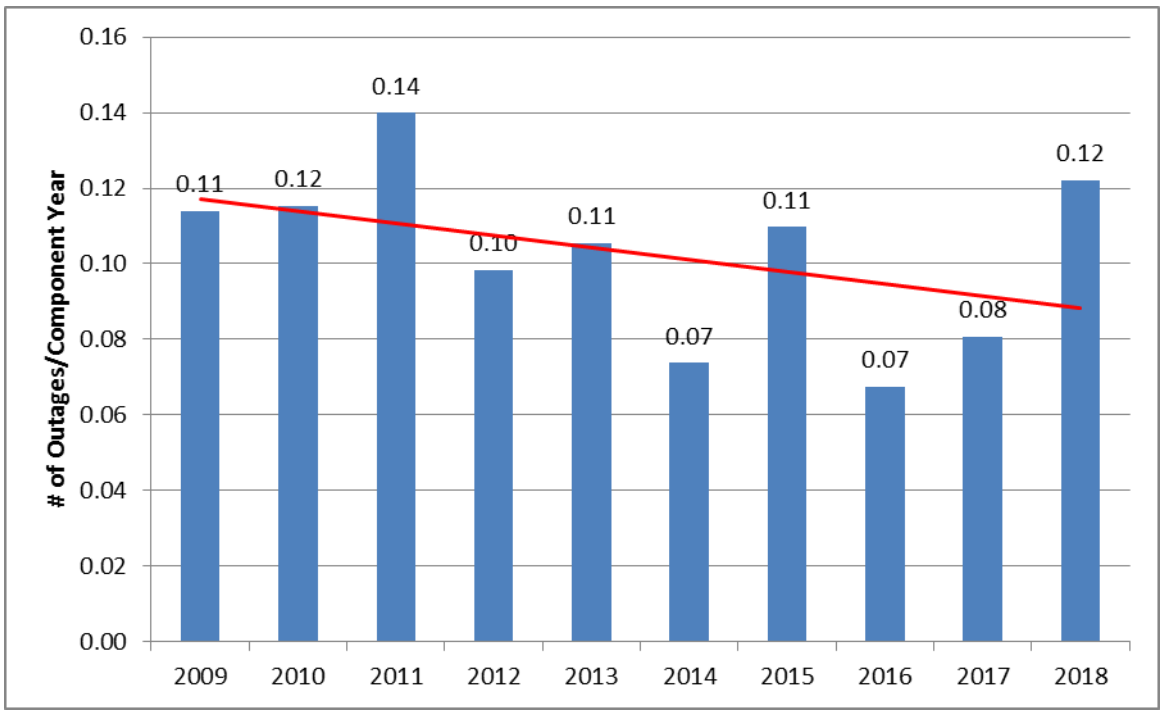
Please update all the forced outage frequency and duration figures in this section to include 2018 actual information.

Response:

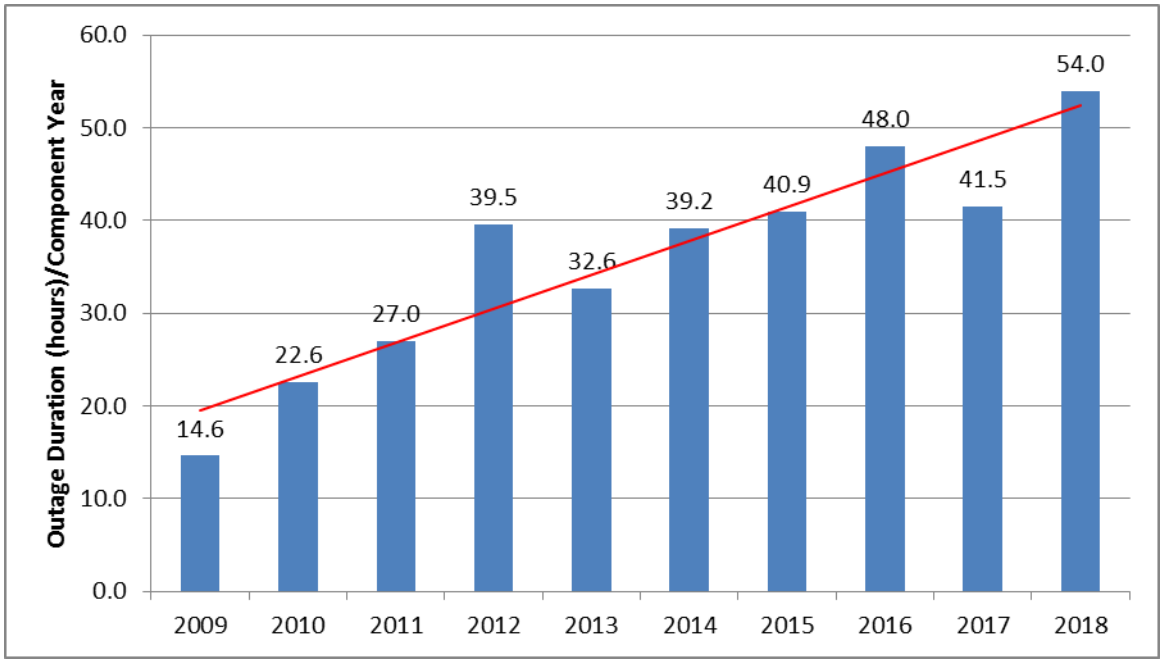
B1-1-1, TSP Section 2.2 Page 11: Figure 5-Forced Outage Duration of Transformers



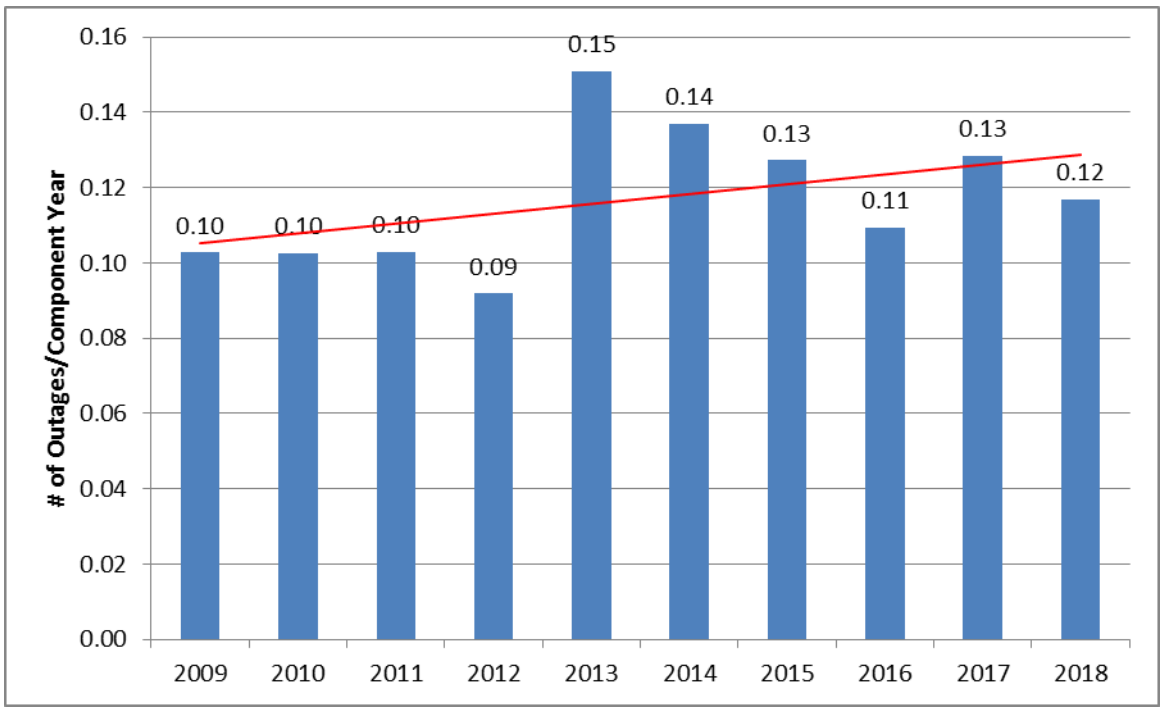
B1-1-1, TSP Section 2.2 Page 12: Figure 6-Forced Outage Frequency of Transformers



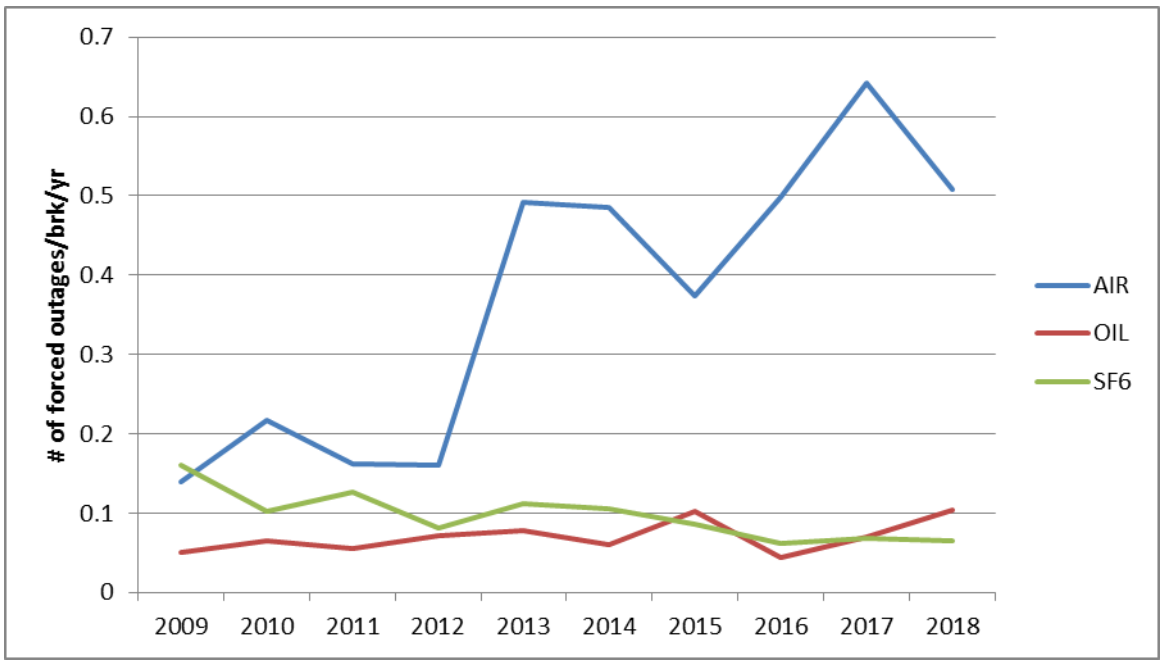
B1-1-1, TSP Section 2.2 Page 19: Figure 9-Circuit Breaker Forced Outage Duration



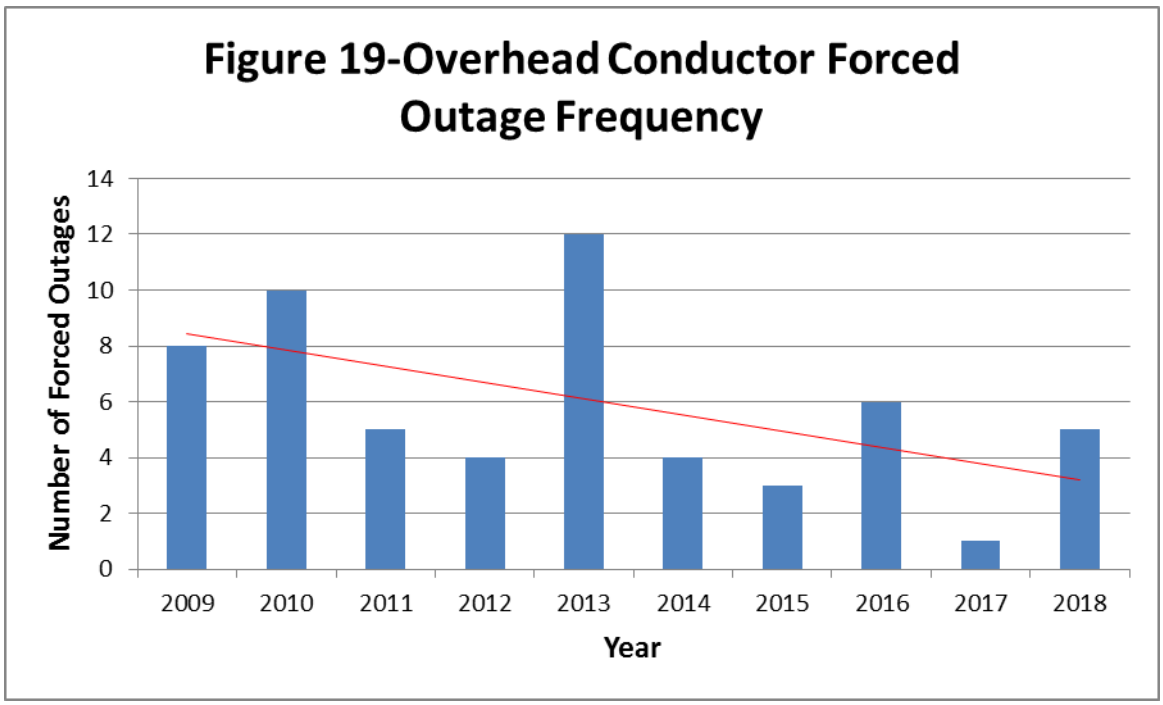
B1-1-1, TSP Section 2.2 Page 20: Figure 10-Circuit Breaker Forced Outage Frequency



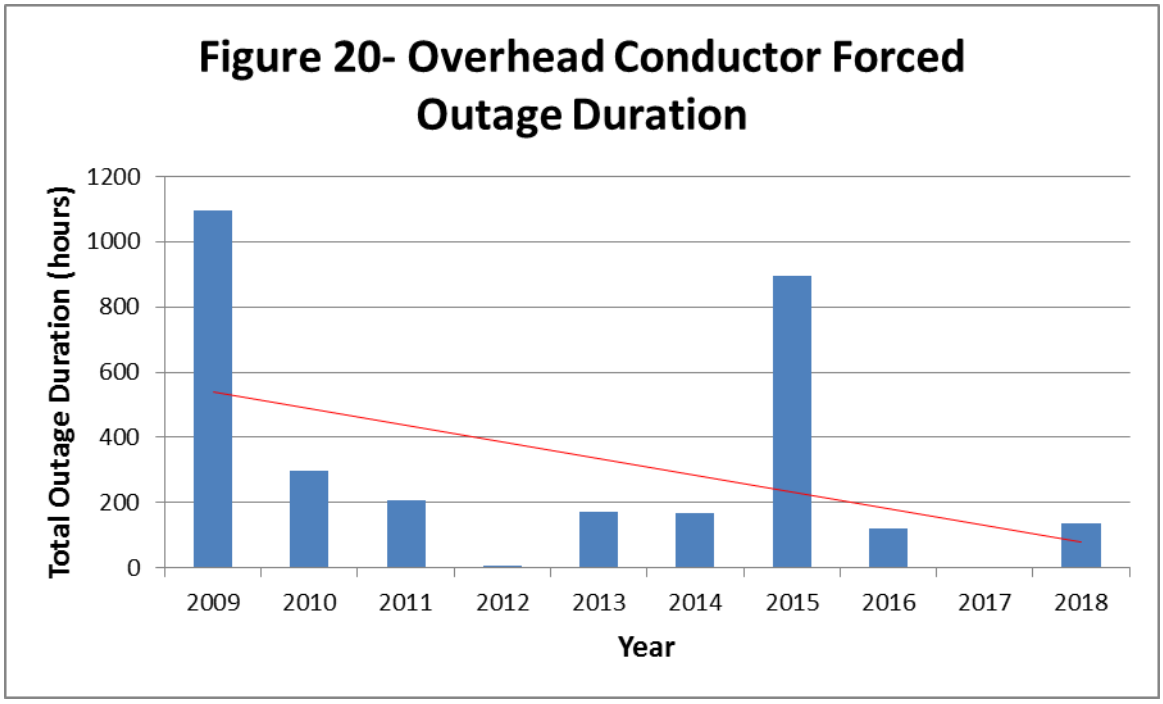
B1-1-1, TSP Section 2.2 Page 20: Figure 11-Summary of Forced Outage by Breaker Type



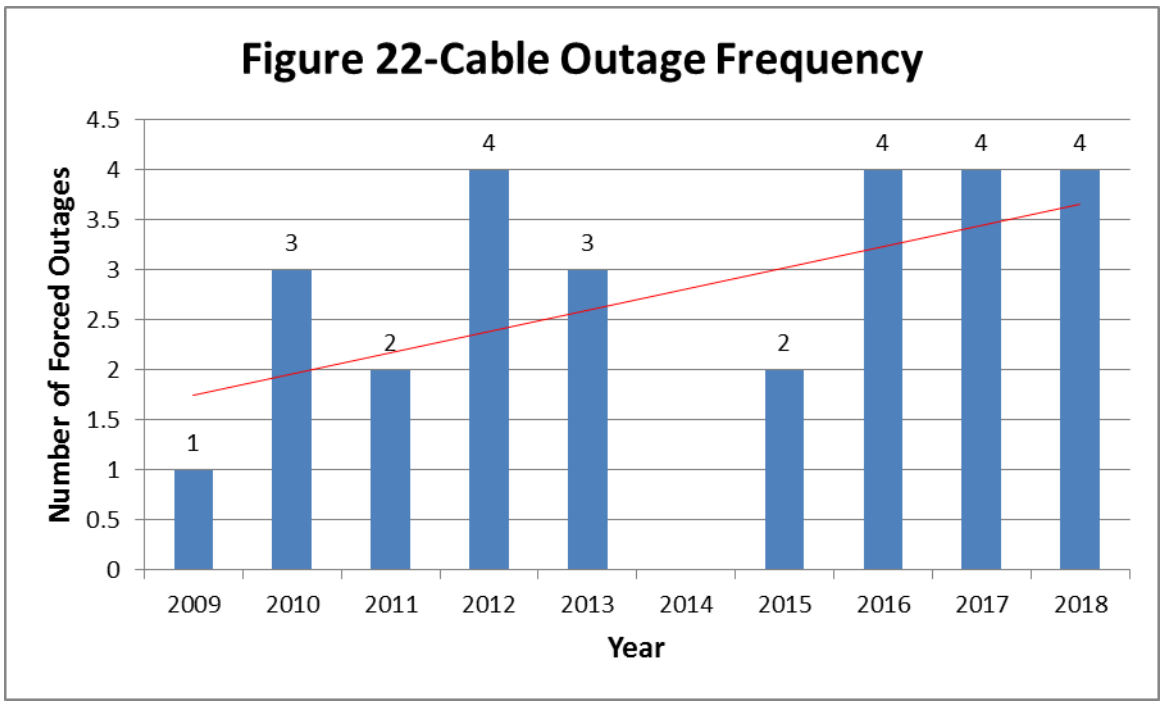
B1-1-1, TSP Section 2.2 Page 58: Figure 19-Overhead Conductor Forced Outage Frequency



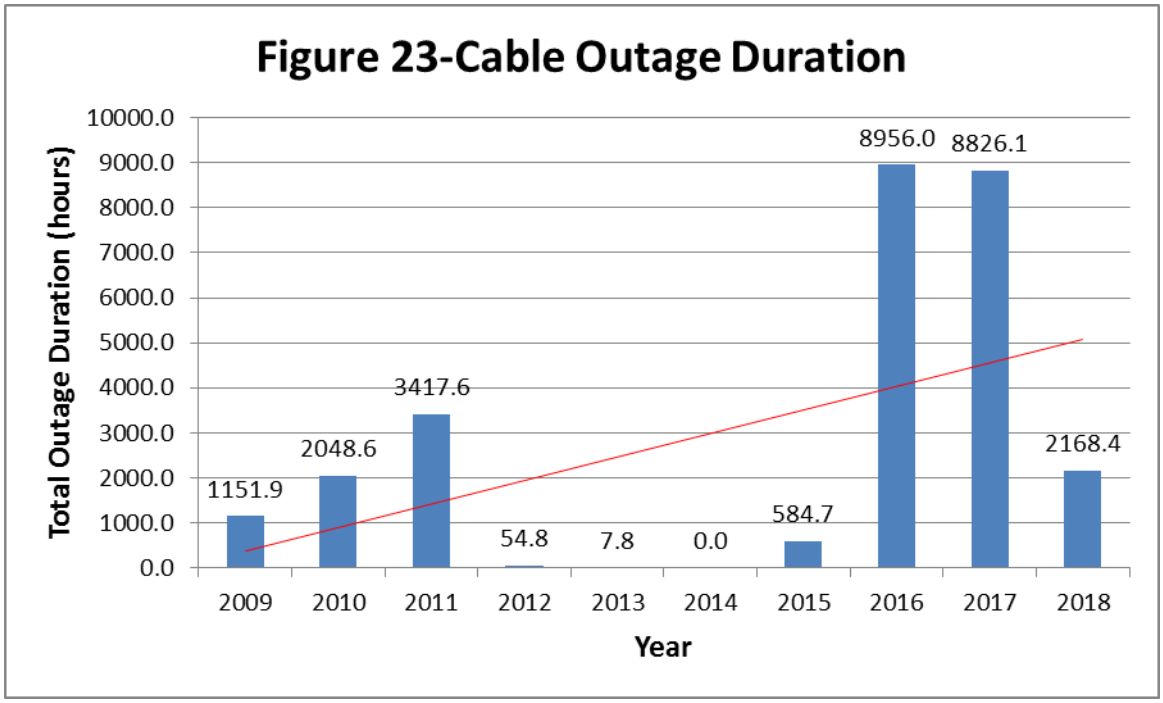
B1-1-1, TSP Section 2.2 Page XX: Figure 20- Overhead Conductor Forced Outage Duration



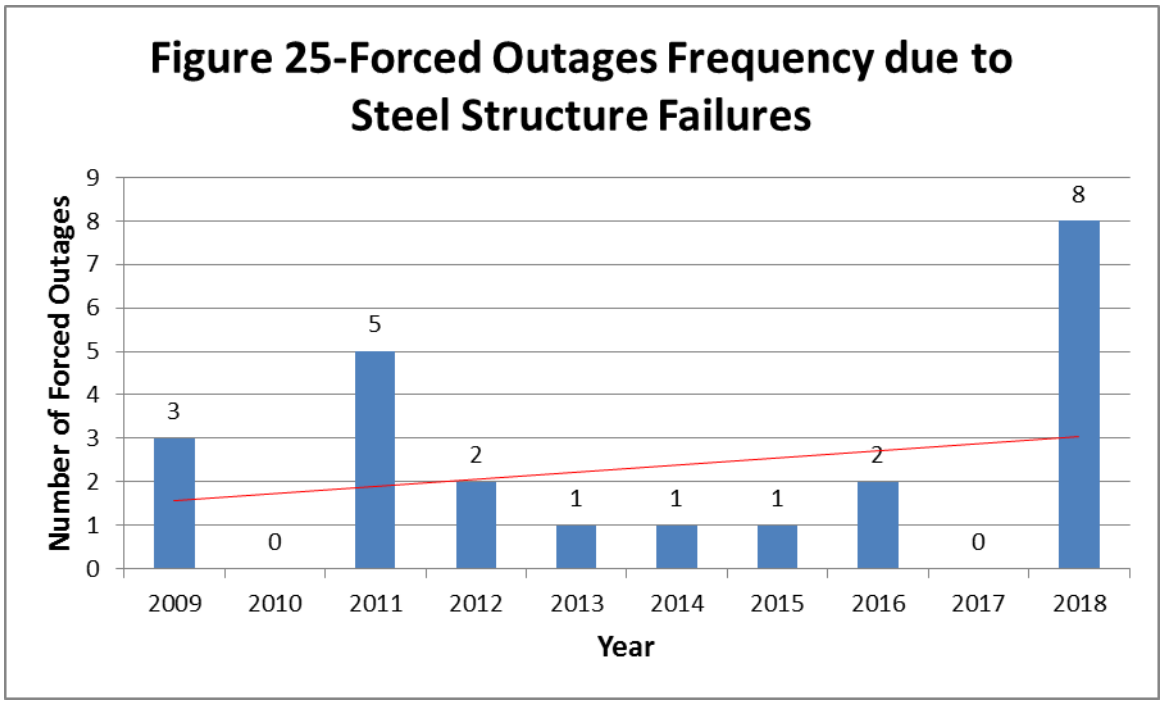
B1-1-1, TSP Section 2.2 Page 62: Figure 22-Cable Outage Frequency



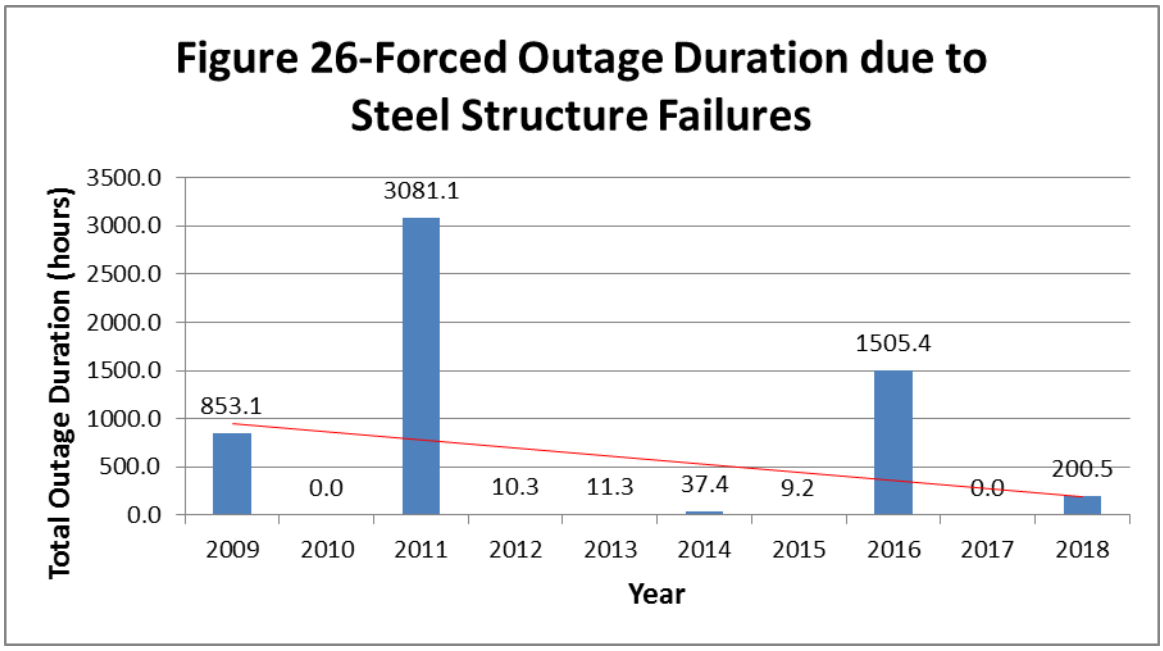
B1-1-1, TSP Section 2.2 Page 63: Figure 23-Cable Outage Duration



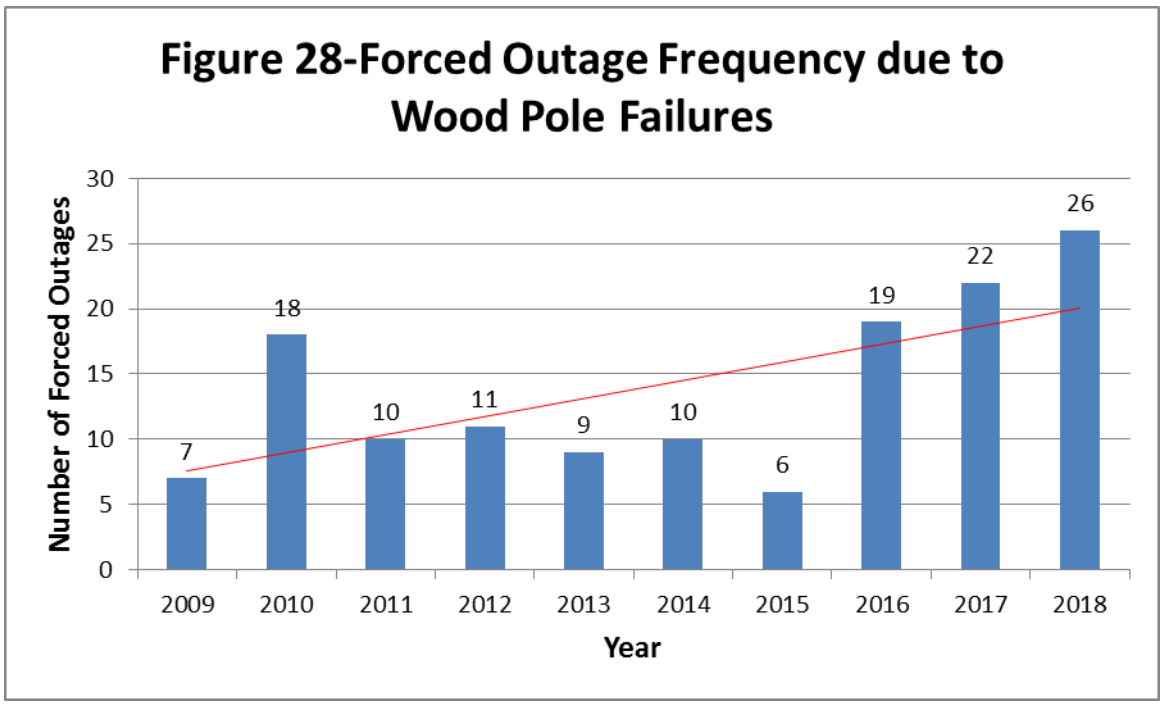
B1-1-1, TSP Section 2.2 Page 68: Figure 25-Forced Outages Frequency due to Steel Structure Failures



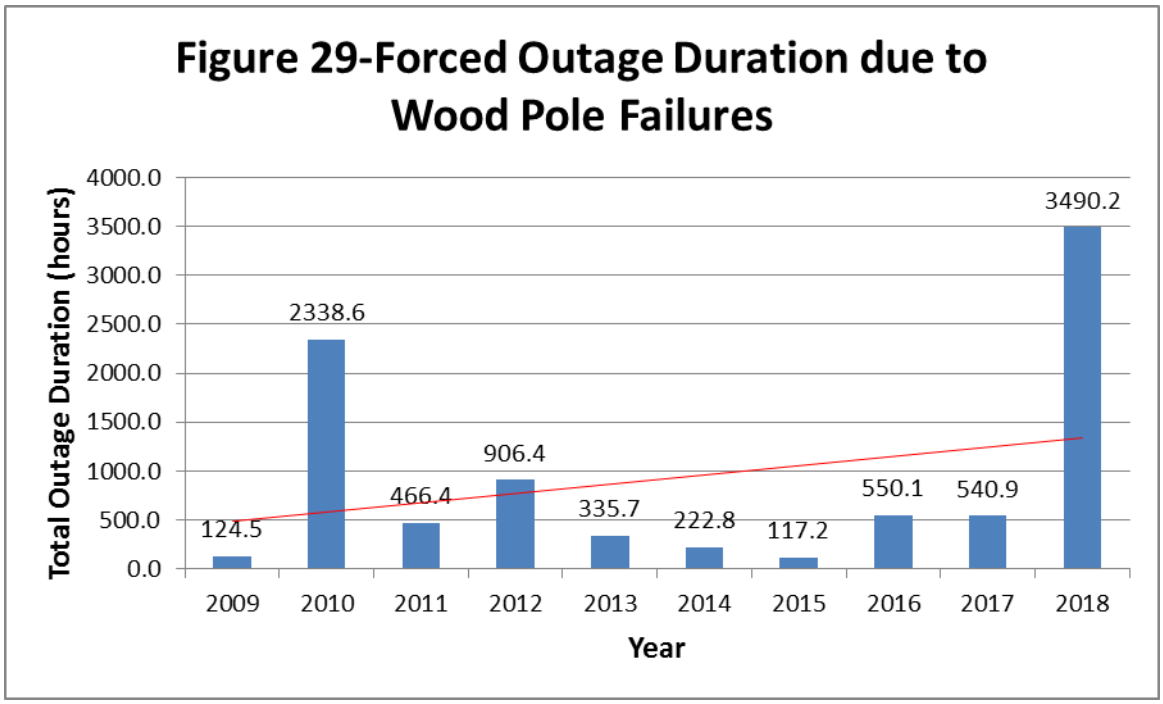
B1-1-1, TSP Section 2.2 Page 68: Figure 26-Forced Outage Duration due to Steel Structure Failures



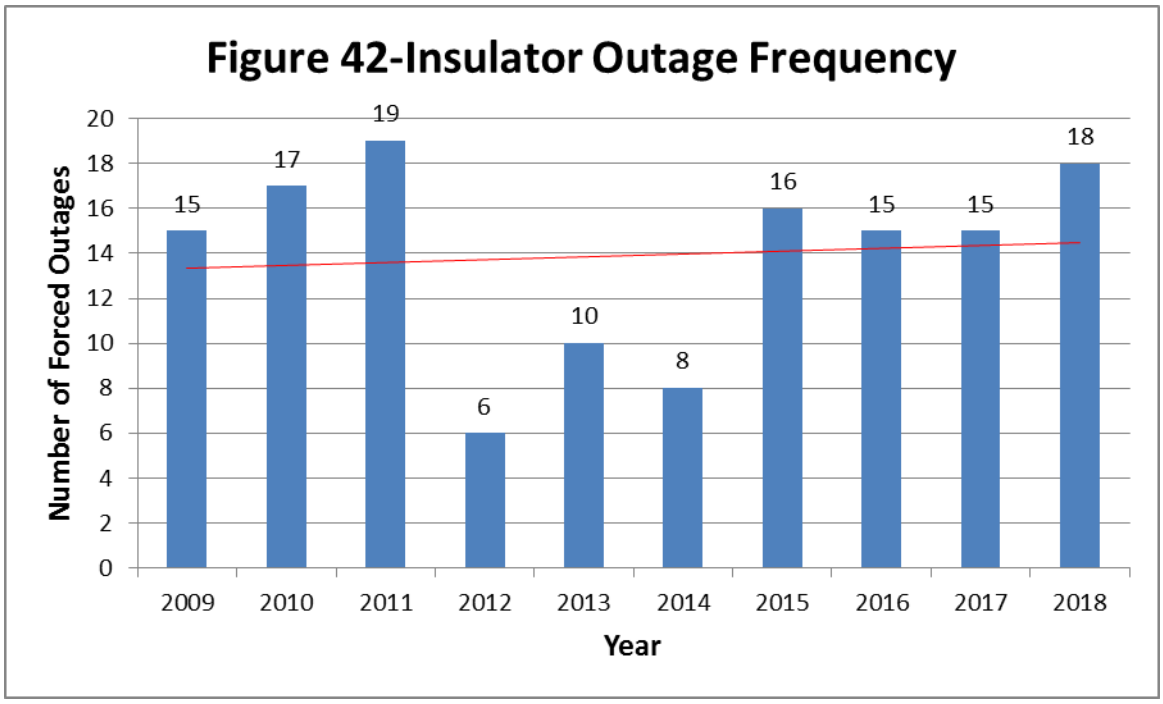
B1-1-1, TSP Section 2.2 Page 71: Figure 28-Forced Outage Frequency due to Wood Pole Failures



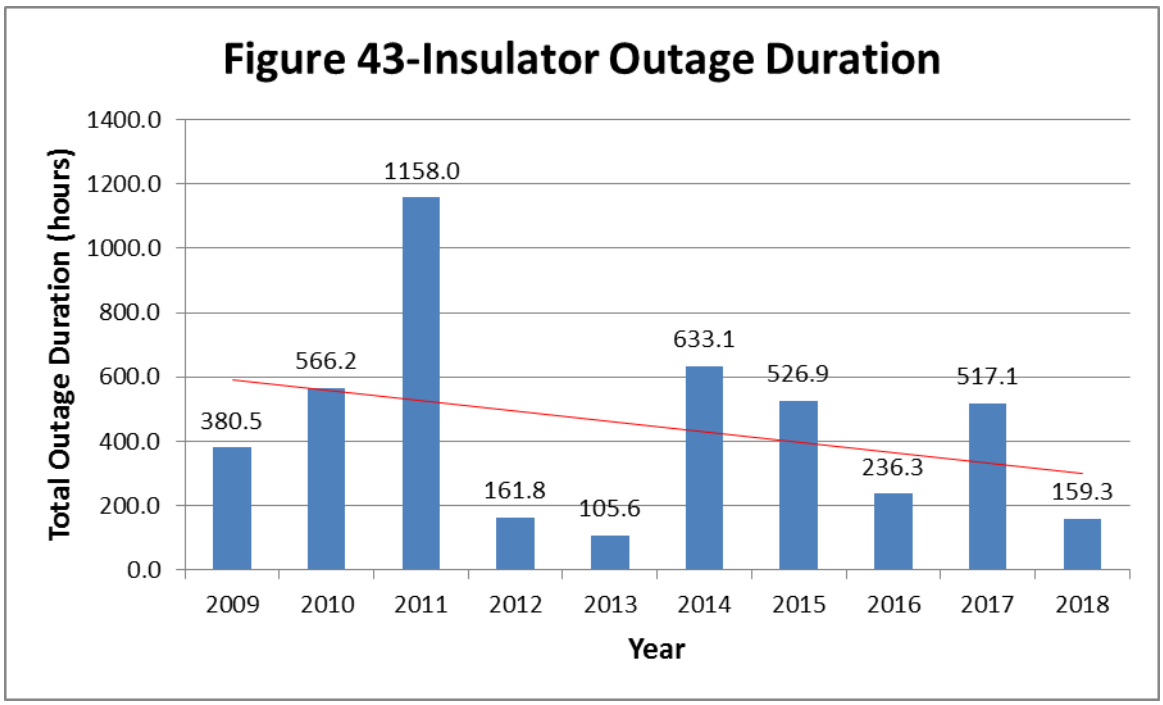
B1-1-1, TSP Section 2.2 Page 72: Figure 29-Forced Outage Duration due to Wood Pole Failures



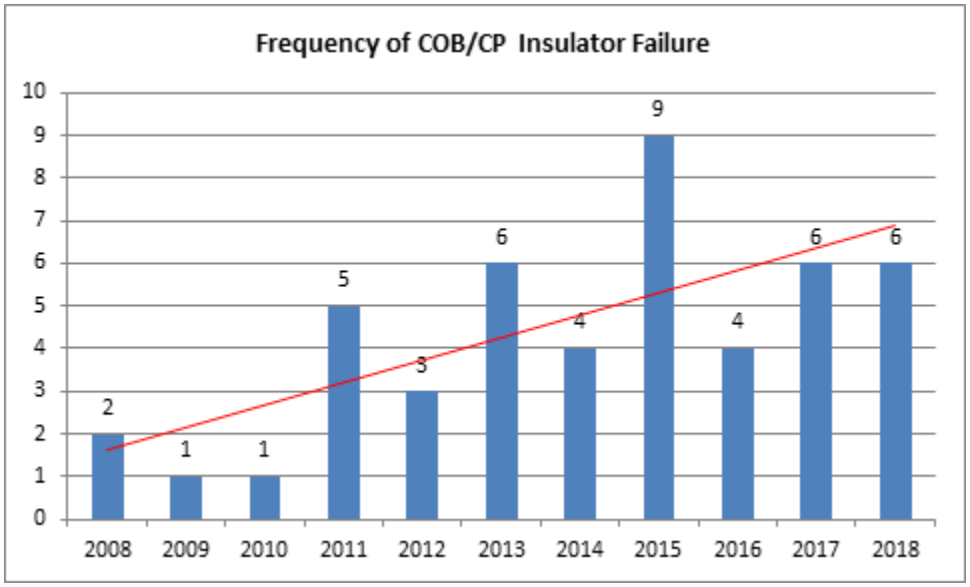
B1-1-1, TSP Section 2.2 Page 90: Figure 42-Insulator Outage Frequency



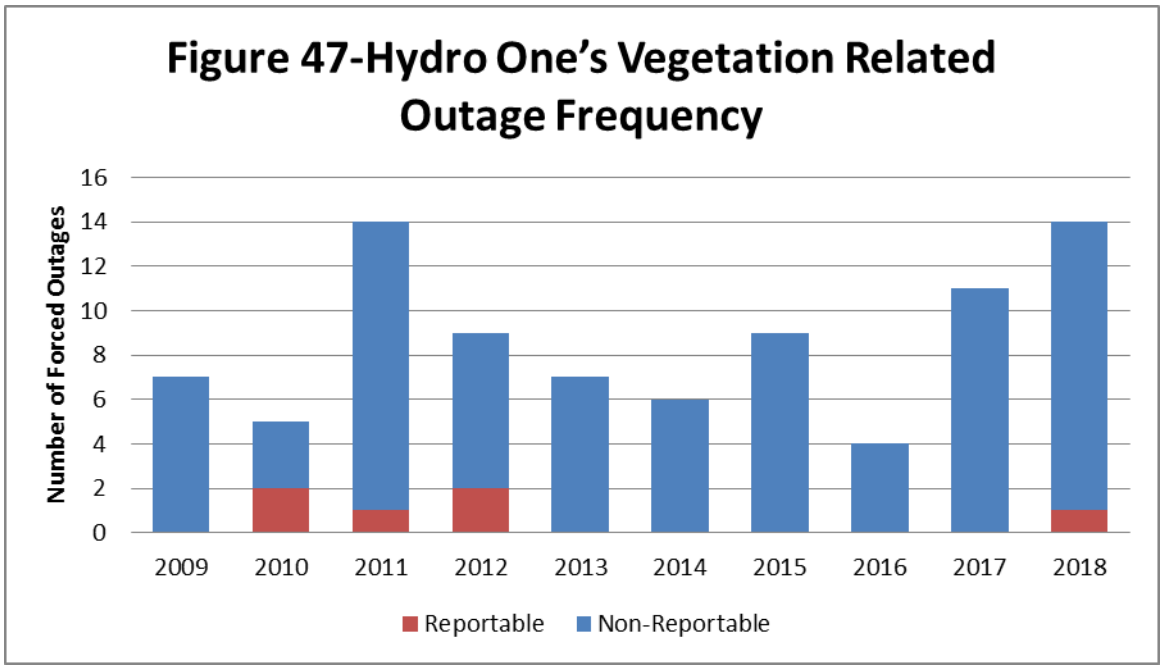
B1-1-1, TSP Section 2.2 Page 90: Figure 43-Insulator Outage Duration



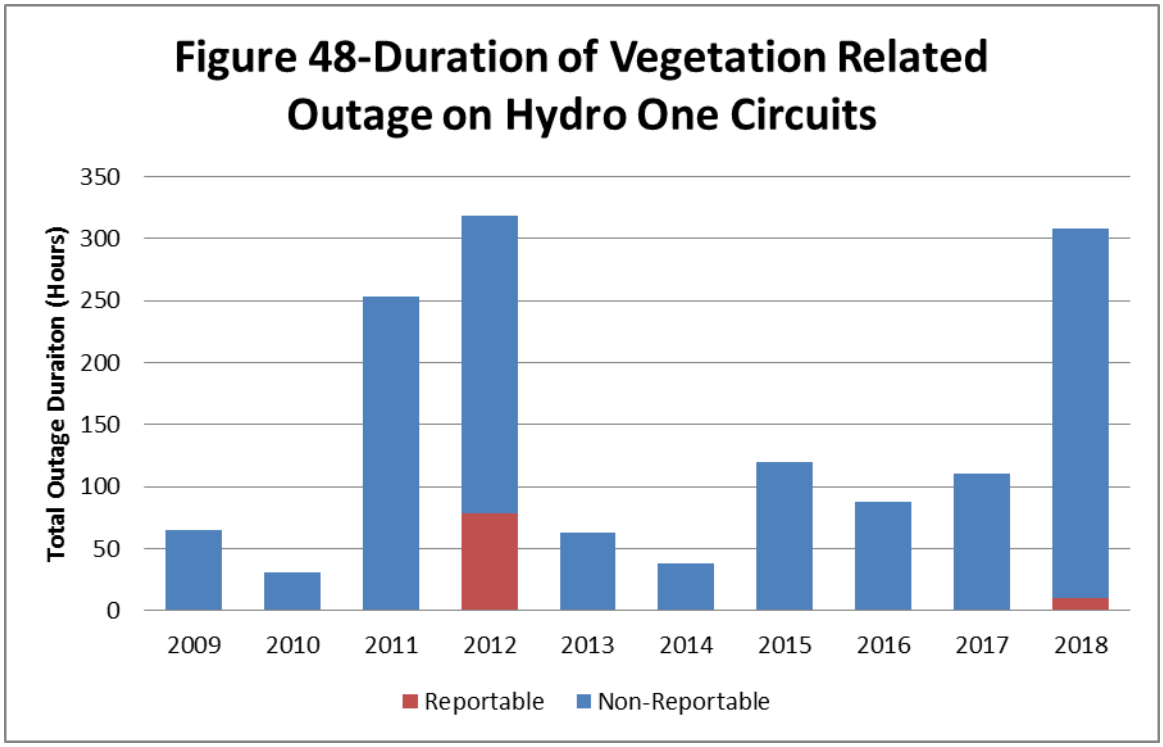
B1-1-1, TSP Section 2.2 Page 91: Figure 44-Frequency of COB/CP Insulator Failures



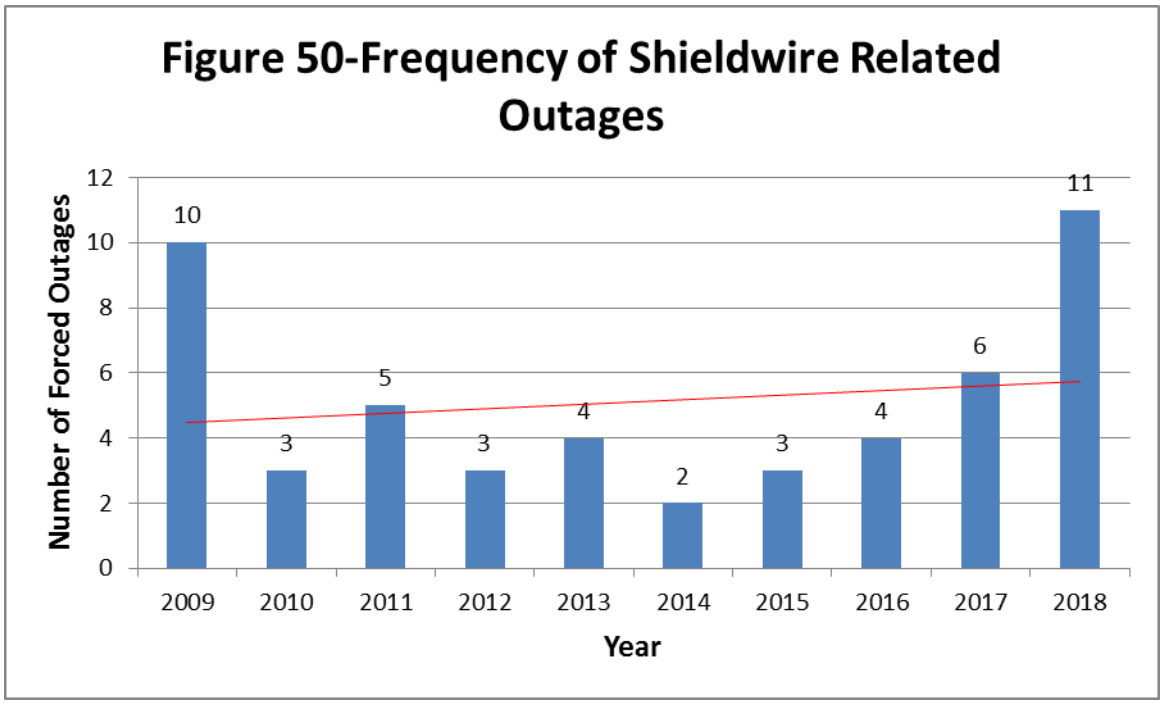
B1-1-1, TSP Section 2.2 Page 95: Figure 47-Hydro One's Vegetation Related Outage Frequency



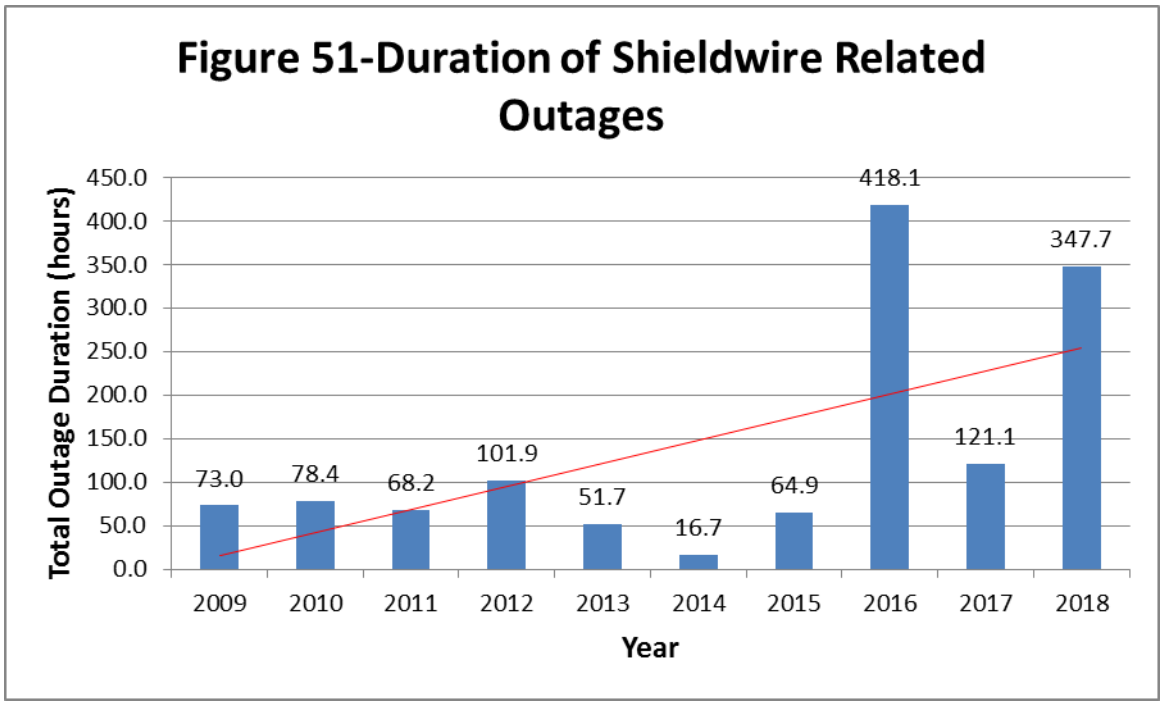
B1-1-1, TSP Section 2.2 Page 90: Figure 48-Duration of Vegetation Related Outage on Hydro One Circuits



B1-1-1, TSP Section 2.2 Page 100: Figure 50-Frequency of Shieldwire Related Outages



B1-1-1, TSP Section 2.2 Page 101: Figure 51-Duration of Shieldwire Related Outages



Witness: Bruno Jesus

SEC INTERROGATORY #35

Reference:
TSP-01-01

Interrogatory:
For each year between 2015 and 2022, and for each spending category, please provide what percentage of transmission capital spending is undertaken by external contractors as compared to internal resources.

Response:
For externally executed contract work (eg. ePC, PC, etc), below is a breakdown of percentage of transmission capital spending is undertaken by external contractors as compared to internal resources. Please note these percentages represent all costs including labour, material, equipment, etc. Due to the use of fixed price contracts we are unable to provide a breakdown for labour only.

OEB Category	2015	2016	2017	2018
System Access				
External	13%	3%	18%	19%
Internal	87%	97%	82%	81%
System Renewal				
External	7%	7%	8%	10%
Internal	93%	93%	92%	90%
System Service				
External	32%	33%	10%	6%
Internal	68%	67%	90%	94%
General Plant				
External	0%	0%	0%	0%
Internal	100%	100%	100%	100%
Total				
External	11%	10%	9%	9%
Internal	89%	90%	91%	91%

Note: Percentages are calculated based on gross capital expenditures

For future years (2019-2022), Hydro One intends to leverage a variety of labour resourcing options including regular, temporary, PWU Hiring Hall, direct-hire casual

building trades and contracted qualified service providers. For contracted work, Hydro One will leverage its qualified third-party construction partners to augment its direct-hire casual workforce. The plan is to maintain the current capacity within Transmission Lines and Stations Construction divisions to complete complex work. It will utilize contractors to rapidly scale to deliver its growing capital work program particularly for transmission lines sustainment projects therefore the percentage of work completed by qualified service providers will increase in line with the work program. In addition, Hydro One will continue to engage contractors to complete its non-core work where it does not have the internal capabilities such as major buildings and high-voltage underground cable installations. Hydro One will focus on contracting areas that are rapidly increasing such as transmission lines sustainment projects.

The specific execution model (ePC, PC, etc) and contracts are not in place for future years therefore Hydro One is not able to provide specific percentages.

SEC INTERROGATORY #36

Reference:
TSP-01-01

Interrogatory:
Please complete the attached excel spreadsheet.

Response:
Please refer to Attachment 1.

Historically asset replacements were carried out on an asset centric program basis. Since EB-2016-0160, Hydro One has bundled projects in order to concurrently address multiple assets throughout a station that exhibit poor condition, as like for like replacement of individual assets is no longer sufficient.

	EB-2016-0160 Application/Proposal (1)					EB-2016-0160 DR0**		EB-2019-0082					
	2014A	2015A	2016F	2017F	2018F	2017F	2018F	2017A	2018A	2019F	2020F	2021F	2022F
Transformer Portfolio * **													
# Replacements	24	21	19	27	22	27	22	15	26	20	9	23	19
% of Fleet	3.3%	2.9%	2.6%	3.7%	3.1%	3.7%	3.1%	2.1%	3.6%	2.8%	1.3%	3.2%	2.7%
Capital ($M)	132.0	115.5	104.5	148.5	121.0	148.5	121.0	85.0	151.7	120.2	55.7	146.7	124.8
Circuit Breaker Portfolio * **													
# Replacements	83	31	43	66	132	66	132	108	148	88	135	105	88
% of Fleet	1.8%	0.7%	0.9%	1.5%	2.9%	1.5%	2.9%	2.4%	3.2%	1.9%	2.8%	2.2%	1.9%
Capital ($M)	58.1	21.7	30.1	46.2	92.4	46.2	92.4	77.9	109.9	67.3	106.4	85.2	73.6
Protection Systems Portfolio * **													
# Replacements	610	266	367	449	528	449	528	298	184	453	465	370	503
% of Fleet	5.0%	2.2%	3.0%	3.7%	4.4%	3.7%	4.4%	2.5%	1.5%	3.6%	3.7%	3.0%	4.0%
Capital ($M)	76.3	33.3	45.9	56.1	66.0	56.1	66.0	38.4	24.4	61.9	65.4	53.6	75.1
Conductor Portfolio													
Replacements (km)	93	201	183	192	440	192	440	119	51	140	64	483	795
% of Fleet	0.3%	0.7%	0.6%	0.6%	1.5%	0.6%	1.5%	0.4%	0.2%	0.5%	0.2%	1.7%	2.7%
Capital ($M)	40.7	58.4	76.9	67.1	143.1	67.1	143.1	36.5	52	137.6	150.8	191.4	211.7
Wood Pole Portfolio													
# Replacements	897	845	850	850	850	935	850	966	735	560	800	800	800
% of Fleet	2.2%	2.0%	2.0%	2.0%	2.0%	2.2%	2.0%	2.3%	1.8%	1.3%	1.9%	1.9%	1.9%
Capital ($M)	43.6	38.5	38.3	35.3	35.3	38.8	33.9	41.2	35.3	34.8	51.0	52.0	53.0
Steel Structure Portfolio													
# Renewal	121	300	462	1250	1600	1145	1600	725	1050	220	260	500	500
% of Fleet	0.2%	0.6%	0.9%	2.4%	3.1%	2.2%	3.0%	1.4%	2.0%	0.4%	0.5%	1.0%	1.0%
Capital ($M)	5.1	4.6	8.8	42.5	54.4	39.0	26.2	42.1	37.7	9.3	11.4	21.8	22.3
Underground Cable Portfolio													
Replacements (km)	3.1	0	0	0	4.8	0	4.8	0	0	4.7*	0	0	0
% of Fleet	1.1%	0.0%	0.0%	0.0%	1.8%	0.0%	1.8%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%
Capital ($M)	20.6	3.5	1.4	2.3	22.5	2.3	22.5	10.7	16.5	15.0	7.1	32.5	33.6

Source: (1) EB-2016-0160 I-6-20

* Discrepancy is due to rounding

** EB-2016-0160 DRO Forecast reflects EB-2016-0160 Application/Proposal due to timing of Decision & Order. Revised units were not forecast part of the DRO submission.

***These capital expenditures are conducted for both the asset and station centric approach, estimated unit costs have been provided

SEC INTERROGATORY #37

Reference:
TSP-03-03

Interrogatory:
SEC understands from previous Hydro One proceedings that for various programs that involve high volumes of similar work, Hydro One can enter multiple 'alternatives' which represent differing levels of work (e.g differing numbers of asset replacements) into its Copperleaf program. Which programs did Hydro One provided alternative level of spending/asset work, and what each of those alternatives were. Please also explain how the reference alternatives relate to the alternative provided in the various Investment Summary Documents.

Response:
Functional investment alternatives, including alternative approaches, are considered as part of the needs assessment when developing candidate investments; these functional alternatives are typically included in the various Investment Summary Documents.

This is completed prior to the Investment Planning process; during the Investment Planning process, alternative pacing is considered based on the recommend functional alternative; these levels consider work volumes and/or timing flexibility to facilitate investment prioritization and optimization.

Alternative work volumes are typically included for line component programs such as wood pole replacements or steel tower coating. Descriptions of alternatives considered are included in:

- Wood Poles: System Renewal ISD #21
- Tower Coating: System Renewal ISD #22
- Foundation Replacement: System Renewal ISD #23
- Shieldwire Replacement: System Renewal ISD #24

Each of the alternatives set out in the ISDs would have been considered as part of the Copperleaf process.

SEC INTERROGATORY #38

Reference:
TSP-03-03, ISD-GP-01

Interrogatory:
With respect to the Integrated System Operations Centre (ISOC):

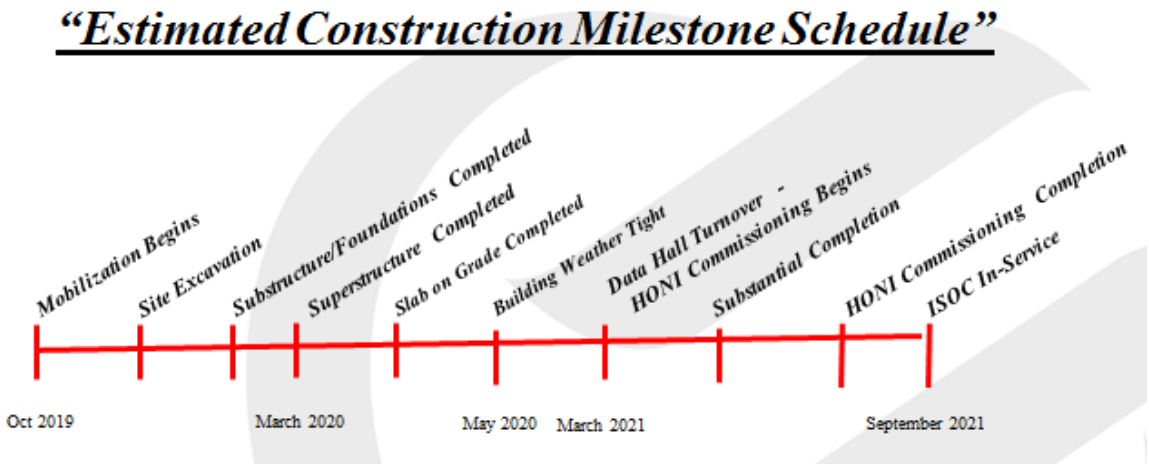
a) Please explain the increase in total forecast cost as compared to what was presented in the EB-2017-0049 application.

b) Please provide an up-to-date project schedule on a similar basis as provided in EB-2017-0049 (Exhibit I, Tab 30, Schedule Staff-174). Please explain all variances.

c) Has the full business case been completed? If so, please provide a copy.

Response:
a) In December 2018, Hydro One received results from the RFP. Costs were higher than the Class A ± 5% estimate provided by an independent cost consultant in May 2017. Hydro One returned to the cost consultant to request an update so it could better understand the discrepancy between the RFP results and the Class A estimate. The cost consultant updated the estimate and it was higher for the following reasons: skilled trade labour rate escalations, new foreign tariff structures, and competition for local construction resources. The revised Class A estimate was consistent with the costs included in the RFPs received by Hydro One.

b) Up-to-date project schedule as follows:



The construction schedule has been shifted due to the delay in approval.

c) The business case has not yet gone to the Hydro One Board of Directors but is expected to in the near future.

SEC INTERROGATORY #39

Reference:
TSP-03-03, ISD-GP-10

Interrogatory:
With respect to the Accommodation & Improvements Service Centres & Admin program:

a) Please provide a version of Table 1 and 2 that include total costs not just costs allocated to transmission.

b) Which is the equivalent ISD in the EB-2017-0049 application?

Response:
a)

Table 1 – Net Investments by Category for 2020-2024, Transmission & Distribution ($ millions)

	2020	2021	2022	2023	2024
New Facilities and Major Renovations	5.5	0.3	6.7	23.3	5.7
Site Improvements (asphalt; drainage; servicing; fencing; security)	3.8	2.1	3.0	0.3	0.2
Building Envelope (roof; windows/doors; cladding)	4.2	5.0	3.0	7.0	-
Mechanical & Electrical (HVAC; lighting; generators)	0.8	0.7	1.2	0.7	1.0
Minor Building Renovations and Furniture	2.2	1.9	2.7	1.9	1.8
Total Net Investments:	16.5	10.1	16.6	33.2	8.8

Table 2 – Total Investment Cost, Transmission & Distribution ($ millions)

($ Millions)	Prev. Year	2020	2021	2022	2023	2024	Forecast 2025+	Total
Capital[2] and Minor Fixed Assets	0.0	16.5	10.1	16.6	33.2	8.8	0.0	85.1
Less Removals	0.0	0.8	0.8	0.8	0.8	0.8	0.0	4.0
Gross Investment Cost	**0.0**	**15.7**	**9.3**	**15.8**	**32.4**	**8.0**	**0.0**	**81.1**
Less Capital Contributions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Investment Cost	**0.0**	**15.7**	**9.3**	**15.8**	**32.4**	**8.0**	**0.0**	**81.1**

b) The equivalent ISD in the EB-2017-0049 application is *GP-02 Real Estate Field Facilities Capital*.

SEC INTERROGATORY #40

Reference:
TSP-03-03, ISD-GP-12

Interrogatory:
With respect to Transport & Work Equipment:

a) Please provide a version of Table 1 and 2 that include total costs not just costs allocated to transmission.

b) With respect to the costs for 2018 to 2022, please explain the variance, if one exists, from the total costs that would have underpinned the distribution allocation in ISD GP-01 in EB-2017-0049)

Response:
a)

Table 1 - Forecast of Acquisitions for 2020 to 2022
($ millions)

Equipment Type[1]	2020	2021	2022
	Cost	Cost	Cost
Light	9.9	12.3	8.4
Heavy	12.3	9.6	15.3
Off-Road	4.5	4.5	4.2
Miscellaneous	1.8	2.1	0.6
Service Equipment	3.0	3.0	3.0
Helicopter	8.1	8.1	8.4
Total[2]	**39.6**	**39.6**	**39.9**

1. Light– cars, SUVs, pickups, vans
   Heavy– service trucks, highway tractors, radial boom derricks (RDB), bucket trucks
   Off Roads – rubber tire, tracked equipment
   Miscellaneous – boats, chippers, tensioners, manlifts, forklifts
   Service Equipment – snowmobiles, ATVs, managed Fleet Services.

Witness: Robert Berardi

2. Total investment costs are based on average unit costs and relate to approximately 400 units annually

Table 2 - Total Investment Cost ($ millions)[1]

	Prev. Years	2020	2021	2022	2023	2024	Forecast 2025+	Total
Capital[2] and Minor Fixed Assets	0	39.6	39.6	39.9	40.0	40.0	0	199.1
Less Removals	0	0	0	0	0	0	0	0
Gross Investment Cost	**0**	**39.6**	**39.6**	**39.9**	**40.0**	**40.0**	**0**	**199.1**
Less Capital Contributions	0	0	0	0	0	0	0	0
Net Investment Cost	**0**	**39.6**	**39.6**	**39.9**	**40.0**	**40.0**	**0**	**199.1**

1. Due to the in-year nature of program investments, only 2020-2024 expenditures are shown
2. Includes Overhead at current rates.

b) Distribution allocated cost indicated for 2018-2022 from the GP-01 in EB-2017-0049 is $201M. It represents a total cost of $301.3M. Of this, $189.6M was earmarked for 2020-2022.

The total cost indicated for 2020-2022 in the transmission ISD-GP-12 as per Table 1 in response (a) is $119.1M. This variance represents the results of Right-Sizing initiative implemented in 2017. The initiative has resulted in reduced requirement for capital acquisition from 2020-2022 to sustain the replacement program for existing fleet complement.

SEC INTERROGATORY #41

Reference:
TSP-03-03, ISD-SA-07

Interrogatory:
With respect to the Secondary Land Use program, please explain what types of costs are not recoverable through a CCRA.

Response:
Although the majority of expenditures associated with secondary land use are fully recoverable, certain expenditures including corridor safety modifications such as grounding mitigation on Hydro One's towers, arising from grounding studies and compatibility assessments of third party proposals, are not recoverable through a CCRA.

Witness: Bruno Jesus

SEC INTERROGATORY #42

Reference:

Interrogatory:

Please provide a table that shows the capex to in-service addition rate for each project/program (by ISD).

Response:

The CapEx to In-Service Addition (ISA) rate, based on the cumulative forecast capital expenditures incurred over the 2020-24 period divided by the cumulative forecast in-service additions over the 2020-24 period is as follows:

Table 5 - System Access - Material Capital Investments		**CapEx to ISA**
ISD	**Investment Name**	**Ratio**
SA-01	Connect New IAMGOLD Mine	0.95
SA-02	Horner TS: Build a Second 230/27.6kV Station	0.65
SA-03	Halton TS: Build a Second 230/27.6kV Station	0.94
SA-04	Connect Metrolinx Traction Substations	1.19
SA-05	Future Transmission Load Connection Plans	1.00
SA-06	Protection and Control Modifications for Distributed Generation	N/A
SA-07	Secondary Land Use Transmission Asset Modifications	2.28
Table 6 - System Renewal - Material Capital Investments		
ISD	**Investment Name**	
SR-01	Air Blast Circuit Breaker Replacement Projects	0.84
SR-02	Station Reinvestment Projects	0.83
SR-03	Bulk Station Transformer Replacement Projects	1.29
SR-04	Bulk Station Switchgear and Ancillary Equipment Replacement Projects	1.68
SR-05	Load Station Transformer Replacement Projects	1.68
SR-06	Load Station Switchgear and Ancillary Equipment Replacement Projects	1.52
SR-07	Protection and Automation Replacement Projects	1.94
SR-08	John Transformer Station Reinvestment Project	1.19

Witness: Bruno Jesus

SR-09	Transmission Station Demand and Spares and Targeted Assets	0.99
SR-10	Transformer Protection Replacement	0.40
SR-11	Legacy SONET System Replacement	1.00
SR-12	Telecom Performance Improvements	1.00
SR-13	ADSS Fibre Optic Cable Replacements	0.91
SR-14	Mobile Radio System Replacement	0.97
SR-15	Telecom Fibre IRU Agreement Renewals	1.06
SR-16	NERC CIP-014 Physical Security Implementation	0.90
SR-17	NERC CIP Transient Cyber Asset Project	0.50
SR-18	PSIT Cyber Equipment Replacement	1.00
SR-19	Transmission Line Refurbishment - End of Life ACSR, Copper Conductors & Structures	0.88
SR-20	Transmission Line Refurbishment - Near End of Life ACSR Conductor	1.42
SR-21	Wood Pole Structure Replacements	1.02
SR-22	Steel Structure Coating Program	1.04
SR-23	Tower Foundation Assess/Clean/Coat Program	1.02
SR-24	Transmission Line Shieldwire Replacement	1.02
SR-25	Transmission Line Insulator Replacement	1.00
SR-26	Transmission Line Emergency Restoration	1.01
SR-27	C5E/C7E Underground Cable Replacement	0.96
SR-28	OPGW Infrastructure Projects	2.06
SR-29	Physical Security ISL Application Replacement	1.00
Table 7 - System Service - Material Capital Investments		
ISD	**Investment Name**	
SS-01	Lennox TS: Install 500kV Shunt Reactors	0.66
SS-02	Wataynikaneyap Line to Pickle Lake Connection	0.89
SS-03	Nanticoke TS: Connect HVDC Lake Erie Circuits	0.00
SS-04	East-West Tie Connection	0.69
SS-05	St. Lawrence TS: Phase Shifter Upgrade	0.97
SS-06	Merivale TS to Hawthorne TS: 230kV Conductor Upgrade	0.97
SS-07	Milton SS: Station Expansion and Connect 230kV Circuits	1.00
SS-08	Northwest Bulk Transmission Line	N/A
SS-09	Barrie Area Transmission Upgrade	0.90
SS-10	Kapuskasing Area Transmission Reinforcement	0.65
SS-11	South Nepean Transmission Reinforcement	1.00
SS-12	Alymer-Tillsonburg Area Transmission Reinforcement	0.97

SS-13	Leamington Area Transmission Reinforcement	0.98
SS-14	Southwest GTA Transmission Reinforcement	0.91
SS-15	Future Transmission Regional Plans	1.03
SS-16	Customer Power Quality Program	1.00
Table 8 - General Plant - Material Capital Investments		
ISD	**Investment Name**	
GP-01	Integrated System Operations Centre - New Facility Development	0.57
GP-02	Grid Control Network Sustainment	0.99
GP-03	Network Management System Capital Sustainment	1.00
GP-04	Integrated Voice Communications and Telephony System Refresh	1.00
GP-05	Transmission Non-Operational Data Management System	1.00
GP-06	Operating Common IT Infrastructure	1.00
GP-07	Hardware/Software Refresh and Maintenance	1.02
GP-08	Corporate Services Transformation - HR / Payroll	1.00
GP-09	Corporate Services Transformation - Finance	1.71
GP-10	Facility Accommodation & Improvements Service Centres & Admin	0.99
GP-11	Transmission Facilities & Site Improvements	0.99
GP-12	Transport & Work Equipment	1.00

SEC INTERROGATORY #43

Reference:
C-02-01-01 Table 17, 18 and 38

Interrogatory:
Please provide the referenced tables in excel format.

Response:
Please refer to interrogatory response I-07-SEC-043, Attachment 1.

Witness: Andrew Spencer

SEC INTERROGATORY #44

Reference:

Interrogatory:

For each year between 2012 and 2018, please provide a table that shows:

a) T-SAIDI for the single circuit system broken down by cause code.

b) T-SAIFI for the double circuit system broken down by cause code.

c) T-SAIDI for the double circuit system broken down by cause code.

d) T-SAIFI for the double circuit system broken down by cause code.

Response:

a) T-SAIDI for the single circuit system broken down by cause code.

	2012	2013	2014	2015	2016	2017	2018
BES CONDIT_N	0.3215	9.187	0.7099	0.2349	0.3268	1.4026	2.0261
CONFIGURAT_N	11.556	13.4948	3.5874	5.0071	1.7953	2.2382	8.9548
ENVIRONMENT	142.0908	0.1283	0.0000	0.0000	10.2026	0.0000	0.0000
EQUIPMENT	25.6946	88.196	69.4151	62.9126	213.1896	70.5395	78.2705
FOREIGN	21.4308	43.3745	9.5794	26.6225	26.5406	21.7032	20.9391
HUMAN	0.6666	0.07	1.8018	0.701	2.3258	11.2362	1.2869
NEIGHBOURING UTILITY	0.0000	0.0000	0.0000	0.0000	0.0000	0.9376	0.0000
SPS OPERATION	0.0000	0.0000	0.0000	0.0000	0.0654	0.0000	5.0557
UNKNOWN	7.7798	5.1009	0.899	2.0375	1.6646	0.6948	2.432
WEATHER	23.7145	35.5624	13.1646	29.0721	8.6687	25.024	83.6463
T-SAIDI	233.2545	195.1139	99.1573	126.5878	264.7791	133.7761	202.6114

b) T-SAIFI for the single circuit* system broken down by cause code.

	2012	2013	2014	2015	2016	2017	2018
BES CONDIT_N	0.0039	0.0661	0.0309	0.0116	0.0077	0.0154	0.0153
CONFIGURAT_N	0.1451	0.2061	0.3241	0.2041	0.1038	0.2767	0.3102
ENVIRONMENT	0.0471	0.0117	0.0000	0.0077	0.0231	0.0000	0.0000
EQUIPMENT	0.3529	0.5637	0.4591	0.4738	0.369	0.5188	0.5898
FOREIGN	0.2235	0.1011	0.108	0.1541	0.1	0.1998	0.1455
HUMAN	0.0902	0.0272	0.1157	0.0385	0.0192	0.1921	0.1034
NEIGHBOURING UTILITY	0.0000	0.0000	0.0000	0.0000	0.0000	0.0307	0.0000
SPS OPERATION	0.0000	0.0000	0.0000	0.0000	0.0038	0.0000	0.0689
UNKNOWN	0.8627	0.5054	0.3048	0.3621	0.4152	0.2767	0.4634
WEATHER	1.9763	2.1539	1.497	1.6408	1.0764	1.7216	1.7772
T-SAIFI	3.7017	3.6352	2.8397	2.8926	2.1182	3.2318	3.4739

**Hydro One assumes part b) intended to ask for single circuit, as double circuit is asked for in part d).*

c) T-SAIDI for the double circuit system broken down by cause code.

	2012	2013	2014	2015	2016	2017	2018
BES CONDIT_N	0.000	0.000	0.000	0.000	0.1536	0.000	0.0299
CONFIGURAT_N	0.6465	0.2895	1.0103	0.4474	0.1881	0.5349	0.2773
ENVIRONMENT	0.000	0.000	0.0598	0.3348	0.000	0.000	2.1713
EQUIPMENT	4.1189	7.5777	3.9754	8.4	2.9976	1.5194	6.396
FOREIGN	1.086	0.498	4.6313	0.2534	1.8024	0.3268	1.0037
HUMAN	0.1302	0.0747	1.1924	0.1486	0.1913	0.276	3.2023
NEIGHBOURING UTILITY	0.000	0.000	0.000	0.000	0.000	0.0047	0.000
SPS OPERATION	0.000	0.000	0.000	0.000	0.000	0	0.3041
UNKNOWN	0.353	0.3012	0.1105	0.2508	0.3308	0.2461	0.358
WEATHER	0.5346	4.0395	0.5081	0.5139	0.0862	2.5017	1.6252
T-SAIDI	6.8692	12.7808	11.4878	10.349	5.7501	5.4096	15.3679

d) T-SAIFI for the double circuit system broken down by cause code.

	2012	2013	2014	2015	2016	2017	2018
BES CONDIT_N	0	0	0	0	0.0063	0	0.0063
CONFIGURAT_N	0.0078	0.0405	0.0436	0.0329	0.0329	0.041	0.0299
ENVIRONMENT	0	0	0.0093	0.0078	0	0	0.0961
EQUIPMENT	0.0832	0.0841	0.0592	0.1424	0.0674	0.0741	0.0977
FOREIGN	0.0596	0.0405	0.0747	0.0438	0.0564	0.03	0.0457
HUMAN	0.0157	0.0125	0.0374	0.0125	0.0298	0.0174	0.0441
NEIGHBOURING UTILITY	0	0	0	0	0	0.0016	0
SPS OPERATION	0	0	0	0	0	0	0.0032
UNKNOWN	0.0424	0.028	0.0311	0.0469	0.0266	0.0457	0.0457
WEATHER	0.0737	0.0981	0.1027	0.0641	0.0282	0.0536	0.0804
T-SAIFI	0.2824	0.3035	0.358	0.3504	0.2477	0.2634	0.4491

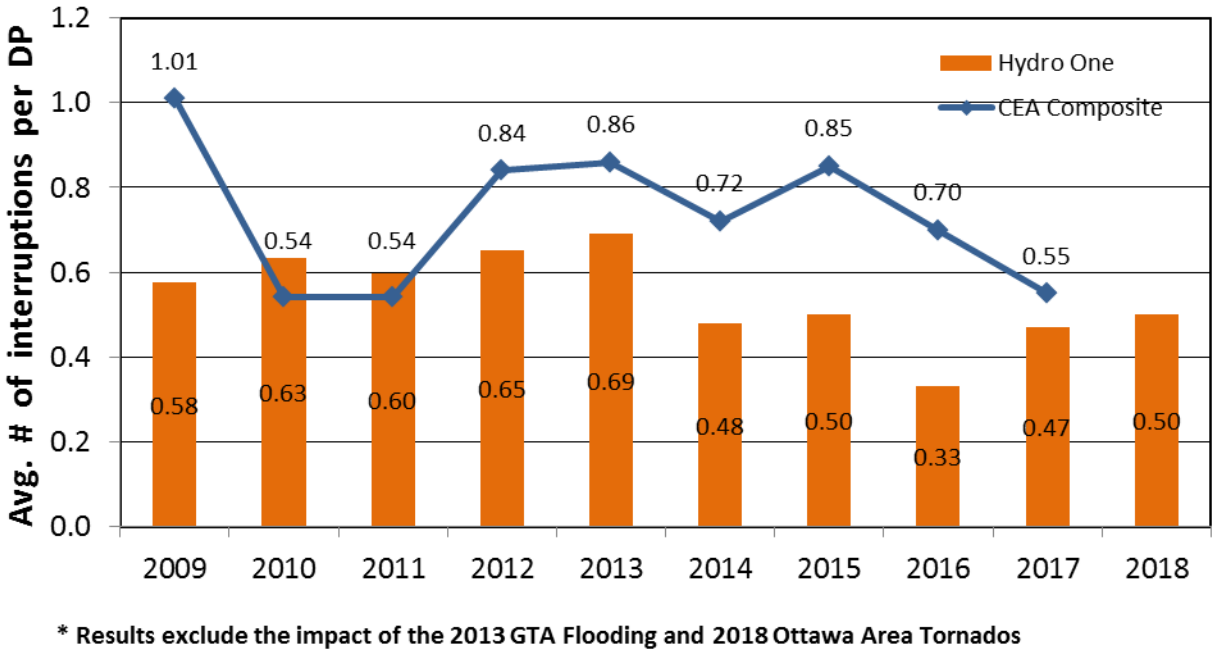
SEC INTERROGATORY #45

Reference:
D-02-01 p.5-8

Interrogatory:
For each of the figures 1a through 4, please provide the CEA values.

Response:

Figure 1a:



*** Results exclude the impact of the 2013 GTA Flooding and 2018 Ottawa Area Tornados**

Figure 1b:

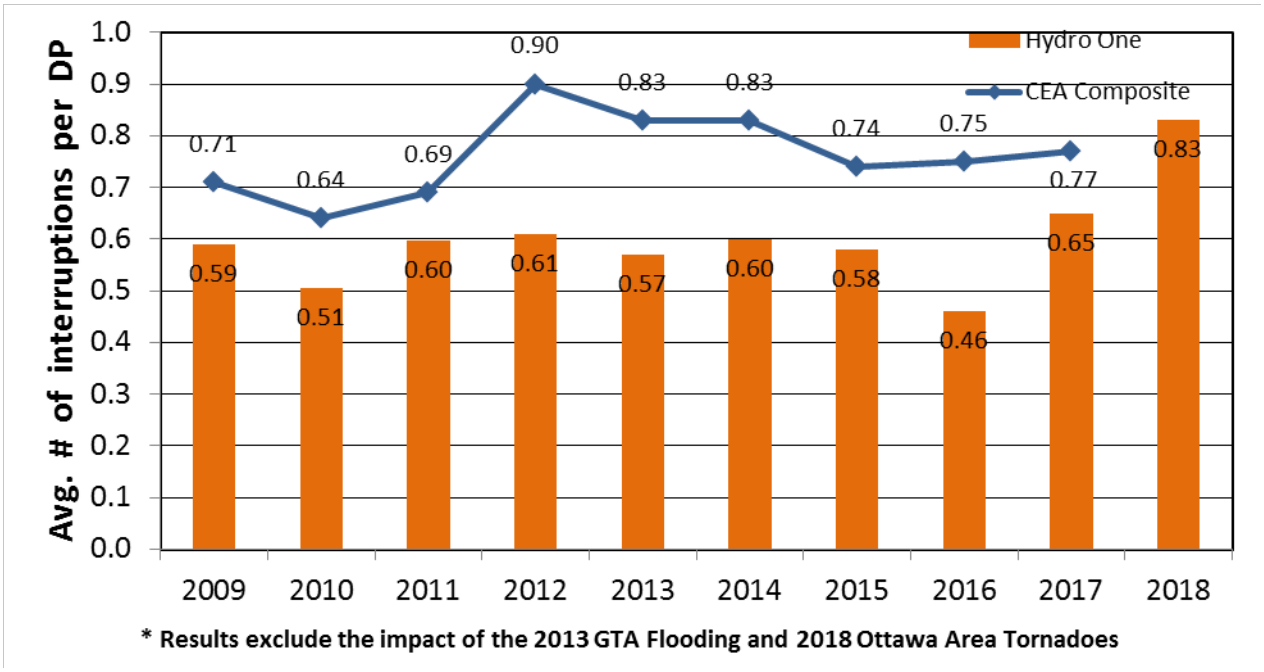


Figure 2:

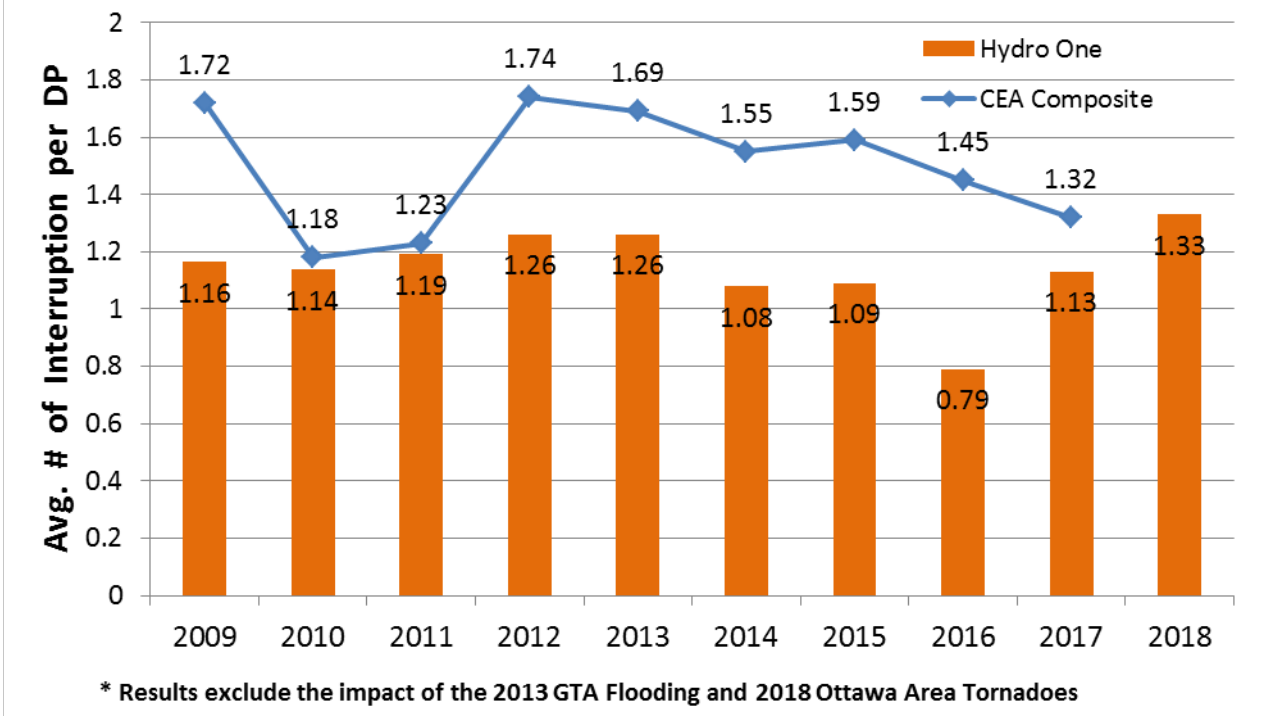
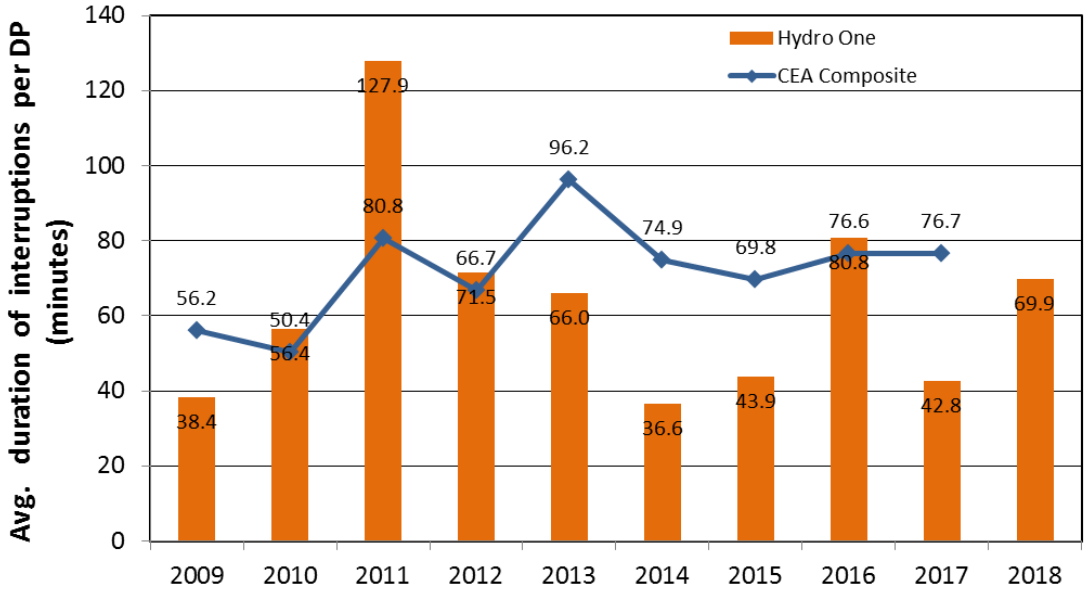
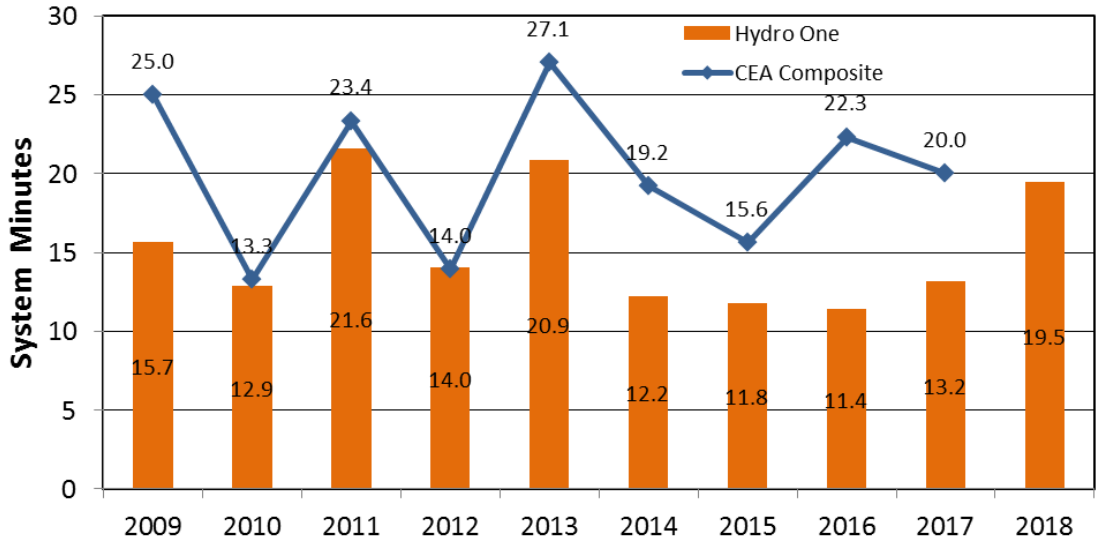


Figure 3:



* Results exclude the impact of the 2013 GTA Flooding and 2018 Ottawa Area Tornadoe
[1]E1C/M1M Forest First represents ~50% of 2011 Total

Figure 4:



*** Results exclude the impact of the 2013 GTA Flooding and 2018 Ottawa Area Tornadoes**

SEC INTERROGATORY #46

Reference:
D-02-01

Interrogatory:
Does Hydro One still participate in the NATF Transmission Reliability Reports, reliability assessments, or similar NATF initiatives? If so, please provide Hydro One's performance as compared to its peers for all years between to 2012 to 2018.

Response:
Yes. The 2018 report is expected to be released in September, 2019. The 2012 to 2017 data is provided in Attachment 1.

Witness: Bruno Jesus

Hydro One Performance Ranking (7/21 means that Hydro One ranks 7th out of 21 peers, where 1st is the best performer)

IPII (Integrated Performance Indicator Index)	2017	2016	2015	2014	2013	2012
IPII Total Score	7/21	15/21	13/21	8/21	13/21	15/21
IPII Score Failed AC Circuit Equipment per Hundred Miles	8/21	9/21	16/21	11/21	11/21	12/21
IPII Score Failed AC Substation Equipment per Element	1/21	8/21	7/21	1/21	2/21	8/21
IPII Score Failed Protection System per Element	19/21	18/21	1/21	15/21	15/21	16/21
IPII Score Human Error per Element	8/21	7/21	1/21	1/21	9/21	11/21
IPII Score AC Circuit Unavailability per Element per Year	11/21	17/21	16/21	9/21	15/21	15/21
IPII Score AC Transformers Unavailability per Element per Year	11/21	15/21	14/21	12/21	10/21	10/21
IPII Score Unknowns per Hundred Miles	1/21	1/21	8/21	10/21	10/21	9/21
IPII Score Lightning per Hundred Miles	16/21	12/21	12/21	15/21	13/21	19/21
IPII Score Weather Excluding Lightning per Hundred Miles	13/21	10/21	7/21	8/21	10/21	6/21
IPII Score Aggregate Residual Causes per Hundred Miles	13/21	8/21	14/21	15/21	14/21	19/21

Traditional Metrics (single year)	2017	2016	2015	2014	2013	2012
AC Circuit Outage Rate per Hundred Miles per Year 200-799 kV	12/21	9/21	9/21	13/21	14/21	10/21
AC Circuit Outage Rate per Element per Year 200-799 kV	18/21	16/21	15/21	17/21	19/21	16/21
AC Circuit Average Outage Rate Duration of Sustained Outages 200-799 kV	10/21	20/21	17/21	7/21	13/21	12/21
AC Circuit Outage Rate Per Hundred Miles per Year-Momentary 200-799 kV	16/21	11/21	9/21	15/21	17/21	14/21
AC Circuit Outage Rate per Element per Year Rate-Momentary 200-799 kV	19/21	14/21	14/21	17/21	20/21	17/21
AC Circuit Outage Rate per Hundred Miles per Year-Sustained 200-799 kV	7/21	8/21	10/21	14/21	15/21	7/21
AC Circuit Outage Rate per Element per Year-Sustained 200-799 kV	14/21	14/21	15/21	14/21	18/21	10/21

Traditional Metrics (five year average)	2013-17	2012-16	2011-15	2010-14	2009-13	2008-12
AC Circuit Outage Rate per Hundred Miles per Year 200-799 kV	14/21	13/21	14/21	15/21	16/21	15/21
AC Circuit Outage Rate per Element per Year 200-799 kV	18/21	19/21	18/21	19/21	20/21	18/21
AC Circuit Average Outage Rate Duration of Sustained Outages 200-799 kV	10/21	13/21	10/21	10/21	11/21	9/21
AC Circuit Outage Rate Per Hundred Miles per Year-Momentary 200-799 kV	15/21	14/21	15/21	17/21	18/21	18/21
AC Circuit Outage Rate per Element per Year Rate-Momentary 200-799 kV	17/21	17/21	18/21	18/21	18/21	18/21
AC Circuit Outage Rate per Hundred Miles per Year-Sustained 200-799 kV	11/21	12/21	11/21	11/21	10/21	9/21
AC Circuit Outage Rate per Element per Year-Sustained 200-799 kV	15/21	18/21	16/21	17/21	14/21	12/21

SEC INTERROGATORY #47

Reference:

F, Appendix 2-JC

Interrogatory:

Please add a column to the table showing year-to-date actuals for 2019.

Response:

Appendix 2-JC provides a forecast for 2019. Q1 actual results for 2019 are not indicative of full-year results as overall expenditures and program by program expenditures are not necessarily incurred uniformly throughout the year. As such, the requested information is of questionable value in this proceeding. As reported in Hydro One's audited Q1 2019 results, OM&A for the first quarter of 2019 was $99M for the Transmission segment, including B2M and SSM.

Witness: Joel Jodoin

SEC INTERROGATORY #48

Reference:
F-1 p.3

Interrogatory:
Please discuss Hydro One's ability to utilize its new distribution vegetation management program discussed as part of the EB-2017-0049 proceeding for any of its lower voltage transmission lines.

Response:
Due to differences in design requirements and vegetation clearance distances, the new distribution vegetation management program does not apply to any of Hydro One's transmission lines.

Witness: Donna Jablonsky

SEC INTERROGATORY #49

Reference:
F-1 p.3

Interrogatory:
Hydro One states that its 2019 budget for 'Overhead Lines Maintenance' program are not sustainable over the long-term. Please provide a detailed explanation for why the 2019 amount is not sustainable and provide any necessary supporting data.

Response:
Please refer to Interrogatory I-01-OEB-184 d). Furthermore, continued funding at the 2019 funding level will not be sufficient to address the asset condition assessment requirements given the aging demographics that need to be kept up with. This will pose unreasonable safety and reliability risks, which will adversely affect Hydro One's customers and system reliability.

SEC INTERROGATORY #50

Reference:

F-04-01 p.13 Table 2

Interrogatory:

Please revise table 2 to remove FTE who are part of the now repatriated customer contract centre.

Response:

Please see the table below:

Table 2: Full Time Equivalents (FTE), 2017-2022

		2017	2018	2019	2020	2021	2022
	MCP	633	631	688	689	690	690
Regular	Society	1289	1307	1553	1541	1542	1536
	PWU	3382	3311	3527	3578	3612	3640
	Total Regular	**5304**	**5249**	**5768**	**5808**	**5844**	**5866**
	MCP	18	22	6	6	6	6
Temporary	Society	36	27	13	12	9	9
	PWU	194	173	99	98	98	98
	Total Temporary	**248**	**222**	**118**	**116**	**113**	**113**
	PWU Hiring Hall	1230	1213	1659	1582	1646	1647
Casual	Casual Trades	1364	1353	1296	1265	1205	1159
	Total Casual	**2594**	**2566**	**2955**	**2847**	**2851**	**2806**
	Grand Total	**8146**	**8037**	**8841**	**8771**	**8808**	**8785**

Note: 2017 Total Regular employees has been corrected.

SEC INTERROGATORY #51

Reference:
F-01-01 p.2-3

Interrogatory:
With respect to vacancy rate:

a) Please provide the actual Hydro One vacancy rate for each year between 2014 and 2018.

b) Please provide a forecast vacancy rate for each year between 2019 and 2022.

c) Please provide the actual vacancy rate included in the 2020-2022 test period budget.

d) For the purposes of your response to part (a) to (c), please explain the methodology used to calculate vacancy rate.

Response:
a) Please see Exhibit I, Tab 01, Schedule OEB-200 a)

b) Please see Exhibit I, Tab 01, Schedule OEB-200 b)

c) Please see Exhibit I, Tab 01, Schedule OEB-200 c)

d) Please see Exhibit I, Tab 01, Schedule OEB-200 b), d)

Witness: Sabrin Lila

SEC INTERROGATORY #52

Reference:
F-04-01 p.28-29

Interrogatory:
For the purposes of the budgets in this application that go to 2022, what assumptions has Hydro One made for the PWU and Society after the expiry of their current agreements in 2020 and 2019 respectively.

Response:
It is pre-mature to anticipate the costs for the PWU and Society beyond the expiry of their current collective agreements.

For the purposes of budgeting Hydro One used an escalation estimate of 2% annually for both Society and PWU after the expiry of the current agreements.

SEC INTERROGATORY #53

Reference:

F-04-01

Interrogatory:

With respect to retirement eligibility and retirements,

a) Please provide a table that showing the number of eligible retirements for each year between 2014 and 2018, and the number of actual retirements taken in each of those years.

b) Please provide a table showing the number of employees eligible to retire in each year between 2019 and 2022.

Response:

a)

Year	Eligible Retirements For The Year (At Jan 1st)	Actual Retirements For The Year
2015	927	167
2016	959	210
2017	1195	270
2018	1011	206

b)

Year	Eligible Retirements For The Year (as of May 2019)
2019	912
2020	89 newly eligible
2021	67 newly eligible
2022	101 newly eligible

Witness: Sabrin Lila

SEC INTERROGATORY #54

Reference:
F-04-01 Appendix B

Interrogatory:
With respect to the 'PWU Base Rate Comparison' Table:

a) Does the 'Hydro One Rate' reflect the mid-point of the position salary band, actual or median base compensation for those employees, some other amount?

b) Is the answer to part (a) the same for the peer group data?

c) What is the source of the information or the peer group? If Hydro One sought the information directly from the peer utilities, please provide copies of the specific questions it asked them.

d) What percentages of PWU incumbent positions are included within the positions benchmarked?

e) Please explain what types of compensation are consider 'base' pay.

Response:
a) The Hydro One rates in the referenced attachment reflect the "end rate" or journeyperson rate.

b) Yes.

c) F-4-1 Appendix B was produced by the Hydro One Labour Relations Department as part of the normal process to provide an external scan of unionized rates in preparation for Hydro One - PWU collective bargaining. This particular table, prepared by Hydro One contains publicly available base rate data.

d) 36.6% of PWU incumbent positions are included within the positions benchmarked (as of December 31, 2018).

Witness: Sabrin Lila

e) Base pay is the hourly rate or weekly rate, not including any applicable premiums (e.g. overtime premium, relief rate, shift premium, etc.)

SEC INTERROGATORY #55

Reference:
F-04-01-02

Interrogatory:
With respect to the Mercer Compensation Cost Benchmarking Study:

a) Please provide an estimate of the dollar difference between the weighted average total compensation for Hydro One's employees allocated to its transmission business and the P50 median used in the study. Please provide the amount in 2017 (the year the study was completed) and for each year between 2020 and 2022. Please provide a step-by-step explanation of how the estimate was reached and include the supporting calculations so that calculations can be verified.

b) Please provide a list of all types of compensation (i.e. salary, overtime, share grant, LTIP etc.) that were paid in 2017 that: i) were included in the study, and ii) were not included in the study.

c) Please provide the percentage of total compensation in each year between 2020 and 2022 that if of a type not types not included in the study.

d) Are there any additional types of compensation that will be paid in 2020 through 2022 that were not in 2017?

Response:
a) An estimate of the dollar difference between the weighted average total compensation for Hydro One's employees allocated to its transmission business and the market median used in the study is as follows:

	Study Year	2020	2021	2022
Estimated Dollar Difference (Hydro One to Market Median)	$34,485,965	$38,566,291	$40,010,087	$39,079,490

Witness: Sabrin Lila, Iain Morris, Joel Jodoin

This value was calculated based on the results of the Compensation Cost Benchmarking Study (F-04-01-02), based on the following set of assumptions:

- Estimates are based on the differential between the average salary and the market median rate for the corresponding level, multiplied by the number of incumbents in the relevant level.
- Projections assume external market increases and Hydro One salary increases as per the information below:
    - Market (MCP roles): CPI + 0.6%,
    - Market (represented roles): Increase at rate of CPI
    - CPI Assumptions: 2017: 2.3%, 2018: 2.3%, 2019: 2.0%, 2020: 2.0% , 2021: 1.9%, 2022: 2.0%

- Assumes that headcount increases occur as per the business plan (F-04-01 Table 2) and the proportion of MCP incumbents in each level remains consistent.

- The allocation of compensation to Transmission related activities is based on the following percentages 2020: 48.22%, 2021: 49.68% and 2022: 48.35%.

Hydro One has reduced the amount of compensation for recovery in revenue requirement since the Mercer Study was conducted. The above Mercer median should be updated to reflect the further offsetting reductions as consistent with OEB approved decision in EB-2017-0049. The variance between the Mercer study market median and Hydro One compensation as well as the reductions included in this application related to OM&A are set out in the table below:

Net Mercer Median Reductions Allocated to OM&A ($M)	**2020**
Mercer Median - Tx OM&A	10.1
Pension Reduction OM&A	(5.5)
OPEB Reduction OM&A	(2.4)
Executive Comp. Reduction	(1.5)
The Directive	(0.1)
Total Net Mercer OM&A Reductions	**0.5**

- Mercer Median (+$10.1 million) is the OM&A component of the transmission allocated portion of $36.8 million as stated above;

- The current revenue requirement reflects the reduced pension OM&A costs (-$5.5 million) due to the actuarial valuation of pension expenses completed by Willis Towers Watson (Exhibit F, Tab 5, Schedule 1 Attachment 1);

- The current revenue requirement reflects the reduced OPEB OM&A costs (-$2.4 million) as a result of the latest valuation which is provided in Exhibit I, Tab 1, Schedule OEB-205;

- The current revenue requirement reflects the reduced executive compensation OM&A costs (-$1.5 million) identified in EB-2018-0130, Exhibit I, tab 7, schedule 3, page 2 to be in compliance with Bill 2; and

- As part of the blue-page update Hydro One further reduced its OM&A (-$0.1 million) by factoring the Ontario Government Directive issued on January 1, 2019 ("the Directive"), as discussed in Exhibit F, Tab 4, Schedule 1, page 35 and also identified in Exhibit F, Tab 1, Schedule 1, page 3.

Hydro One submits that if the OEB is contemplating a further reduction to the amount of compensation recovered in rates based on the Mercer benchmark median, the appropriate amount is $0.5 million. This amount reflects the reductions already incorporated in Hydro One's current application.

b) The compensation elements included in the Mercer Compensation Benchmark Study are described in Exhibit F-4-1 Attachment 2, p. 28 of 34 Appendix C – Detailed compensation Benchmark Methodology. The compensation elements are: Base Salary / Wage, Short-term Incentive or Bonus paid/lump sum, Benefits including post retirement non-pension benefits, Pensions, and long-term incentives (i.e. LTIP, share awards).

c) The study included all relevant compensation elements for both Hydro One and market respondents.

d) There are no planned additional types of compensation that will be paid in 2020 through 2022 that were not in 2017.

SEC INTERROGATORY #56

Reference:
F-04-01-01

Interrogatory:
With respect to the Willis Towers Watson Management Compensation Benchmarking Study:

a) Please explain the methodological differences between this study, and the Willis Towers Watson Executive and Non-Executive Competitive Compensation Review filed in EB-2016-0160 (Exhibit I-06-057 Attachments 2 and 3).

b) [p.10] Please provide an estimate of the dollar difference between the weighted average total compensation for Hydro One's employees allocated to its transmission business and the P50 median used in the study. Please provide the amount for the year the study is representative of and for each year between 2020 and 2022. Please provide a step-by-step explanation of how the estimate was reached and include the supporting calculations so that calculations can be verified.

Response:
a) The overarching approach of this study aligns to Willis Towers Watson's standard benchmarking methodology.

- **Peer Groups:** A segmented peer group approach supported each study, and was used to align jobs with a more direct market for talent in each segment. Segmentation was also used as a way to better align compensation to market and to manage costs. Due to changes in annual salary survey participation, the underlying composition of the peer groups in each study would inherently differ based on the survey participation of peer companies.

- **Compensation Elements:** The elements of compensation used in each study were consistent, including: annual base salary, target annual short-term incentive (not actual) and where applicable, long-term incentive grant awards, including Hydro One's share grant.

- **Roles Benchmarked:** There were no changes in the methodology of how Hydro One's roles were benchmarked; however, Hydro One's roles may have evolved. The sample of benchmark positions in the current study may have changed, however, a representative sample were benchmarked in both studies.

- **Employee Groups:** The Willis Towers Watson Management Compensation Benchmarking Study (filed 2019-03-21, EB-2019-0082, Exhibit F-4-1), did not include benchmarking results for Hydro One's CEO and the CEO's direct reports. These positions were included in the previous study: Willis Towers Watson Executive and Non-Executive Competitive Compensation Review filed in EB-2016-0160 (Exhibit I-06-057 Attachments 2 and 3).

b) An estimate of the dollar difference between the weighted average total compensation for Hydro One's employees allocated to its transmission business and the market median used in the study is as follows:

	Study Year	2020	2021	2022
Estimated Dollar Difference (Hydro One to Market Median)	$450,531	-$837,045	-$1,480,175	-$2,140,199

This value was calculated based on the results of the Management Compensation Benchmarking Study (F-04-01-01), based on the following set of assumptions:

- Estimates are based on the differential between the salary structure midpoint and the market median rate for the corresponding level, multiplied by the number of incumbents in the relevant level.

- Projections assume external market increases at a rate of 2.5% per annum for 2020, 2021 and 2022. Hydro One salary structure is assumed to increase by 1.5% per annum over the same period.
    - Based on Willis Towers Watson's annual Salary Increase Budget survey, typical Canadian salary increase budgets ranging from 2.0 - 3.0% per annum (midpoint used).

- Historically, MCP structure midpoints have not increased annually and remain unchanged from the past year. As a result we view 1.5% annual increases as a conservative estimate.

- Assumes that headcount increases occur as per the business plan (F-04-01 Table 2) and the proportion of MCP incumbents in each level remains consistent.

- The allocation of compensation to Transmission related activities is based on the following percentages 2020: 48.22%, 2021: 49.68% and 2022: 48.35%.

SEC INTERROGATORY #57

Reference:
F-04-01-03 p.7

Interrogatory:
With respect to the Willis Towers Watson PWU Benchmarking Study, please provide an estimate of the dollar difference between the weighted average total compensation for Hydro One's employees allocated to its transmission business and the P50 median used in the study. Please provide the amount for the year the study is representative of and for each year between 2020 and 2022. Please provide a step-by-step explanation of how the estimate was reached and include the supporting calculations so that calculations can be verified.

Response:
a) An estimate of the dollar difference between the weighted average total compensation for Hydro One's employees allocated to its transmission business and the market median used in the study is as follows:

	Study Year	2020	2021	2022
Estimated Dollar Difference (Hydro One to Market Median)	-$9,383,384	-$14,367,138	-$16,412,218	-$17,595,910

This value was calculated based on the results of the PWU Benchmarking Study (F-04-01-03), based on the following set of assumptions:

- Estimates are based on the differential between the average salary and the market median rate for the corresponding level, multiplied by the number of incumbents in the relevant level.
- Projections assume external market increases at a rate of 2.5% per annum for 2020, 2021 and 2022. PWU data is assumed to increase by 2.0% per annum over the same period.
    - Based on Willis Towers Watson's annual Salary Increase Budget survey, typical Canadian salary increase budgets ranging from 2.0% - 3.0% per annum (midpoint used).

Witness: Sabrin Lila

    - PWU increases were projected based on the highest annual increase based on the most recent collective agreement.

- Assumes that headcount increases occur as per the business plan (F-04-01 Table 2) and the proportion of PWU incumbents in Core Services remains consistent (13% of PWU employees)

- The allocation of compensation to Transmission related activities is based on the following percentages 2020: 48.22%, 2021: 49.68% and 2022: 48.35%.

SEC INTERROGATORY #58

Reference:
F-04-01-05

Interrogatory:
Please provide the attachment in excel.

Response:
Please refer to Attachment 1 to this Exhibit for the updated Excel file.

In reviewing the excel file for the compensation tables, it came to Hydro One's attention that formula errors affecting both total Transmission and Distribution compensation occurred. These have been corrected in this file. The underlying source data is correct – as such, there is no impact to revenue requirement.

Witness: Sabrin Lila

SEC INTERROGATORY #59

Reference:
F-07-01

Interrogatory:
Please update the proposed income tax amounts for 2020 to 2022 to reflect the impact of Bill C-97 implementing the Federal Government's budge 2019 budget. Please provide schedule showing the impact of the changes contained in Bill C-87.

Response:
In our response below, Hydro One assumed the reference to Bill C-87 is meant to be Bill C-97, which includes the legislation for accelerated CCA.

Please refer to Exhibit I, Tab 01, Schedule OEB-208 for the revised taxable income and capital cost allowance schedules updated for accelerated CCA.

Witness: Nancy Tran

SEC INTERROGATORY #60

Reference:
G-01-01

Interrogatory:
Please provide a table that shows Hydro One's allowed and actual return on equity for each year between 2012 and 2018. Please explain any the drivers of any variances between allowed and actual ROE of more than 100 basis points.

Response:
Please refer to Exhibit I, Tab 02, Schedule EnergyProbe-24 for a table that shows the last five historical years.

SEC INTERROGATORY #61

Reference:
G-01-02 p.2

Interrogatory:
Has any of the credit rating agencies listed in Table 1, changed its short-term or long-term debt credit rating for Hydro One since 2016? If so, please provide details and the implication of the change in Hydro One's actual and forecast cost of debt.

Response:
There have been two credit rating downgrades since 2016.

On June 20, 2018, Moody's Investors Service (Moody's) downgraded the long-term debt rating for Hydro One Inc. to "Baa1" from "A3" and affirmed the existing "Prime-2" short-term debt rating for Hydro One Inc. Moody's indicated that it "no longer assigns any probability of extraordinary support from the Province of Ontario (Province) in Hydro One's credit analysis which has led to the downgrade."

On September 13, 2018, S&P lowered the issue-level rating on Hydro One Inc.'s senior unsecured debt by one notch to "A-" from "A" and lowered the rating on Hydro One Inc.'s commercial paper program by one notch to "A-1(low)" from "A-1(mid)" on the Canadian National Scale. The one notch downgrade reflected S&P's "reassessment of Hydro One's management and governance structure, which has weakened following the government of Ontario's decision to exert its influence on the utility's compensation structure through legislation, potentially promoting the interests and priorities of one owner above those of other stakeholders."

All else being equal, the implication of a debt rating downgrade would normally be expected to increase a company's credit spread, which is a component of its cost of debt. However, corporate credit spreads are a function of many factors including general economic conditions, government bond yields, equity market performance, and the supply of and demand for corporate debt. As shown in Exhibit I, Tab 10, Schedule VECC-4 part b), Hydro One Inc.'s YTD 2019 credit spreads post-downgrade (5-year: 0.97%, 10-year: 1.32%, 30-year: 1.66%) are relatively unchanged from Hydro One's 2016 credit spreads pre-downgrade (5-year: 0.98%, 10-year: 1.28%, 30-year: 1.73%).

Witness: Samir Chhelavda

SEC INTERROGATORY #62

Reference:

G-01-02 p.6 Table 4

Interrogatory:

Please provide a similar table that includes actual information for 2016 to 2018.

Response:

Please see Exhibit I, Tab 10, Schedule VECC-43 part b).

Witness: Samir Chhelavda