RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-15

Reference: Exhibit 2A, Tab 4, Schedule 2

QUESTION (A):

a) Please provide the Standardized Labour Rate calculation for the Power Line Technician for each of the years 2020-2025.

RESPONSE (A):

Please see Table 1 below for the calculation of Standard Labour Rate ("SLR") for the Power Line Technician position for 2020-2025:

Table 1: Standard Labour Rate ("SLR") Calculation

	Actual				**Bridge**	**Forecast**
	2020	**2021**	**2022**	**2023**	**2024**	**2025**
Total Compensation Costs ($ Millions) **(A)**	$10.1	$8.5	$9.7	$7.9	$12.4	$12.4
Total Working Hours	149,982	123,809	131,662	105,387	162,440	155,556
Less: Leaves	(25,773)	(21,275)	(22,625)	19,005	(32,760)	(31,680)
Less: Time not spent working on a specific operating or capital project	(10,488)	(8,658)	(9,207)	7,448	(20,755)	(19,881)
Total Available Hours **(B)**	113,722	93,876	99,831	78,934	108,925	103,995
Standard (Hourly) Labour Rate (A/B)	**$88.82**	**$90.62**	**$97.64**	$100.18	**$113.41**	**$119.20**

QUESTION (B):

b) The on-cost rate for Material Handling is calculated by dividing procurement and warehousing related operating expenses that meet the capitalization criteria as described in Toronto Hydro's Capitalization Policy with the dollar value of material moving through the warehouse in a given year. Please provide the calculation for the years 2020 to 2029.

RESPONSE (B):

Please see Table 2 below for the calculation of material handling on-cost rate for 2020-2029.

Table 2: Material Handling On-cost ($ Millions)

	Actual				Bridge	Forecast				
	2020	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Eligible procurement and warehousing related operating expenses	$13.2	$12.9	$14.2	$18.4	$19.1	$21.7	$23.7	$25.1	$25.7	$27.3
Material throughput	$110.3	$122.7	$141.5	$164.7	$143.3	$165.1	$174.1	$182.8	$177.6	$183.6
Material Handling On-Cost Rate (Exhibit 4, Tab 2, Schedule 13, Table 3)	**12.0%**	**10.5%**	**10.0%**	**11.2%**	**13.3%**	**13.2%**	**13.6%**	**13.8%**	**14.5%**	**14.9%**

QUESTION (C):

c) Please explain the increase in Material Handling On Costs over 2025-2029 compared to 2021 actuals.

RESPONSE (C):

The increase in material handling on-cost over 2025-2029 compared to 2021 is driven by the increases in dollar value of material moving through the warehouse in a given year of the capital plan, increase in procurement and warehouse related operation expenses that meet the capitalization criteria, and a new contract setting process to competitively source procurement and warehouse services in 2025.

Toronto Hydro's 2025-2029 capital expenditure plan is forecasted to be a 38 percent[1] increase over the current 2020-2024 period. To support this growth, additional resources are required to process material movements required to execute this work. As described in Exhibit 4, Tab 2, Schedule 13, page 17, more resources are needed to process purchase orders, conduct efficient competitive sourcing at the most favorable acquisition cost, collaborate with business units, and mitigate material supply risks to support grid modernization and electrification initiatives. With the current service contract expiring at the end of 2024, new rates for the 2025-2029 forecast period will be instated and are assumed to be a reflection of the current global inflationary pressure resulting from major world events in the 2020-2024 rate period.

[1] See Toronto Hydro's response to 2A-Staff-104, Appendix A for the latest Capital Expenditure plan

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-16

References: Exhibit 2B, Section A, Page 7

<u>Preamble:</u>

With respect to Figure 2:

QUESTION (A):

a) Please provide the calculation for 26% of Assets at End of Useful Life by 2023.

RESPONSE (A):

Toronto Hydro calculates the percentage of Assets Past Useful Life ("APUL") by comparing the asset population age demographics with the useful life for each asset class. See Toronto Hydro's response to interrogatory 1B-PP-9 for how the utility defines useful life.

If the asset is in-service and has an age at or greater than its useful life, then Toronto Hydro considers the asset as operating beyond its useful life. Toronto Hydro then divides this population by the total demographics to determine the proportion that is at or past useful life. To ensure the metric is not dominated by lower-cost, higher-volume assets, Toronto Hydro translates the asset volumes to dollars by applying a representative unit cost for each respective asset class.

The denominator used to calculate the percentage of assets past useful life is approximately $10.6 billion and the value of assets at end of useful life is approximately $2.7 billion. This results in the 25 percent of assets at end of useful life by 2023.

QUESTION (B):

b) Please provide the calculation for 11% of Assets To Reach Useful Life by 2030.

RESPONSE (B):

Toronto Hydro uses the same approach described in the response to part (a) to calculate the proportion of the asset demographic population that will reach useful life by 2030. Following this approach, the percentage of APUL by 2030 is 36 percent and Toronto Hydro took the difference between the population of APUL by 2030 and the population of APUL by 2023 to get the 11 percent.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-17

Reference: Exhibit 2B, Section A, Page 24

With respect to Figure 6, please provide the following:

QUESTION (A):

a) 2021: Revision of Standard Design Practices Document

RESPONSE (A):

The Standard Design Practices (SDP) document is a comprehensive internal design requirement document spanning 418 pages. It encompasses a multitude of company-specific information, procedures, configurations, contacts, frameworks, and preferences for Toronto Hydro's operations. At the reference noted above, the SDP is merely mentioned as part of an overall chronology of planning milestones. The production of the SDP in its entirely provides limited probative value relative to the expenditures sought as part of the DSP. Furthermore, its disclosure gives rise to public safety issues since disclosure could provide individuals with insights into system configuration and protocols, potentially leading to illegal access to the grid and/or theft (power or equipment). Misuse or misinterpretation of the content could result in public safety risks, legal complications, and potential damage. As a result, Toronto Hydro respectfully declines to produce the SDP.

QUESTION (B):

b) 2022: Grid Modernization Roadmap

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 2B-SEC-48.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-18

Reference: Exhibit 2B, Section A, Page 24

Toronto Hydro is working to introduce an initiative which considers Probability of Failure and Consequence of Failure measures to its existing ACA measures.

QUESTION (A):

a) Please provide the start date and forecast end date of this initiative.

RESPONSE (A):

Toronto Hydro completed development of the Probability of Failure variables in December 2023, for the initial purpose of integrating these values into the Engineering Asset Investment Planning ("EAIP") tool. The calculation of Consequence of Failure is in progress as part of value framework development for the EAIP project. Please see 2B-AMPCO-20 for more information.

The utility plans to continue evolving and enhancing its Condition-Based Risk Management ("CBRM") framework (which includes the ACA methodology), and as part of this effort intends to explore the development of asset class risk matrices, which will combine asset health and criticality indices (i.e., consequence of failure) into an expanded view of asset risk demographics.[1]

QUESTION (B):

b) Please provide the % completion rate to date for this initiative.

[1] Details of Toronto Hydro's Quantified Risk-Based Analysis is explained in Exhibit 2B Section D3.2.1.3

RESPONSE (B):

The calculation of Probability of Failure is 100% complete. See response to part (a) regarding Consequence of Failure.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-19

References: Exhibit 2B, Section A, Page 24

Preamble: Toronto Hydro is in the process of developing a detailed AM Capabilities roadmap.

QUESTION (A):

a) Please provide the start date and forecast end date of this initiative.

RESPONSE (A):

Please refer to Exhibit 2B, Section D1 at pages 14-16, for more information on the status and direction of Toronto Hydro's asset management road-mapping activities. Exhibit 2B, Section D5.2.3 provides additional information on the utility's strategic objectives for asset analytics and decision-making for 2025-2029. Toronto Hydro finalized these objectives as part of the integrated planning process that produced the 2025-2029 Distribution System Plan, and a number of initiatives intended to advance these objectives are currently embedded within the organization's broader technology and product roadmaps.

The utility plans to ramp-up the next phase of its ISO 55001 gap closure efforts in the second half of 2024, and as part of that effort will undertake the process of consolidated a detailed AM Capabilities roadmap. The utility's goal is to have a draft roadmap in place by the end of 2024, with finalization occurring in early 2025.

QUESTION (B):

b) Please provide the % completion rate to date for this initiative.

RESPONSE (B):

Toronto Hydro estimates that progress toward a detailed roadmap is at approximately 30-40 percent.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-20

Reference: Exhibit 2B, Section A, Page 24

<u>Preamble:</u> Toronto Hydro is implementing Phase 3 of the EAIP Solution.

QUESTION (A):

a) Please provide the start date and forecast end date of this initiative.

RESPONSE (A):

Toronto Hydro has been in the process of implementing an Engineering Asset Investment Planning ("EAIP") solution in multiple phases, and is currently in Phase 3 of the project. Phase 3 started in June 2023, and Toronto Hydro forecasts it will be completed by the end of June 2024. After the system is implemented as part of Phase 3 Go-Live, Toronto Hydro expects to integrate the solution as part of its asset management processes, which includes the Investment Planning Portfolio Reporting ("IPPR") process and Execution Work Program ("EWP") development. Once this is complete (targeted by the end of 2024), the system will be considered fully operationalized.

QUESTION (B):

b) Please provide the % completion rate to date for this initiative.

RESPONSE (B):

The percent completion to date for Phase 3 of EAIP is 70 percent. Toronto Hydro's progress on the overall EAIP project is 85 percent.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-21

Reference: Exhibit 2B, Section A, Page 24

Please provide the start date and forecast end date for ISO 55001 Certification and the % completion rate to date for this initiative.

RESPONSE:

Toronto Hydro aims to achieve ISO 55001 certification within the 2025 to 2029 rate period. The current aspiration is to certify by the end of 2026 (which would put the utility on a recertification schedule of 2029). However, the specific timing for ISO 55001 certification remains under detailed assessment (a refreshed roadmap is under development as part of planning for the next stages of the project). The ultimate certification date will be influenced by several factors, including:

- Given the nature of the project (i.e., management system gap closure and transformation), there will be continuous refinements to the scope of work. As the project progresses, the specific minimum actions required, as well as Toronto Hydro’s decisions to go beyond those minimum efforts for certain dimensions of the AM System, will evolve.
- Availability of resources, as many individuals supporting the ISO deliverables will be taking on responsibility in addition to their existing roles.
- In the event of an unsuccessful certification attempt, Toronto Hydro will need to prepare to recertify; it is not uncommon for utilities to undertake multiple certification attempts, or (more commonly) to push out the timeline for a certification audit based on a preliminary third-part assessment of audit preparedness.
- Beyond the preparation and completion of deliverables, Toronto Hydro has to ensure the improvements are successfully embedded into the Asset Management System and sustainable over the long-run. The utility is conscious of the fact that a rushed, bare

minimum approach to achieving certification may not result in sustained benefits in the long-run.

Toronto Hydro needs to achieve an overall score of 3.0 (45%) on the ISO maturity scale. An assessment performed in December 2023 indicates a modest increase in the overall score for Toronto Hydro in 2020, from 2.56 to 2.69 (38% to 40%). Please refer to 2B-SEC-34 for more details on the updated gap assessment.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-22

Reference: Exhibit 2B, Section A, Page 24

QUESTION (A) AND (B):

a) Please provide Figure 6 to show the Planned Enhancements of the AM Process (2025-2029).

b) For each of the Planned Enhancements please provide the start and end dates and % completion to date.

RESPONSE (A) AND (B):

Toronto Hydro does not have an exhaustive list of planned Asset Management System enhancements with firm timelines for the entire 2025-2029 period. The utility adopts an agile approach to initiative planning and execution in this area, recognizing that continuous improvement in asset management involves many complimentary and interdependent initiatives moving in parallel.

As discussed in response to 2B-AMPCO-19, the utility is currently developing a longer-term AM Capability Roadmap which will aide in the prioritization and execution of the various strategic AM capability-related objectives outlined in Sections D1 and D5 of Exhibit 2B.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-23

Reference: Exhibit 2B, Section A, Page 37

Toronto Hydro maintains a strategic approach by utilizing a combination of internal and external resources to execute its extensive capital and maintenance programs.

QUESTION (A):

a) Please provide the % of internal and external resources for each of the years 2020 to 2024 allocated to capital programs and maintenance programs.

RESPONSE (A):

Please see Table 1 below for percentage of internal and externally contracted costs for capital programs and Table 2 for the percentage of internal and external costs for maintenance programs. In responding to this interrogatory it is Toronto Hydro's understanding that by "maintenance programs", AMPCO meant Preventative and Predictive Overhead Line Maintenance, Preventative and Predictive Underground Line Maintenance, Preventative and Predictive Station Maintenance Program, and Corrective Maintenance. Additionally, Toronto Hydro notes that beside internal and external costs, other costs for capital and maintenance programs primarily include material purchased which is excluded from Tables 1 and 2 below.

Table 1: 2020-2024 Percentage (%) of Internal and External Capital Costs

	Actual				Bridge
	2020	2021	2022	2023	2024
Internal Costs (Labour + Vehicles)	18%	16%	13%	15%	16%
External Costs	55%	60%	58%	54%	56%

Table 2: 2020-2024 Percentage (%) of Internal and External Maintenance Costs

	Actual				Bridge
	2020	**2021**	**2022**	**2023**	**2024**
Internal Costs (Labour + Vehicles)	34%	31%	29%	29%	29%
External Costs	59%	62%	65%	65%	64%

QUESTION (B):

b) Please provide the resource assumptions (internal and external) for 2025-2029.

RESPONSE (B):

Program work is assigned to internal crews until available hours for work are balanced to assigned work. Once internal crews are balanced, remaining work is assigned to contracted resources. Please see Exhibit 4, Tab 4, Schedule 3 for details of Toronto Hydro's internal hiring projections and plans, including the outsourcing strategy at pages 30-31. Please refer to 2B-SEC-55 part (b) and 4-AMPCO-82 parts (b) and (c) for further information.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-24

Reference: Exhibit 2B, Section C

QUESTION (A):

a) Please update Figures 10 and 11 with 2023 data.

RESPONSE (A):

Please see Toronto Hydro's response to Interrogatory 2B-SEC-35 part (a).

QUESTION (B):

b) With respect to Tables 4-6, please provide the data for Defective Equipment only by equipment type for the years 2018-2023.

RESPONSE (B):

Please see Tables 1-3 below.

Table 1: Number of Interruptions - Defective Equipment by Equipment Type (Excluding MEDs)

	2018	2019	2020	2021	2022	2023
Overhead Conductor	43	28	32	32	65	89
Overhead Insulator	10	12	10	17	13	10
Overhead Pole	35	27	29	26	30	50
Overhead Switch	33	26	32	45	53	48
Overhead Transformer	31	26	33	25	64	51
Station Equipment	10	9	5	8	8	8
Underground Cable	198	137	146	156	198	134
Underground Switch	17	15	12	23	7	18
Underground Transformer	62	42	32	24	41	51

	2018	2019	2020	2021	2022	2023
Various	2	8	3	8	5	2
Grand Total	441	330	334	364	484	461

Table 2: Number of Customer Interruptions - Defective Equipment by Equipment Type (Excluding MEDs)

	2018	2019	2020	2021	2022	2023
Overhead Conductor	24,029	20,578	39,288	30,694	22,115	29,852
Overhead Insulator	4,055	16,198	18,687	21,974	14,013	7,028
Overhead Pole	25,618	51,750	30,604	41,700	20,778	47,327
Overhead Switch	32,357	12,822	57,321	45,740	52,626	10,571
Overhead Transformer	2,617	1,615	6,340	2,448	7,643	11,641
Station Equipment	13,166	11,456	5,281	5,166	9,652	4,185
Underground Cable	144,022	105,187	125,225	162,647	198,958	103,757
Underground Switch	31,738	19,427	9,096	24,905	3,930	11,790
Underground Transformer	30,188	31,924	15,922	14,091	27,773	34,275
Various	274	8,517	869	5,620	2,448	33
Grand Total	308,064	279,474	308,633	354,985	359,936	260,459

Table 3: Number of Customer Hours Interrupted - Defective Equipment by Equipment Type (Excluding MEDs)

	2018	2019	2020	2021	2022	2023
Overhead Conductor	26,964	20,732	34,050	27,610	13,427	25,153
Overhead Insulator	9,423	13,003	11,783	22,584	8,888	5,053
Overhead Pole	18,343	26,875	12,818	31,454	9,433	17,451
Overhead Switch	17,863	10,431	30,283	21,581	27,976	5,798
Overhead Transformer	5,532	2,002	3,212	2,465	8,588	7,808
Station Equipment	18,190	28,609	4,816	12,286	10,636	7,096
Underground Cable	126,109	82,260	168,502	112,949	157,462	106,930
Underground Switch	23,974	19,825	5,081	34,583	2,121	6,162
Underground Transformer	20,586	17,893	9,991	6,293	10,707	16,231
Various	1,467	9,820	811	4,492	16,746	36
Grand Total	268,452	231,449	281,347	276,297	265,983	197,717

QUESTION (C):

c) With respect to the Cause Code Major Event Days (MEDs), please provide the Number of Interruptions, Number of Customer Interruptions, and Number of Customer Hours Interrupted for each of the years 2018-2023.

RESPONSE (C):

Please see Table 4 below.

Table 4: MED Number of Interruptions, Customer Interruptions, and Customer Hours Interrupted

Year	Number of Interruptions	Number of Customer Interruptions	Number of Customer Hours Interrupted
2018	266	427,761	1,365,533
2019	0	0	0
2020	41	54,253	97,477
2021	0	0	0
2022	92	145,313	469,876

QUESTION (D):

d) In excel, please provide in excel the Number of Interruptions, Number of Customer Interruptions, and Number of Customer Hours Interrupted for each of the years 2018 to 2023 for Overhead Equipment, Underground Equipment, Station Equipment and Various.

RESPONSE (D):

Please refer to tab ‘Q.D’ of Appendix A to this response.

QUESTION (E):

e) Please define Various in Figure 20 and Figure 21.

RESPONSE (E):

Various refers to interruptions where multiple assets (more than one) failed concurrently. As such, the equipment failures may be attributed to more than one equipment category (e.g. Overhead, Underground, or Station Equipment).

QUESTION (F):

f) In excel, please provide the Number of Interruptions, Number of Customer Interruptions, and Number of Customer Hours Interrupted for each of the years 2018 to 2023 for Overhead Transformers, Overhead Switches, Poles and Pole Hardware, Overhead Insulators, Overhead Conductors.

RESPONSE (F):

Please refer to tab 'Q. F' Appendix A to this response.

QUESTION (G):

g) In excel, please provide the Number of Interruptions, Number of Customer Interruptions, and Number of Customer Hours Interrupted for each of the years 2018 to 2023 for Underground Cables and Cable Accessories, Underground Switches, Underground Transformers.

RESPONSE (G):

Please refer to tab 'Q. G' Appendix A to this response.

QUESTION (H):

h) In excel, please provide the data in part c) and f), separately for the Horseshoe Area and Downtown and provide excel versions of the data.

RESPONSE (H):

Please refer to tab 'Q. H' Appendix A to this response.

QUESTION (I):

i) Please provide the total number of customers and the number of customers in the Horseshoe Area and Downtown for each of the years 2018 to 2023.

RESPONSE (I):

Please see Table 5 below for the total number of customers served (12-month average), from 2018 to 2023. Toronto Hydro does not have a system to track the total number of customers served separately by the Horseshoe Area and Downtown Core for reliability reporting purposes. As of the time of preparing this response, the utility estimates that 66 percent of its customers are served by the Horseshoe system, while 34 percent are served by the Downtown system.

Table 5: Total Number of Customers Served

Year	Total Number of Customers Served (Average)
2018	764,126
2019	769,120
2020	773,593
2021	776,908
2022	783,097
2023	787,012

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-25

References: Exhibit 2B, Section C, Page 14

<u>Preamble:</u> Table 3 provides a percentage breakout of SAIFI (Excluding MEDs) by outage cause for 2018-2022.

Please provide the % Contribution to SAIFI by outage cause for each of the years 2018-2023.

RESPONSE:

Please see Table 1 below for a percentage breakout of SAIFI, excluding Major Event Days ("MEDs"), by outage cause.

Table 1: SAIFI Contribution by Cause Code (Excluding MEDs) – 2018-2023

Major Cause Code	2018	2019	2020	2021	2022	2023
Adverse Environment	0.1%	0.0%	0.2%	0.0%	0.7%	0.0%
Adverse Weather	8.9%	8.5%	3.8%	9.0%	4.4%	9.1%
Defective Equipment	27.2%	28.0%	24.6%	29.6%	28.2%	23.4%
Foreign Interference	9.2%	9.5%	13.2%	12.5%	10.7%	12.8%
Human Element	2.4%	4.7%	2.2%	4.5%	0.9%	2.9%
Lightning	0.2%	0.4%	0.0%	2.8%	0.3%	0.4%
Loss Of Supply	23.2%	16.3%	12.2%	5.7%	14.7%	12.7%
Scheduled Outage	0.7%	1.2%	0.5%	0.7%	2.7%	3.4%
Tree Contacts	8.9%	7.3%	10.3%	9.9%	8.0%	9.5%
Unknown	19.3%	24.1%	33.0%	25.2%	29.3%	25.8%

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-26

Reference: Exhibit 2B, Section D1, Page 12

Please complete the following table:

Performance Measures	Forecast End of 2024	Actual End of 2024	Forecast End of 2029
Box Framed Poles			
Remaining on the System			
Non-Energy Mitigating Cable Chamber Lids in High Risk Locations			
Rear Lot Customers on System			
Direct-buried Cable on system (km)			
Network Modernization (% of submersible units)			
PCB-contaminated Oil Spills			
Lead Cable Remaining on System (km)			

RESPONSE:

Please see Table 1 below. Toronto Hydro assumes that “Actual End of 2024” is a typo and intended to be “Actual End of 2023.”

Table 1: Key Performance Measure Actual 2023 and Forecast 2024 and 2029

Performance Measures	Forecast End of 2024	Actual End of 2023	Forecast end of 2029
Box Framed Poles remaining on the system	491	574	0
Non-energy Mitigating Cable Chamber Lids in High-Risk Locations	8794	8974	5994
Rear Lot Customers on System	6,609	6,869	5,142
Direct-buried Cable on System (km)	642	N/A[1]	460
Network Modernization (% of submersible units)	70%	N/A[1]	80%[2]
PCB Contaminated Oil Spills	0	N/A[1]	0
Lead Cable Remaining on System (km)	1162	1200	972[2]

[1] See 1B-SEC-23
[2] Forecast takes into account planned and reactive replacement of deteriorated units, and units that are being added/replaced due to loading considerations (i.e., customer connections). Based on recent historical performance and assuming the proposed investment plan is approved, assumed 2% increase in submersible unit count between 2025-2029 resulting in 80% submersible units by the end of the rate period.
[2] Forecast based on historical rate of PILC and AILC removal (2018-2023)

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-27

Reference: Exhibit 2B, Section D1, Page 21

Preamble:

As part of the IPPR process, Toronto Hydro monitors and reports on the progress of capital programs, which includes program level expenditures, project-specific execution status and project expenditures.

Over the period 2020-2023, please provide the list of material projects/programs that performed poorly over 2020-2023, explain why and provide the key lessons learned for execution of the 2025-2029 portfolio.

RESPONSE:

Toronto Hydro does not have a definition for "poor performing" programs/projects. Project costs and program completion rates may vary from initial estimates and plan lines due to myriad factors, including unforeseen challenges during execution.

All projects are reviewed at a project level for adherence to plan. As mentioned in Exhibit 2B, Section D1.2.3, Toronto Hydro monitors changes to projects through a change management and governance process. This process includes the change request process, project variance analysis, and numerous metrics to drive process adherence and continuous improvement. For further details on the project variance analysis process refer to the response to interrogatory 2B-AMPCO-29 part (d).

Toronto Hydro's integrated, portfolio-based forecasting and planning processes focus on delivery over the five years of the utility's Distribution System Plan period, allowing for adjustments to be made when the utility finds that long-term program execution is not on track. Additionally, part of the Investment Planning and Portfolio Reporting ("IPPR") process is to review spend variances of 10% and $1 million (over or under) from the previous year in order review common drivers, emerging issues, and process adherence, and to encourage continuous improvement at all stages of planning and execution. Portfolio targets may be adjusted based on new findings and emerging requirements as part of the IPPR process. As work is being executed, the work mix can be adjusted for multiple reasons such as resource availability, changes in priority, or emerging urgent work. All of these processes provide continuous feedback to the planning teams on lessons learned during execution that are then reviewed and considered as part of future work planning, and Toronto Hydro expects these improvements to benefit execution of the 2025-2029 portfolio.

One recent process improvement included updating the checklist that planners use to ensure inclusion of all expected costs. This list is updated based on execution variances and challenges identified through the project variance analysis process. The utility has also introduced additional review steps to confirm inclusion of all expected costs in estimates during the hand-off from planning to program management. Another improvement based on recent experience is an ongoing review of the material management process and its alignment with the project execution process. This review has identified the need to start the procurement process earlier in the planning process, for key material with long lead times (>1 year), in advance of the formal design phase to reduce cycle time for project execution.

Toronto Hydro also expects its implementation of an Engineering Asset Investment Planning ("EAIP") tool will improve transparency and reporting with respect to project portfolios and create new opportunities to enhance program execution effectiveness in the 2025-2029 period. Please see Exhibit 2B, Section D1, page 14 for more information.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-28
Reference: Exhibit 2B, Section D1, Page 23

AMPCO seeks to further understand how Toronto Hydro prioritizes projects comparatively at the project and portfolio level. Is this a manual or automated process? How did Toronto Hydro optimize its project portfolio?

RESPONSE:
Details on Toronto Hydro's project prioritization are discussed in Exhibit 2B, Section D1.2.1.4, page 23, and Exhibit 2B, Section D1.2.3, page 25. This process is currently manual and is managed as part of Toronto Hydro's Program Management and Execution process, particularly the Execution Work Program ("EWP") as discussed in Exhibit 4, Tab 2, Schedule 9, Section 8.

The development of the EWP is iterative in nature and involves continuous coordination between program managers and system planners to ensure alignment with strategic objectives. Planning teams assign priority levels to their projects that are then considered along with factors such as project labour requirements, schedules and resources to determine the prioritized mix of projects to be executed in a given year. As part of the forecasting process high and medium priority projects are assigned for execution ahead of low priority projects. The EWP forecasting process includes a daily consolidation of inputs from all operations teams to provide visibility on the project selection alignment to the portfolio targets and inclusion of all high priority projects. This consolidation is reviewed throughout the EWP forecasting process with key stakeholders to adjust and align the forecast selection to the portfolio targets as closely as possible while still considering program execution constraints.

Toronto Hydro's process for project prioritization is anticipated to evolve once its new EAIP optimization tool has been embedded as part of its business planning process.

Note that Toronto Hydro's 2025-2029 investment plan is not based on project details.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-29
Reference: Exhibit 2B, Section D1, Pages 25-26

At D1.2.3 Toronto Hydro explains its Project Management and Execution process. Toronto Hydro monitors changes to projects through a change management and governance process. This process includes monthly executive performance reporting, key program status reporting, change request process management, project variance analysis, and numerous metrics to drive process adherence and continuous improvement. Depending on the magnitude of a required change to a project's cost, schedule, or scope of work, the change may require a detailed assessment of alternatives and formal approval from senior management and the executive team before proceeding.

QUESTION (A):

a) Please complete the following table:

	2020-2024	2025-2029
# Projects		

RESPONSE (A):

Over the 2020-2024 rate period, Toronto Hydro expects to execute approximately 2700 projects. Toronto Hydro's DSP is planned on a programmatic (rather than project-level) basis. As such, 2025-2029 project details are not available.

QUESTION (B):

b) Please provide the key internal document that governs Toronto Hydro's project management process.

RESPONSE (B):

The Project Planning Process (PPP), which documents the overall life cycle for capital execution projects, is attached as an appendix to this response. For more information on Program Management and Support Segment, see Exhibit 4, Tab 2, Schedule 9 at section 8.

QUESTION (C):

c) Please provide an example of a monthly executive performance report.

RESPONSE (C):

Executive oversight of the capital program occurs through the monthly Investment & Operations Planning (IOP) management process which centers around a monthly meeting with all executives and senior leaders responsible for the planning and execution of the capital and operations work program. The mentioned report refers to the presentation that is given at this monthly governance meeting where numerous topics related to the execution of the work program are thoroughly canvassed and discussed. These topics include, but are not limited to: (i) monthly and year to date results, and annual outlooks for the work program; (ii) material availability and resource balancing considerations; (iii) work reprioritization as needed to manage execution challenges and deliver the work program; (iv) lessons learned and continuous improvement initiatives; (v) design readiness, schedule adherence and other process-related considerations); (vi) macro-level emerging issues that may pose an overall risk to the program (e.g. COVID, inflation, supply chain interruptions). Toronto Hydro declines to provide an example of a monthly IOP report, as without aforementioned context of the monthly review meeting, this report provides no probative value to deciding the issues in this proceeding. The governance process is described above and Toronto Hydro witnesses who have experience with this process are available to answer further questions at the Technical Conference.

QUESTION (D):

d) Please provide an example of a project variance analysis.

RESPONSE (D):

A Project Variance Analysis (PVA) is used to review the specific types of cost variance (e.g. labour, material, vehicle, other) on planned capital work and the reasons for the variance which can include but are not limited to changes in scope of work, site related and coordination issues, external and regulatory factors (road restrictions, permitting), material costs. Please find attached a template of the PVA document.

QUESTION (E):

e) Please explain what triggers a Project Variance Report. Please provide the number of Project Variance Reports over 2020-2023.

RESPONSE (E):

A Project Variance Analysis is triggered by a variance that is more than +20% or (-15%).[1] Table 2 provides the number of PVAs over 2020-2023.

Table 2: Number of Project Variance Reports

	2020	2021	2022	2023
Number of PVAs	144	129	121	169

QUESTION (F):

f) Please provide the % of Planned Capital Projects Completed on Time or Early for each of the years 2020-2023 and provide the calculation.

RESPONSE (F):

Please see the table below.

[1] This threshold aligns with the AACE International Recommended Practice No. 18R-97. Cost Estimate Classification System – As applied in Engineering, Procurement, and Construction for the Process Industries

Table 3: Percent of Projects Completed Early/On-Time.

Year	# of Projects Completed	# of Projects Completed Early/On time	% of Projects completed Early/On time
2020	274	252	92%
2021	286	264	92%
2022	286	227	79%
2023	314	248	79%

In 2022, Toronto Hydro began tracking completions against a project list that is defined in January of each new year, as opposed to tracking completion against the mid-year re-forecast. This change was made to improve overall adherence to the forecasted plan lines. As a result of this change the reported completion rate for 2022 and 2023 is lower than in previous years.

QUESTION (G):

g) Please provide the % of Planned Capital Projects Completed on or below Budget for each of the years 2020 to 2023 and provide the calculation.

RESPONSE (G):

Please see table below.

Table 4: Percent of Planned Capital Projects Completed On or Below Budget

Year	# of Projects Completed	# of Projects Completed On/Below Budget	% of Projects completed On/Below Budget
2020	274	195	71%
2021	286	213	74%
2022	286	224	78%
2023	314	234	75%

QUESTION (H):

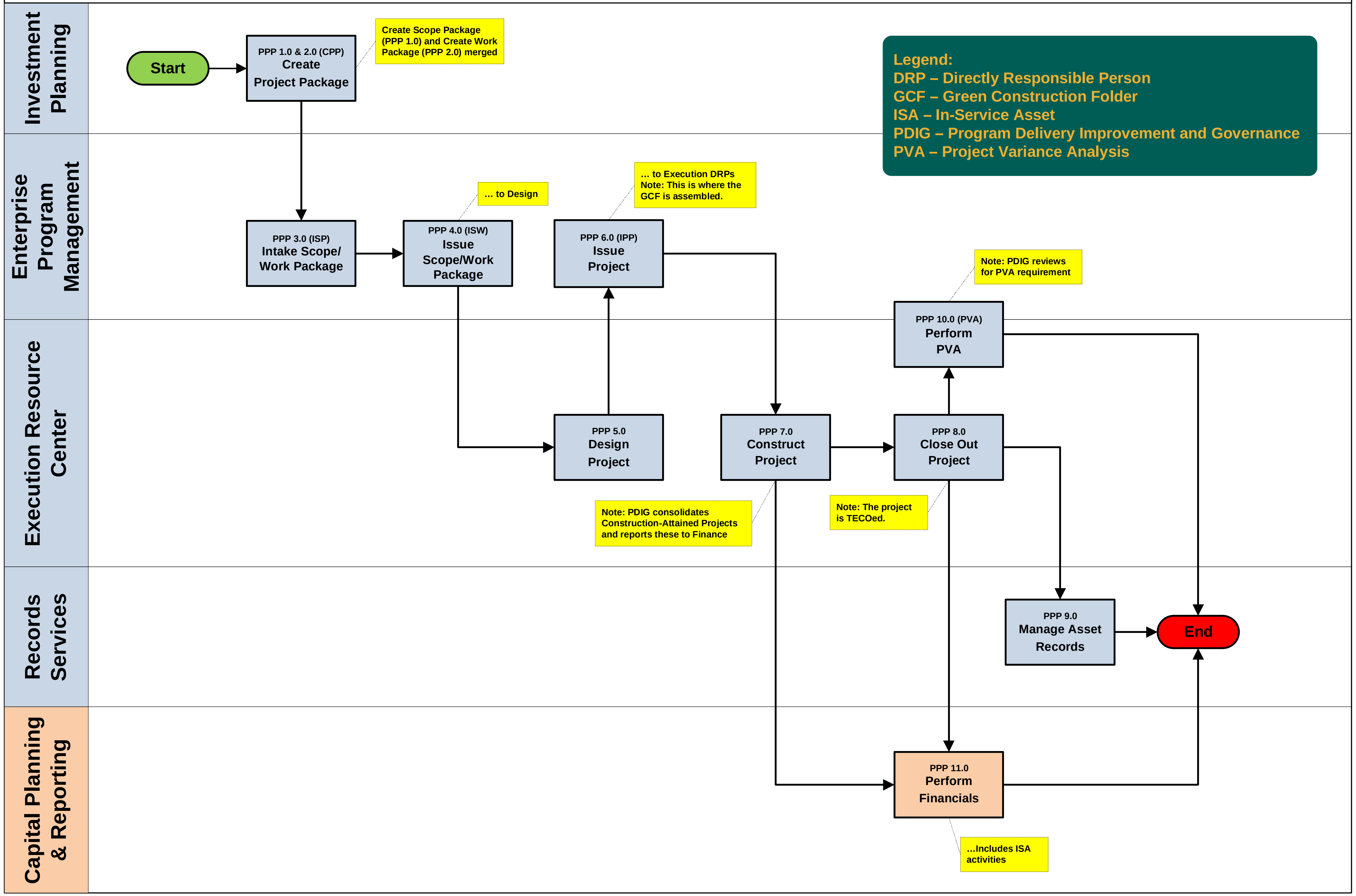
Please provide a list of projects 2020-2023 that required formal approval from senior management and the executive team before proceeding.

RESPONSE (H) :

All projects are approved by the senior management team and overseen by the executive team through the governance process set out in part (c).

Project Planning Process (PPP) Level 2 Process Map

As at April 28, 2022 (v3.0)



TORONTO HYDRO

Summary Report

Last Refreshed	M/YYYY | HR:MM:SS GMT-04:00
Refreshed By	
Page	1 of 1

WBS Element Lev	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Descript	Construction Attaine	WBS Responsible Cost Cente	Designer Project DR	Construction DR
							#

Cost Category	Planned Cost (DSAP)	Planned Cost (C	Actual Cost	Variance (% Actual of Estimate	Total Project Varianc

Gap Analysis Required on: ______________________

Specify area(s) to analyze (e.g., Labour Variance, $$ Variance, etc.)

Gap Analysis Completion Date: ______________________

Project Execution Supervisor S

____

Name:

Date:

TORONTO HYDRO

Labour Variance Report

Company code	WBS Element L1	WBS Element L1 Description	WBS Element L2	WBS Element L2 Description	WBS Element L3	WBS Element L3 Description	PM Order	Activity Type	Planned Labour Hours (DSAP)	Planned Labour Hours (CHKL)	Actual Hours	Labour Variance
								Total	**3,524.1**		**4,645.0**	**-1,120.9**
								Total Labour Variance hrs %				**-31.81%**

Material Variance Report

Last Refreshed D/MM/YYYY | HR:MM:SS GMT-04:00
Refreshed By

WBS Element L1	WBS Element L1 Description	WBS Element L2	WBS Element L2 Description	WBS Element L3	WBS Element L3 Description	PM Order	Material	Material Description	Estimated Quantity (DSAP)	Estimated Quantity (CHKL)	Actual Quantity	Returned Quantity	Net Quantity	Material Variance Qty
								Sum:	**1,118**		**1,530**		**1,530**	**-412**
								Total Material Variance % (Qty)						**-36.85%**

Gap Root Report

WBS Element Level 2	WBS Element Level 2 Description	WBS Element Level 3	WBS Element Level 3 Description	Construction Attained Date	WBS Responsible	Designer Project DRP	Construction DRP

Cost Category	Planned Cost (DSAP)	Planned Cost (CHKL)	Actual Cost	Variance (% Actual of Estimat	Total Project Varianc
External					
Labour					
Material					
Vehicle					
Total:					

Total Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g.,Scope change $ (re - phased); contingencies not accounted for)	
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)	
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)	
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)	
	☐	Externaland Regulatory Factors (City's restriction,policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)	
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)	
	☐	Overtime (No provision for overtime work)	
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)	
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)	
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)	
Root Cause Details (Note:Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If nededed, please discuss with your Supervisor.)			
Options / Solutions	♦		
Recommendation	♦		
Implementation Plan	♦		
	♦	**Planned Date of Implementation**	
	♦	**Actual Date of Implementation**	
Analysis Completed			
All Implementations Completed			

Labour variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g.,Scope change $ (re - phased); contingencies not accounted for)	
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)	
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)	
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)	
	☐	Externaland Regulatory Factors (City's restriction,policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)	
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)	
	☐	Overtime (No provision for overtime work)	
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)	
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)	
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)	
Root Cause Details (Note:Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If nededed, please discuss with your Supervisor.)			
Options / Solutions	♦		
Recommendation	♦		
Implementation Plan	♦		
	♦	**Planned Date of Implementation**	
	♦	**Actual Date of Implementation**	
Analysis Completed			
All Implementations Completed			

Material Variance

Category of Analysis Note: More than one category may be selected.	☐	Change in Scope of Work/Accounting for Contingency (Change in scope of work; e.g.,Scope change $ (re - phased); contingencies not accounted for)	
	☐	Site related & Coordination Issues (Issues related to the site; includes situation not foreseen prior to construction, as well as, situations that could been avoided with thorough inspection and other actions; also includes project that experienced variance due to coordination issues with customers or other THESL project)	
	☐	Incorrect or Missed charges (Charges missed or incorrectly classified; i.e. missed charges or recurring ways in which incorrect charges are accured)	
	☐	Missed Estimate/Estimate Issue (Missed estimates or other estimate related issue; e.g., refinement of design, discretionary estimate items, detailed design errors(missing/additional units), etc.)	
	☐	Externaland Regulatory Factors (City's restriction,policy changes from other utilities, etc. that could not be feasible be anticipated at the design stage)	
	☐	Changes from Internal to External (Change from internal to external due to resource or scheduling constraints)	
	☐	Overtime (No provision for overtime work)	
	☐	Rate Changes (Changes in rates such as UPCMS, material, cut repair, etc.)	
	☐	Assembly Unit (AU)/Compatible Unit (CU) Error (Errors in the breakdown or composition of AUs/CUs)	
	☐	Incorrect/additional material ordered (Materials taken/charged to the project that were not in the original estimate; e.g., double ordering, not taking materials that were in the estimate)	
Root Cause Details (Note:Please provide enough information to explain the variance, including the associated $ for the variance; e.g., OT is not accounted for in the project and $25k of the variance, apprentices were not included in the estimate and accounts for $20k of extra charges, etc. If nededed, please discuss with your Supervisor.)			
Options / Solutions	♦		
Recommendation	♦		
Implementation Plan	♦		
	♦	**Planned Date of Implementation**	
	♦	**Actual Date of Implementation**	
Analysis Completed			
All Implementations Completed			

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-30

Reference: Exhibit 2B, Section D1, Page 27

Toronto Hydro tracks Program Accomplishments as an Outcome Measure.

QUESTION (A):

a) Please discuss if Toronto Hydro tracks Program Accomplishments at the segment/program level or portfolio level, or both.

RESPONSE (A):

Toronto Hydro tracks program accomplishments at the segment/program level, and these can be aggregated to higher levels of reporting if needed.

QUESTION (B):

b) Please discuss if each program has a specific and unique outcome measure that is formally tracked. If yes, please provide the Program Accomplishments for each segment in E5 to E8.

RESPONSE (B):

Toronto Hydro's use of the term "program accomplishments" refers to volumetric accomplishments of work and project-based milestones, whereas "outcome measures" refers to performance outcomes. Where appropriate (e.g., compliance-driven programs), Toronto Hydro may treat program accomplishments as the performance outcomes for the program (e.g., box-framed poles eliminated). Program accomplishments and outcome measures allow Toronto Hydro to monitor the performance of its investment program, and to determine to what extent projects have contributed to expected outcomes, including risk reduction.

Each program has a unique set of accomplishments to be tracked (e.g., pole replacements) along with one or more outcome measures that may be unique to the program (e.g., benefits achieved from Network Condition Monitoring & Control investments)[1] or shared with other programs (e.g., SAIDI/SAIFI).

Toronto Hydro has included program accomplishment and outcome measures throughout its evidence, including within the detailed program evidence found in Exhibit 2B (Sections E5-E7). Outcome measures that are influenced by multiple programs are discussed in Sections D2, C, and E2 of Exhibit 2B and in Exhibit 1B, Tab 3, Schedule 2 (e.g., overall asset condition demographics by asset class; SAIDI/SAIFI results, oil spills, etc.).

[1] Exhibit 2B, Section E7.3

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-31

Reference: Exhibit 2B, Section D1, Page 28

AMPCO seeks to understand if new and revised standards is a significant driver of costs over 2025-2029.

If material, please provide the number of new and revised standards over 2020-2023 and the impact on costs.

RESPONSE:

Toronto Hydro confirms that new and revised standards are not a significant driver of costs over the 2025-2029 period.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-32

References: Exhibit 2B, Section D2, Page 16

Please complete the following Table:

THESL System	2017	2022	2029
% Underground			
% Overhead			

RESPONSE:

Please see Table 1 below. These values are based on the length of cables and wires (i.e., linear assets) within each system. Toronto Hydro cannot project a forecast for 2029 due to the complex nature of the distribution system and the various factors that may impact the mix of overhead versus underground system over time, such as the volume and type of customer connection demand, externally initiated relocations, resiliency investments, and rear lot conversions.

Table 1: Underground and Overhead Percentages of Linear Assets

Toronto Hydro System	2017	2022	2029
Underground	45%	46%	n/a
Overhead	55%	54%	n/a

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-33

References: Exhibit 2B, Section D2

Please list any third-party asset studies undertaken over the period 2020-2024 and include the scope of work and summarize any conclusions and recommendations.

RESPONSE:

Please see Table 1 below. For the purpose of this interrogatory response, Toronto Hydro is interpreting "asset" studies as any study or report undertaken to assess its major electrical assets within its Distribution System Plan over the 2020-2024 period. For benchmarking studies conducted by third parties, please refer to Toronto Hydro's response to interrogatory 1B-SEC-5.

Table 1: Third-Party Asset Studies Undertaken over 2020-2024

Study	Scope	Conclusions and Recommendations
AMI 2.0 Technology Assessment Report	Conducted by Util-Assist to provide a summary of current market offerings from leading AMI vendors.	With current AMI technology rapidly end-of-life in Ontario, an investment in AMI 2.0 is needed as part of the regular asset lifecycle management. Current economic and market conditions have provided a strong incentive for AMI vendors to improve the value proposition of the technology.
AMI 2.0 Strategy Document	Conducted by Ernst & Young to provide consulting services focused on meter technology and Advanced Metering Infrastructure (AMI) upgrades from a strategic perspective, including opportunities, use case prioritization and deployment strategies.	Provided AMI 2.0 Use Cases, **illustrated case studies from utilities across the globe with respect to how AMI has been used to enable business capabilities, and** recommended an AMI 2.0 roadmap.

Study	Scope	Conclusions and Recommendations
AMI 2.0 Program Outline	Conducted by Ernst & Young to provide results of working sessions with Toronto Hydro stakeholders to consider key aspects of an AMI program, as Toronto Hydro prepares for replacing their current fleet of smart meters.	Provided AMI 2.0 Use Cases to be established in the near term and implementation timelines, major program components of an AMI program, and consideration for various solution components based on AMI vendor selection.
P-225000-XS175001 Windsor TS: A5-6WR Switchgear Replacement Feasibility Study Report	Conducted by WSP in 2023 to provide assessment of Toronto Hydro's Transformer Station switchgear A5-6WR replacement located at Windsor TS.	With latest information provided by switchgear manufacturers, it is feasible to install ABB or Powell proposed switchgear for Windsor TS A5-6WR replacement.
P-260006-ZZ999001 Danforth MS: A1-2DA Replacement Feasibility Study Report	Conducted by WSP in 2023 to provide assessment of Toronto Hydro's Transformer Station switchgear A1-2DA replacement located at Danforth MS.	With latest information provided by switchgear manufacturers, it is feasible to install ABB or Powell new switchgear for Danforth TS A1-2DA replacement.
P-260008-ZZ999001 High Level MS: A7-8H Replacement Feasibility Study Report	Conducted by WSP in 2023 to provide assessment of Toronto Hydro's Transformer Station switchgear A7-8H replacement located at High Level MS.	It is feasible to install new ABB switchgear or Powell switchgear in A1-2H area to replace the existing switchgear A7-8H of High-Level MS. With Option C of new switchgear installation, ABB switchgear could have 18 feeder positions and Powell switchgear could have 20 feeder positions.
Feasibility Report Wiltshire TS - A5-6WA Switchgear Replacement Feasibility Study Report	Conducted by SNC Lavalin in 2023 to provide assessment of Toronto Hydro's Transformer station switchgear A5-6WA replacement located at Wiltshire TS.	Both solutions i.e. Powell's Floor mounted switchgear and ABBs Raised platform switchgear are technically compliant to Toronto Hydro requirements. However, Powell's Floor mount switchgear solution may be a practical solution considering that it provides choice of maximum number of feeders while offering low price as compared to ABB. It is recommended to continue to contact the manufacturers to make sure the proposed switchgear meet Toronto Hydro requirement and then select a most suitable switchgear for new switchgear installation for Wiltshire A.

Study	Scope	Conclusions and Recommendations
Distribution Asset Failure Curve Study	Conducted by Hatch to explore the potential for advancing asset failure curves from an industry consensus-based approach to a more data-driven approach, leveraging advanced statistical methods.	Produced a range of failure curves for a selection of asset classes.
Preventative Maintenance Optimization Overhead Switches	Conducted by METSCO Energy Solutions Inc. in 2022 to review Toronto Hydro's existing preventative maintenance practices for overhead three-phase gang-operated and SCADA-mate switches to identify opportunities for improvement.	Recommended a variable cycle for Toronto Hydro's switches based on their risk category.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-34

Reference: Exhibit 2B, Section D2, Page 18

Toronto Hydro identified around 45,000 deficiencies each year through planned inspections, responding to equipment failures and power interruptions, or through the course of day-to-day work. The total number of deficiencies are higher compared to the last rate application partially due to the inclusion of deficiencies corrected on site, which were not counted in the previous DSP.

Please provide the number of deficiencies excluding deficiencies corrected on site.

RESPONSE:

The number of deficiencies identified each year excluding deficiencies corrected on site is around 38,000.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-35

References: Exhibit 2B, Section D2, Page 17

Preamble:

With respect to Table 1:

QUESTION (A):

a) Please provide the data in the Priority Deficiencies (Number assigned) column excluding deficiencies corrected on site.

RESPONSE (A):

The priority deficiencies provided in Table 1 of Exhibit 2B, Section D2 exclude deficiencies corrected on-site.

QUESTION (B):

b) Please provide the underlying data and calculations in Table 1, including assumptions.

RESPONSE (B):

Each of the asset management performance indicators in Table 1 of Exhibit 2B, Section D2 were calculated as described in Table 1 below.

1 **Table 1: Calculation of Asset Management Performance Indicators**

AM Performance Indicators	Underlying Data and Calculation
Oil Deficiencies	• *Data*: Inspection Records • The number of assets with an oil leak identified during inspections are aggregated by sub-system
Priority Deficiencies	• *Data*: Inspection Records and Work Request Data • Priority Deficiencies are determined by aggregated the deficiencies, for which work requests were issued and priorities assigned (such as P1, P2, P3), by sub-system.
Customer Hours of Interruption	• *Data*: ITIS Data • Defective Equipment outage incidents and corresponding total number of customer hours interrupted are aggregated by sub-system.
Customer Interruptions	• *Data*: ITIS Data • Defective Equipment outage incidents and corresponding total number of customers interrupted are aggregated by sub-system.
Condition	• *Data*: Asset Registry and Inspection Records • The number of assets in HI4 or HI5 are divided by the total population of the assets with health scores by sub-system.
Oil Containing PCBs	• *Data*: Asset Registry and Inspection Records • The number of assets containing or at-risk of containing PCBs were aggregated by sub-system.
Age	• *Data*: Asset Registry • The number of assets that are at or past Useful Life by sub-system.
Legacy Assets	• *Data*: Asset Registry • The remaining inventory of the asset or configuration type in the distribution system.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-36
Reference: Exhibit 2B, Section D2

QUESTION (A):

a) For each of the asset types in Figures 15, 19, 20, 25 and 29, please provide in excel the number of failures for each of the years 2018 to 2023.

RESPONSE (A):

Please see Appendix A of this interrogatory response for number of failures in the 2018-2020 period.

Toronto Hydro has interpreted this question as requesting condition-based failure data. Toronto Hydro comprehensively gathered condition-based failure data to derive Probability of Failure ("PoF") parameters. The study involved collecting data based on the failure modes as defined in Exhibit 2B, Section D3, Appendix C, page 14. Toronto Hydro undertook this initiative in 2021 for the primary purpose of determining the average number of failures for asset classes with an asset condition assessment methodology. The dataset acquired for this exercise does not extend beyond 2020.

Please refer to Toronto Hydro's response to Interrogatory 2B-Staff-134 for the process used to collect the number of failures. Collecting accurate and complete asset-specific failure data from operational records is a significant and resource-intensive undertaking. This is especially true for Incipient and Degraded failure modes, which rely upon records from corrective fieldwork that require significant filtering, data cleansing, and data blending efforts. For this reason, Toronto Hydro does not update failure records for all failure modes on an annual basis.[1]

QUESTION (B):

b) For each asset type in part a), please provide in excel the percentage of failures in assets past useful life for the period 2020-2023.

RESPONSE (B):

Please see Appendix A. This information is provided on a best-efforts basis. Due to data limitations, there are some gaps in Toronto Hydro's ability to link specific failure events to asset condition at the time of failure. Note that the percentage of failures past useful life is dependent on the relative age distribution observed within each asset class.

QUESTION (C):

c) For each asset type in part a), please provide in excel the percentage of failures in assets with a Health Index of HI4 or HI5 for the period 2020-2023.

RESPONSE (C):

Please see Appendix A. For a more meaningful and comprehensive view of the relationship between condition and failure refer to 2B-STAFF-134, Table 1.

[1] Note that in a number of locations in the pre-filed evidence and the interrogatory responses, Toronto Hydro is providing failure-related data that includes the years 2021 and later. To be clear, this data is generally limited to Outage failures (i.e., asset failures that resulted in a recorded outage event) or failures estimated from Reactive Capital data.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-37

Reference: Exhibit 2B, Section D2, Appendix A

Please provide any costs over the test period resulting from Stantec's Climate Change Vulnerability Assessment Update.

RESPONSE:

There are no costs forecast over the 2025-2029 period resulting from Stantec's Climate Change Vulnerability Assessment Update.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-38

References: Exhibit 2B, Section D3, Page 9

For each of the asset types in Figures 15, 19, 20, 25 and 29 in 2B-D2, please provide in excel the total number of deficiencies (P1 + P2 + P3) for each of the years 2020 to 2023, including and excluding asset deficiencies corrected onsite.

RESPONSE:

Please see Appendix A to this response, '2B-AMPCO-38_App A_Deficiencies.xlsx'. The priority deficiencies provided in this file exclude deficiencies corrected on-site. The "Find-it and Fix-it" approach is for non-critical deficiencies that are identified and feasible to repair on site. Toronto Hydro does not create a notification for this type of work, which helps eliminate additional travel time for a different crew to complete the repair.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-39

References: Exhibit 2B, Section D3, Page. 9

QUESTION (A):

a) With respect to Figure 2, please provide the total number of Work Requests split between Capital Work and Non-Capital Work for each of the years 2020-2023.

RESPONSE (A):

Please see Table 1 below.

Table 1: Capital and Non-Capital Work Requests (Excluding Cancellations)

TYPE OF WORK	2020	2021	2022	2023
CAPEX (Capital Work)	1,582	984	1,284	772
OPEX (Non-Capital Work)	6,500	10,327	11,707	13,074

QUESTION (B)

Please provide the number of Work Requests cancelled each year.

RESPONSE (B):

b) Please see Table 2 below for the number of Work Requests cancelled each year.

Table 2: Number of Work Requests Cancelled 2020-2023

	2020	2021	2022	2023
Cancellations	9,633	9,349	7,262	9,973

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-40

Reference: Exhibit 2B, Section D3 p.28

Please map the assets in Table 8 to the following Categories: Overhead, Underground, Station and Network.

RESPONSE:

Please see the table below.

Table 1: Assets by Category

Overhead	Underground	Station	Network
• Overhead Gang-Operated Switches • SCADA-Mate Switches • Wood Poles	• Submersible Transformers • Vault Transformers • Padmount Transformers • Air-Insulated Padmount Switches • SF6-Insulated Padmount Switches • SF6-Insulated Submersible Switches • Air-Insulated Submersible Switches • Cable Chambers • ATS Vaults • CLD Vaults • CRD Vaults • Submersible Switch Vaults • URD Vaults	• Station Power Transformers • Airblast Circuit Breakers (MS & TS) • Air Magnetic Circuit Breakers (MS & TS) • 4 kV Oil Circuit Breakers (MS) • KSO Oil Circuit Breakers (TS) • SF6 Circuit Breakers (TS) • Vacuum Circuit Breakers (MS & TS)	• Network Protectors • Network Transformers • Network Vaults

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-41

Reference: Exhibit 2B, Section D3, Page 28

With respect to Table 7, please provide Toronto Hydro's optimal timing to address assets in each Health Index band.

RESPONSE:

Toronto Hydro does not prescribe optimal replacement timing to Health Index bands as this would be an oversimplification of the asset management decision-making process. Asset health scores are one of several important factors that influence the pacing and prioritization of planned asset replacements. Asset criticality, for example, is equally important. An asset with an HI4 health score that is situated on the main trunk of a feeder (e.g. a wood pole carrying multiple trunk circuits) is likely to be a higher priority for planned replacement than an asset with an HI4 health score situated on a fuse-protected lateral section of a feeder (e.g. a wood pole that is carrying only a secondary service line).

When it comes to determining the appropriate size of the long-term capital expenditure plan, Toronto Hydro leverages Health Index demographics to inform estimation of the minimum necessary pacing of asset replacement required to manage the condition of a given asset population in alignment with outcome objectives. Please see response to 2B-SEC-44 for more information.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-42

Reference: Exhibit 2B, Section D3, Page 54

The IPPR process also creates a feedback loop that provides information about program level completion and historical work executed in each program. Information is reported on an individual project basis and includes the project's total spending and assets replaced or installed in any particular program.

Where applicable, for each of the segments in E5 to E8, please provide the actual asset units replaced and installed over 2020-2024 compared to forecast.

RESPONSE:

Please see Appendix A to this response for the forecast and actual units replaced and installed over 2020-2024 compared to forecast for each of the applicable segments in E5 to E8.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-43

References: Exhibit 2B, Section D3, Appendix A

QUESTION (A):

a) With respect to Tables 3-5, please add the asset population to the Table and update the excel versions.

RESPONSE (A):

Please see Tables 1-3 for the revised tables and 2B-AMPCO-43 Appendix A to this response for the excel versions.

Table 1: Summary of Health Index Distribution and Asset Populations as of year end 2017

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
Cable Chambers	11,111	8,112	1,162	1,350	398	89
4kV Oil Circuit Breaker	187	36	4	123	24	0
AirBlast Circuit Breaker	234	15	9	206	1	3
Air Magnetic Circuit Breaker	556	145	90	247	21	53
Oil KSO Circuit Breaker	40	10	7	11	11	1
SF6 Circuit Breaker	160	130	6	18	3	3
Vacuum Circuit Breaker	668	578	46	13	2	29
Network Protectors	1,690	1,086	185	319	74	26
Overhead Gang operated Switches	969	854	27	76	3	9
Air Insulated Padmount Switch	572	404	20	73	30	45
SF6 Insulated Padmount Switch	410	402	0	2	0	6
SCADAMATE Switches	1,119	1,084	1	26	0	8
Air Insulated Submersible Switch	868	755	79	27	7	0
SF6 Insulated Submersible Switch	396	353	14	7	3	19
Station Power Transformers	242	83	77	61	13	8
Network Transformers	1,822	1,334	255	166	60	7
Padmount Transformers	6,617	5,547	656	283	113	18
Submersible Transformers	8,902	7,816	588	271	172	55
Vault Transformers	11,831	6,807	4,315	450	214	45
Underground Vaults (Combined)	1316	1017	186	72	12	29
ATS Vaults	8	8	0	0	0	0
CLD Vaults	21	21	0	0	0	0
CRD Vaults	10	9	0	1	0	0
Network Vaults	545	322	120	63	11	29
Submersible Switch Vaults	120	115	5	0	0	0
URD Vaults	612	542	61	8	1	0
Wood Poles	107,068	63,526	7,354	29,779	5,687	722

1 **Table 2: Summary of Current Health Index Distribution and Asset Populations as of year end 2022**

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
Cable Chambers	10,657	6,640	1,346	2,079	462	130
4kV Oil Circuit Breaker	58	4	0	53	0	1
AirBlast Circuit Breaker	156	2	1	137	8	8
Air Magnetic Circuit Breaker	494	61	47	357	2	27
Oil KSO Circuit Breaker	23	1	13	9	0	0
SF6 Circuit Breaker	133	121	6	2	4	0
Vacuum Circuit Breaker	825	803	12	10	0	0
Network Protectors	1,728	1,342	129	233	21	3
Overhead Gang operated Switches	868	659	98	88	10	13
Air Insulated Padmount Switch	480	359	4	64	24	29
SF6 Insulated Padmount Switch	680	663	0	0	1	16
SCADAMATE Switches	1,170	1,078	9	66	4	13
Air Insulated Submersible Switch	977	720	183	67	7	0
SF6 Insulated Submersible Switch	487	437	18	15	7	10
Station Power Transformers	173	87	66	12	8	0
Network Transformers	1,718	1,370	244	61	40	3
Padmount Transformers	7,011	5,142	1,085	527	233	24
Submersible Transformers	9,161	8,120	699	162	133	47
Vault Transformers	11,497	6,799	3,869	571	247	11
Underground Vaults (Combined)	1183	870	164	49	53	47
ATS Vaults	7	5	1	0	1	0
CLD Vaults	22	20	2	0	0	0
CRD Vaults	11	8	3	0	0	0
Network Vaults	470	225	110	44	46	45
Submersible Switch Vaults	73	70	3	0	0	0
URD Vaults	600	542	45	5	6	2
Wood Poles	106,386	68,288	7,566	21,073	8,950	509

1 **Table 3: Summary of Future Health Index projected for year end 2029 with Asset Populations**

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
Cable Chambers	10,657	6,015	1,026	2,503	535	578
4kV Oil Circuit Breaker	58	4	0	29	24	1
AirBlast Circuit Breaker	156	2	0	97	43	14
Air Magnetic Circuit Breaker	494	11	50	41	361	31
Oil KSO Circuit Breaker	23	1	0	8	14	0
SF6 Circuit Breaker	133	93	28	4	2	6
Vacuum Circuit Breaker	825	786	17	10	12	0
Network Protectors	1,728	1,298	40	56	187	147
Overhead Gang operated Switches	868	517	106	111	91	43
Air Insulated Padmount Switch	480	320	18	13	16	113
SF6 Insulated Padmount Switch	680	663	0	0	0	17
SCADAMATE Switches	1,170	724	65	69	149	163
Air Insulated Submersible Switch	977	667	53	152	90	15
SF6 Insulated Submersible Switch	487	419	26	9	6	27
Station Power Transformers	173	82	11	60	12	8
Network Transformers	1,718	1,243	111	215	87	62
Padmount Transformers	7,011	4,451	542	887	595	536
Submersible Transformers	9,161	7,330	642	635	240	314
Vault Transformers	11,497	5,220	1,668	3,595	587	427
Underground Vaults (Combined)	1183	848	101	83	52	99
ATS Vaults	7	4	1	1	0	1
CLD Vaults	22	20	0	2	0	0
CRD Vaults	11	8	3	0	0	0
Network Vaults	470	207	92	34	47	90
Submersible Switch Vaults	73	68	4	1	0	0
URD Vaults	600	541	1	45	5	8
Wood Poles	106,386	60,308	8,350	5,570	24,464	7,694

QUESTION (B):

b) Page 5: Please provide the Summary of Current Health Index Distribution as of year end 2023 and include asset population in the Table.

RESPONSE (B):

Please see Table 4 below.

Table 4: Summary of Current Health Index Distribution and Asset Populations as of year end 2023

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
Cable Chambers	10,752	6,715	1,385	2,072	482	98
4kV Oil Circuit Breaker	58	4	0	53	0	1
AirBlast Circuit Breaker	156	2	1	137	8	8
Air Magnetic Circuit Breaker	494	61	47	357	2	27
Oil KSO Circuit Breaker	23	1	13	9	0	0
SF6 Circuit Breaker	133	121	6	2	4	0
Vacuum Circuit Breaker	825	803	12	10	0	0
Network Protectors	1,738	1,393	94	229	20	2
Overhead Gang operated Switches	827	569	118	118	9	13
Air Insulated Padmount Switch	484	343	24	66	22	29
SF6 Insulated Padmount Switch	711	694	0	0	0	17
SCADAMATE Switches	1,132	1,035	25	59	5	8
Air Insulated Submersible Switch	1,002	730	192	70	10	0
SF6 Insulated Submersible Switch	488	451	18	5	8	6
Station Power Transformers	177	93	57	19	8	0
Network Transformers	1,687	1,362	270	32	21	2
Padmount Transformers	7,116	5,224	1,105	579	194	14
Submersible Transformers	9,157	8,219	726	88	96	28
Vault Transformers	11,454	5,422	5,206	581	244	1
Underground Vaults (Combined)	1228	909	183	43	74	19
ATS Vaults	7	5	1	0	1	0
CLD Vaults	25	25	0	0	0	0

Asset Class	Population per Asset class	Health Score				
		HI1	HI2	HI3	HI4	HI5
CRD Vaults	19	9	7	1	2	0
Network Vaults	508	243	139	39	68	19
Submersible Switch Vaults	76	71	3	1	1	0
URD Vaults	593	556	33	2	2	0
Wood Poles	108,213	70,008	7,728	21,711	8,343	423

QUESTION (C):

c) Page 4: The footnote to Table 3 states that Wood Pole results are re-calculated based on the refinement to the Wood Pole asset model highlighted in Table 1.

Please provide the condition results for wood poles before the noted recalculation.

RESPONSE (C):

Please see Table 5 below.

Table 5: Wood Pole Health Index Distribution as of end of 2017 Before Recalculation

Asset Class	Health Score				
	HI1	HI2	HI3	HI4	HI5
Wood Poles	68,425	5,777	20,915	10,877	1,074

QUESTION (D):

d) Page 6: Please confirm Table 5 is based on the future, projected for year end 2029, based on no investment. If yes, please provide the Summary of Future Health Index projected for year-end 2029 taking into account the planned investments for 2025-2029.

RESPONSE (D):

Confirmed. Please see Toronto Hydro's response to interrogatory 2B-SEC-44.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-44

Reference: Exhibit 2B, Section D5, Page 19

Please provide costs for the Intelligent Grid Programs in Table 2 for the years 2020-2024.

RESPONSE:

Please see table below.

Table 1: 2020-2024 Intelligent Grid Programs Expenditures ($ Millions)

Program	2020-2024 Total[1]
Network Condition Monitoring and Control (NCMC)[2]	56.8
Stations Digital Relays[3]	7.7
AMI 2.0[4]	87.4
SCADA Switches & Reclosers[5]	19.9
FLISR	4.2
ADMS	
Overhead and Underground Sensors	n/a - new program for 2025-29
Online Cable Monitoring	n/a - new program for 2025-29
Transformer Monitoring	n/a - new program for 2025-29

[1] Includes actuals and bridge.
[2] Please refer to Exhibit 2B, Section E7.3 Table 5 for more information.
[3] Please refer to Exhibit 2B, Section E6.6 Table 49 for more information.
[4] Please refer to Exhibit 2B, Section E5.4 Table 4 for more information.
[5] Please refer to Exhibit 2B, Section E7.1 Table 6 for more information. SCADA switches and reclosers are part of Contingency Enhancement.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-45

Reference: Exhibit 2B, Section D5, Page 34

Please provide costs for the Grid Readiness in Table 3 for the years 2020-2024.

RESPONSE:

Please see table below.

Table 1: 2020-2024 Grid Readiness Expenditures ($ Millions)

Program	2020-2024 Total[1]
Grid Protection Monitoring and Control[2]	11.2
Renewable Energy Storage Systems[3]	1.2
Flexibility Services[4]	2.0
AMI 2.0 for DER Monitoring[5]	87.4
Energy Centre Enhancement for Leveraging DERs	1.0
Energy Centre Enhancement for Monitoring and Forecasting	n/a - new program for 2025-29
Enhancing DER Connection Process	n/a - new program for 2025-29
Hosting and Load Capacity Analysis	n/a - new program for 2025-29
GIS Asset Tracking	n/a - new program for 2025-29
Low Voltage Level Forecasting	n/a - new program for 2025-29

[1] Includes actuals and bridge.
[2] Please refer to Exhibit 2B, Section 5.5, Table 4 for more information.
[3] Please refer to Exhibit 2B, Section 7.2, Table 16 for more information.
[4] Please refer to Exhibit 2B, Section 7.2, Table 7 (OPEX) for more information.
[5] These costs encompass the complete Metering program for 2020-24. Please refer to Exhibit 2B, Section E5.4, Table 4 for more information.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-46

Reference: Exhibit 2B, Section D5, Page 34

Toronto Hydro provides some examples of potential Innovation pilot projects.

QUESTION (A) :

a) Please explain how Toronto Hydro will determine the selection of Innovation pilot projects without duplicating existing or planned work by others.

RESPONSE (A):

Through ongoing research and regular engagement with customers, stakeholders, experts and utility peers, Toronto Hydro intends to make every reasonable effort to ensure it is leveraging and building on innovative work that has been carried out by others in the sector. However, it is important to note (as explained in pages 6 and 7 of the reference evidence), that new distribution capabilities cannot be readily integrated with Toronto Hydro's unique distribution system characteristics without a thorough analysis and testing of impacts. This analysis must typically be undertaken as part of a pilot project to assess the following types of parameters: functional compatibility with existing core technology, feasibility of integration with existing control systems; compliance with minimum safety, operating, and cyber security standards; and financial viability and sustainability. Adopting the innovative solutions implemented by utilities in other jurisdictions is not a "cut-and paste" exercise; it requires further in-depth exploration and testing or piloting to assess the parameters identified above.

QUESTION (B) AND (C):

b) Has Toronto Hydro investigated potential external funding opportunities for Innovation? Please discuss.

c) Has Toronto Hydro investigated potential cost sharing Innovation partnerships? Please discuss.

RESPONSE (B) AND (C):

As noted in Exhibit 1B, Tab 4, Schedule 2 at page 10, Toronto Hydro intends to continue to explore opportunities to leverage external funding and cost-sharing partnerships where possible, including with organizations such Natural Resources Canada. For more information about historical efforts to secure external funding for innovation please refer to the response to interrogatory 1B-Staff-10.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-47

Reference: Exhibit 2B, Section D6, Page 1

The primary objectives of the Facilities Asset Management Strategy (the "Strategy") are to maintain the safety, reliability, and functionality of stations and work centres.

Please provide a copy of the Strategy.

RESPONSE:

The document entitled "Facilities Asset Management Strategy" filed in Exhibit 2B, Section D6 constitutes the strategy.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-48

Reference: Exhibit 2B, Section D7

QUESTION (A):

a) Please provide the specific accomplishments over 2020-2025 to be achieved under Toronto Hydro's Net Zero by 2040 strategy and the corresponding costs.

RESPONSE (A):

During the current rate period, Toronto Hydro accomplished a 25% reduction of Scope 1 emissions relative to 2019 levels, achieved through the initiatives outlined in the following table.

Table 1: Accomplishments under Toronto Hydro's Net Zero by 2040 Strategy for 2020-2025

Initiative	Corresponding costs (approximates):
Optimization of building automation systems	$0.9 million
Using lower emission biofuels	No additional cost compared to using diesel with no biofuel added.
Introducing electric vehicles	Average incremental cost per heavy duty unit: $340,000 Average incremental cost per light duty unit: $24,000
Optimizing vehicle use	No additional cost as this involves optimizing the use of already purchased vehicles.
Using anti-idling technology	$60,000
Reactively replaced Natural Gas HVAC units with hybrid electric or electric (where applicable)	Incremental cost of $300,000

QUESTION (B):

b) Please provide a copy of Toronto Hydro's Net Zero by 2040 strategy.

RESPONSE (B):

The document entitled "Net Zero 2040 Strategy" filed in Exhibit 2B, Section D7 constitutes the strategy.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-49

Reference: Exhibit 2B, Section E5.1, Page 18

Please provide a breakdown of the number of customer connections by customer type for each of the years 2020-2029.

RESPONSE:

Please see Table 1 below. Toronto Hydro notes that the connection type is based on size, required demand load, geographical location, and the available infrastructure in the area, and as such volumes vary year-to-year (as described in Exhibit 2B, Section E5.1, p.7). The 2025-2029 capital expenditure forecast was developed based on historical data; therefore, Toronto Hydro is unable to provide the requested information for 2024-2029.

Table 1: Number of Customer Connections by Type

	2020	2021	2022	2023
Low Voltage New	2,545	2,245	2,290	2,329
Low Voltage Upgrades	2,224	2,687	2,970	3,043
High Voltage	87	132	111	163
Total	**4,856**	**5,064**	**5,371**	**5,535**

Note: High Voltage is inclusive of both new connections and upgrades

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-50

Reference: Exhibit 2B, Section E6.1

QUESTION:

Please complete the following Table:

Area Conversions	2020-2024	2025-2029
Rear Lot Conversion (# of Customers)		
Rear Lot Conversion (# Poles Replaced)		
Box Construction (# Poles Replaced)		
Box Construction (# Transformers Replaced)		
Box Construction (# Switches Replaced)		
Box Construction (Overhead Primary Conductors)		

RESPONSE:

Please see Table 1 below. Toronto Hydro notes that the 2020-2024 number of customers for the Rear Lot program has increased slightly due to having a more refined customer count following project detailed design and attainment. For Rear Lot number of poles replaced, Toronto Hydro has not provided any numbers because, in most cases, poles in rear lot areas are not removed or replaced through Rear Lot Conversion projects. The poles in these areas are predominantly owned by a third party, e.g. Bell, and usually have third-party assets attached to them. In the limited instances where the poles are owned by Toronto Hydro, they still have third-party attachments and therefore cannot be removed. In these cases, at the end of the project Toronto Hydro removes any primary or secondary distribution assets from the poles and transfers the ownership of these poles to the third party.

Toronto Hydro notes that the number of poles for Box Construction have shifted between the 2020-2024 and 2025-2029 periods due to changes in the execution schedule as discussed in Toronto Hydro's response to interrogatory 2B-Staff-201. Toronto Hydro further notes that there has been a net increase of 317 poles converted over the 2020-2023 period increase, which is due to the latency in recording in-service additions from completed projects.

Table 1: Rear Lot and Box Construction Conversion Data and Forecasts

Area Conversions	2020-2024	2025-2029
Rear Lot Conversion (# of Customers)	736	1,467
Rear Lot Conversion (# Poles Replaced)	N/A	N/A
Box Construction (# Poles Replaced)	2,701	2,665
Box Construction (# Transformers Replaced)	1,183	1,459
Box Construction (# Switches Replaced)	548	591
Box Construction (Overhead Primary Conductors)	70 kms	72 kms

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-51

References: EB-2018-0165, Exhibit 2B, Section E6.1, Page 21

Preamble:

With respect to Rear Lot Conversion, Toronto Hydro applied an average cost of $0.036 million per customer plus inflation and engineering and support costs in developing the segment cost forecasts for the 2020-2024 period.

Please provide the actual average cost per customer over the 2020 to 2023 period and show the calculation.

RESPONSE:

Please see Table 1 below. The actual average cost per customer over the 2020 to 2023 period was $0.052 million. Toronto Hydro calculated the average cost by dividing the total cost of all fully completed (i.e. both civil and electrical) rear lot projects during the period, $31,427,781, by the total number of customers converted in those same projects, 599.

Table 1: Calculation of 2020-2023 Rear Lot Cost per Customer

Project Name (Area)	Phase	Cost	# of Customers	Cost/Customer ($)
Jamestown	1	$5,123,552	122	$41,996
Jamestown	2	$4,168,160	63	$66,161
Jamestown	3	$5,112,480	90	$56,805
Thorncrest	9	$4,358,001	83	$52,506
Thorncrest	10	$6,200,180	118	$52,544
Thorncrest	11	$6,465,408	123	$52,564
Total		**$31,427,781**	**599**	**$52,467**

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-52

Reference: EB-2018-0165, Exhibit 2B, Section E6.1, Page 25

Preamble:

With respect to Box Construction, Toronto Hydro used the average cost of $0.029 million per pole plus inflation and engineering and support costs to derive the forecast costs for 2020-2024.

Please provide the actual average cost per pole over the 2020 to 2023 period and show the calculation.

RESPONSE:

The actual average cost per pole over the 2020-2023 period is $0.0457 million and it is calculated by dividing $102.2 million (total spend over the 2020-2023 period) by 2,238 poles (total poles converted over the 2020-2023 period). In Exhibit 2B, Section E6.1 at page 26, Toronto Hydro noted an average cost of $0.0398 million per pole, which was calculated based on projects completed over the 5-year period from 2018-2022. Based on the latest 5-year period (i.e. 2019-2023), the average cost per pole is $0.0438 million. Cost increases are mainly due to factors such as inflation and the increasing complexity of the projects as outlined in Exhibit 2B, Section E6.1.4 at page 26, which make both design and execution more challenging.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-53

Reference: EB-2018-0165, Exhibit 2B, Section E6.1, Page 26

Preamble: When planning box construction conversion projects, Toronto Hydro considers reliability, third party scheduling conflicts and the planned decommissioning of municipal stations. Table 12 provides a list of the eight remaining stations carrying box construction lines, the conversion date and the projected costs.

QUESTION (A):

a) Please update Table 12.

RESPONSE (A):

Please see Table 1 below for the update to Table 12 from EB-2018-0165, Exhibit 2B, Section E6.1.

Table 1: Update to Remaining Stations with Box Construction

Station	Conversion	Station-related or External Dependencies	Projected/ Actual Costs ($M)[1]
Sherbourne MS	2021-2026	Station Decommissioning	21.7
University MS	2021-2029	City of Toronto, Station Decommissioning	25.1
Spadina MS	2022-2026	Metrolinx, Station Decommissioning	37.45
Chaplin MS		Metrolinx, Station Decommissioning	
Strachan MS[2]	2017-2026	Hydro One, Station Decommissioning	21.0
Defoe MS[2]		Metrolinx, Station Decommissioning	
High Level MS	2021-2029	Hydro One, Station Decommissioning	70.5

[1] Excludes inflation and other allocations.

[2] For the Defoe-Strachan area, while all box-framed poles will be removed, full voltage conversion will not be completed until after 2029 due to a number of internal and external dependencies and those costs are not included in the table.

QUESTION (B):

b) Please identify where Toronto Hydro coordinated the elimination of box construction with the station and external dependencies in Table 12 over 2020-2024.

RESPONSE (B):

Please refer to Table 1 in the response to part (a) where Toronto Hydro has also updated the table with respect to its coordination of the elimination of box construction with station and external dependencies.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-54

Reference: Exhibit 2B, Section E6.1 p.18

The evidence states "Based on asset condition assessment, 9 percent of the wood poles have material deterioration and are in poor condition and this percentage is expected to increase to approximately 35 percent by 2029 without any investments. As with age, when considering box-framed poles on their own, these percentages increase: to 15 percent HI4 or HI5 as of 2022 and 61 percent by 2029 (without investment)."

Please provide the data for box-framed poles for 2029 including planned investments.

RESPONSE:

With planned investments, all box-framed poles are expected to be removed by the end of 2026. Please refer to Figure 15 in Exhibit 2B, Section E6.1.4 at page 25 for the box-framed pole conversion plan.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-55

Reference: Exhibit 2B, Section E6.1, Page 20

QUESTION (A) AND (B):

a) With respect to Table 10 Status of 2020-2024 DSP Planned Projects, please provide the cost for each of the completed phases.

b) Please provide the projected costs of projects/phases with completion dates of 2023 and 2024.

RESPONSE (A) AND (B):

Please see Table 1 below, which includes the cost for each of the completed phases (including any completed in 2023) and projected costs for projects/phases with completion dates in 2024. Toronto Hydro has also updated the number of customers for all completed projects based on more recent information obtained through detailed design.

Table 1: Status and Costs for 2020-2024 DSP Planned Projects

<table>
<tr><th>Rear Lot Area</th><th>Phases</th><th>Cost</th><th>Number of Customers (2020-2024 Planned)</th><th>Number of Customers</th><th>Conversion Status</th></tr>
<tr><td rowspan="4">Thorncrest</td><td>Phase 9</td><td>$4,358,001</td><td rowspan="4">618</td><td>83</td><td>Completed</td></tr>
<tr><td>Phase 10</td><td>$6,200,180</td><td>118</td><td>Completed</td></tr>
<tr><td>Phase 11</td><td>$6,465,408</td><td>123</td><td>Completed</td></tr>
<tr><td>Phase 12</td><td>N/A</td><td>139</td><td>Deferred</td></tr>
<tr><td rowspan="3">Jamestown</td><td>Phase 1</td><td>$5,123,552</td><td rowspan="3">258</td><td>122</td><td>Completed</td></tr>
<tr><td>Phase 2</td><td>$4,168,160</td><td>63</td><td>Completed</td></tr>
<tr><td>Phase 3</td><td>$5,112,480</td><td>90</td><td>Completed</td></tr>
<tr><td rowspan="2">Markland Woods</td><td>Phase 6</td><td>N/A</td><td rowspan="2">300</td><td>167</td><td>Deferred</td></tr>
<tr><td>Phase 7</td><td>N/A</td><td>118</td><td>Deferred</td></tr>
</table>

Rear Lot Area	Phases	Cost	Number of Customers (2020-2024 Planned)	Number of Customers	Conversion Status
Martin Grove Gardens	Phases 1 to 5	$7,187,979	452	137	2024
	Phases 6 to 9	N/A		170	Deferred

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-56

Reference: EB-2018-0165, Exhibit 2B, Section E6.1, Page 14

The evidence states “Rear Lot projects include the replacement of PCB at-risk transformers. Through the Area Conversion program, Toronto Hydro is proposing to eliminate approximately 100 PCB at-risk transformers by 2024 as part of the planned projects in the rear-lot system.

Please provide the number of PCB at-risk transformers replaced by 2024.

RESPONSE:

As of the end of 2023, Toronto Hydro has replaced 45 PCB at-risk transformers through Rear Lot projects and is forecasting the removal of four additional PCB at-risk transformers in 2024. The reduction in the number of PCBs units replaced through Rear Lot projects compared to the 2020-2024 distribution system plan forecast is driven by the deferral of rear lot projects (see Exhibit 2B, Section E6.1 at pages 20-21. Toronto Hydro also notes that any PCB at-risk transformers in rear lots not replaced through Rear Lot projects will be or already have been replaced through other capital programs by the end of 2025.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-57

Reference: EB-2018-0165, Exhibit 2B, Section E6.1, Page 19

Preamble:

Toronto Hydro indicates there are currently 400 PCB at-risk transformers on box construction feeders. This accounts for a third of the transformers on box construction feeders as of 2017. The Box Construction Conversion segment will eliminate an estimated 325 PCB at-risk transformers by 2024 through the planned projects.

Please provide the number of PCB at-risk transformers replaced over 2020-2024.

RESPONSE:

As of the end of 2023, Toronto Hydro has removed an estimated 301 PCB at-risk transformers from Box Construction feeders and forecasts the removal of 30 additional PCB at-risk transformers from Box Construction feeders in 2024.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-58

Reference: Exhibit 2B, Section E6.2

QUESTION (A):

a) Page 11 Figure 5: Please provide a table that sets out the number of equipment failures for each of the years 2013 to 2023 for UG Transformer, Underground Cable and Underground Switch in the Horseshoe area.

RESPONSE (A):

In the process of preparing this interrogatory response, Toronto Hydro identified an error with the referenced figure. The original figure consists of data for both the Horseshoe and Downtown systems. Figure 1 below shows the corrected figure (i.e., for Horseshoe only), and Table 1 provides the requested breakdown of the corrected dataset, including 2023. Note that this figure is based on outages caused by asset failures and does not address failures that resulted in repair or replacement without causing an outage.

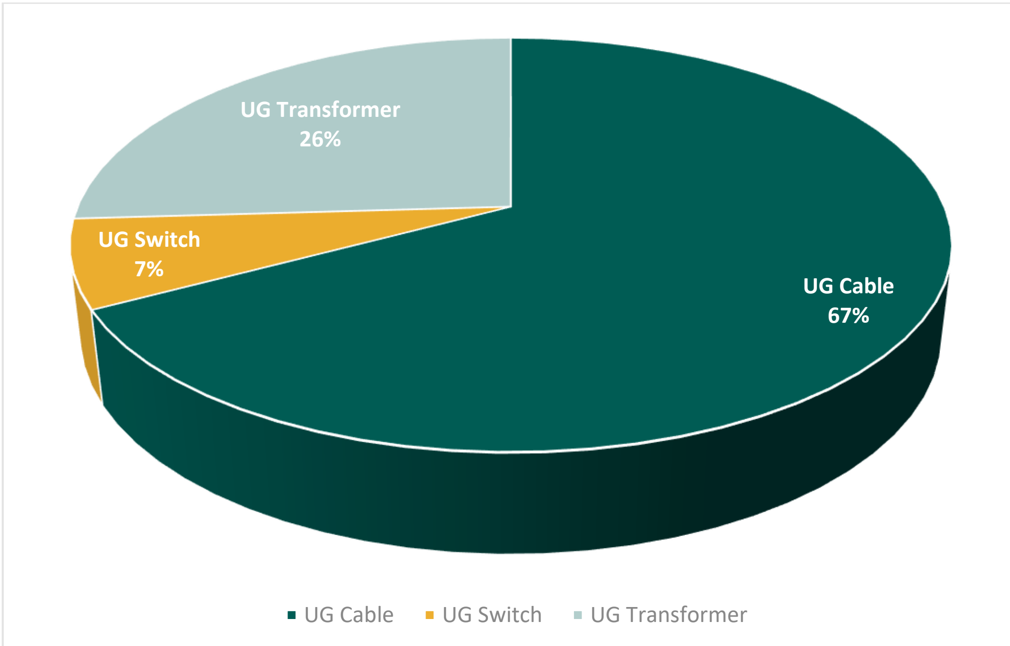


Figure 1: Underground ("UG") Equipment Failures in Underground Horseshoe System by Asset Type from 2013 to 2022

Table 1: Outages due to Defective Equipment in Horseshoe area

Assets	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
UG Cable	206	221	166	150	137	142	79	99	111	157	107
UG Switch	15	13	17	17	14	16	13	11	23	7	15
UG Transformer	74	93	68	71	61	61	41	29	22	39	49

QUESTION (B):

b) Page 28: Do Table 6 and Figure 28 reflect the Horseshoe area? If not please provide for the Horseshoe area.

RESPONSE (B):

Table 6 and Figure 28 in Exhibit 2B, Section E6.2 reflect only the Horseshoe area.

QUESTION (C):

c) Page 31: The forecasted volumes are estimates based on a preliminary selection of areas targeted for complete rebuilds on 27.6 kV feeders, rebuilds with voltage conversion, and spot replacements.

Please provide the preliminary selection of areas.

RESPONSE (C):

Figure 2 below shows the preliminary areas for rebuilds along with locations of remaining transformers with at least material deterioration as of 2029 that will not be part of planned area rebuilds.

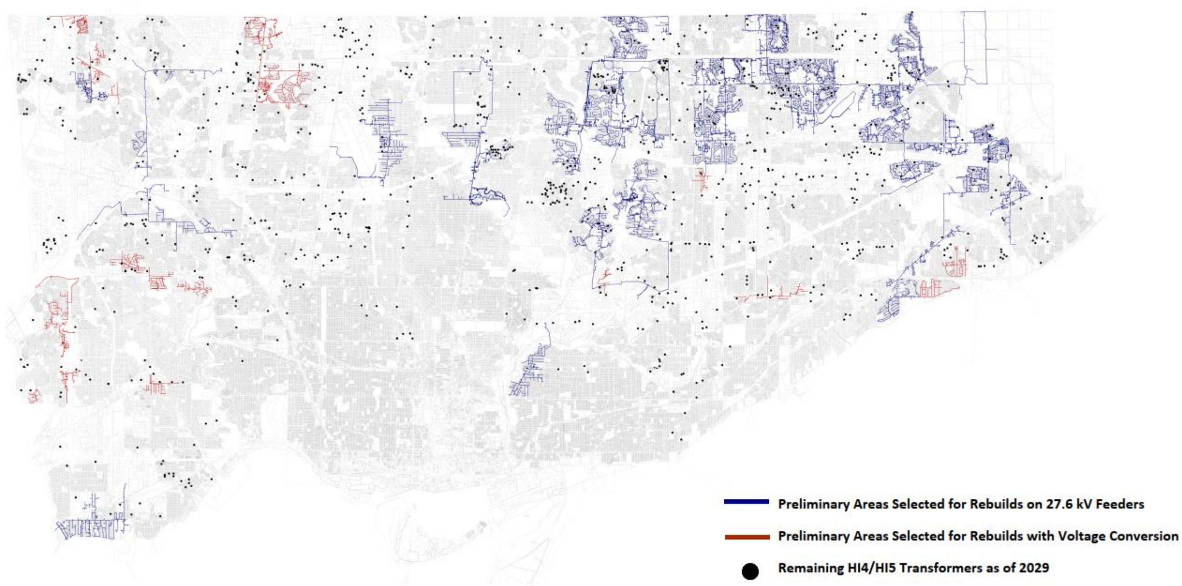


Figure 2: Map of Preliminary Areas Selected for Rebuilds

QUESTION (D):

d) Page 32: Please provide the number of transformer spot replacements for each of the years 2013 to 2023.

RESPONSE (D):

Please see Table 2 below. Toronto Hydro does not have records of how many transformers were replaced specifically using a spot replacement approach prior to 2022.

Table 2: Transformers Replaced under Spot Replacement Projects

	2022	**2023**
Number of Spot Replacements	160	207

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-59

Reference: Exhibit 2B, Section E6.3

QUESTION (A):

a) Please add 2023 data to the following: Figure 15, Figure 21, Figure 22, and Figure 36.

RESPONSE (A):

Please see Figures 15, 21, 22, and 36 from Exhibit 2B, Section E6.3 updated with 2023 information below.

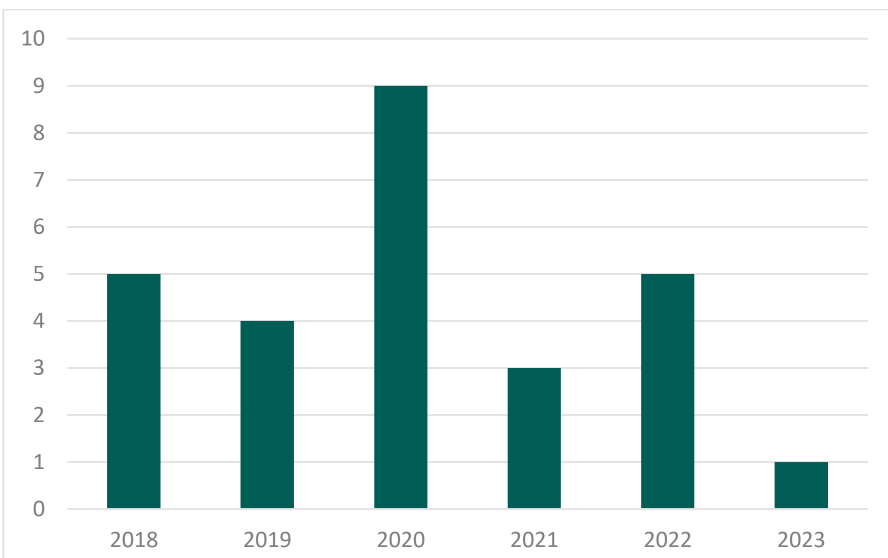
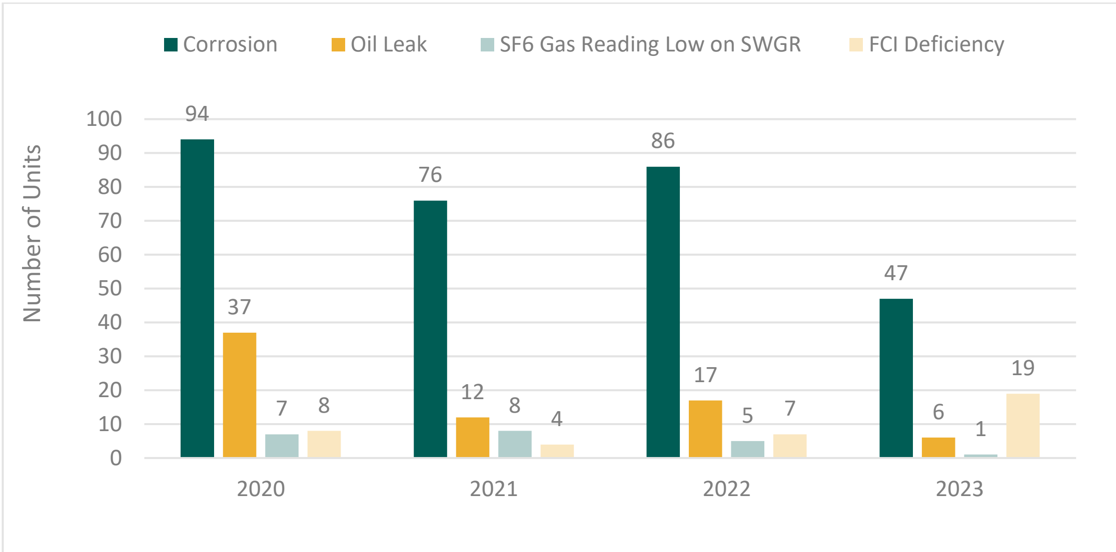
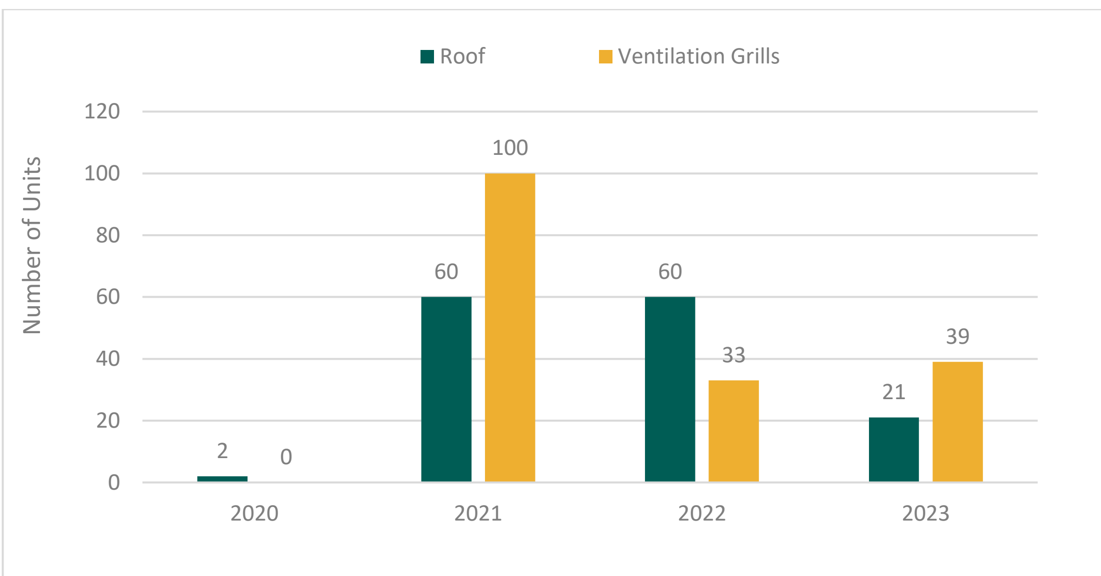


Figure 15: Number of Lid incidents



1 **Figure 21: URD Electrical Deficiencies**

2



3 **Figure 22: URD Civil Deficiencies**

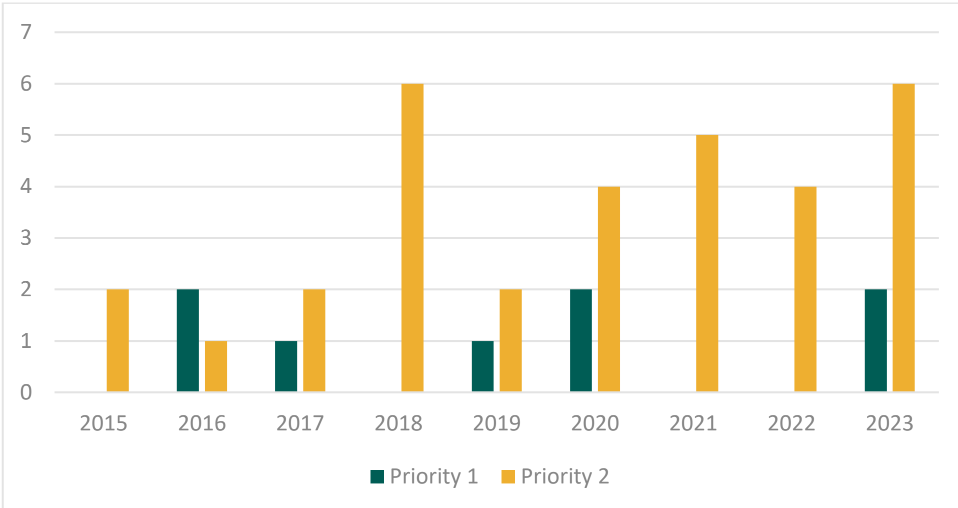


Figure 36: Underground Switchgear Related Work Requests (High Priority Requests)

QUESTION (B):

b) Please provide the number of interruptions on the URD System for each of the years 2018 to 2023.

RESPONSE (B):

Please see Table 1 below.

Table 1: Number of Sustained Interruptions on URD feeders (2018-2023)

2018	2019	2020	2021	2022	2023
5	3	6	2	6	4

QUESTION (C):

c) Page 34: Please provide Figure 35 for the Downtown area.

RESPONSE (C):

The Underground System Renewal – Downtown program (Exhibit 2B, Section E6.3) addresses underground distribution assets in the Downtown core (pre-amalgamation). As such, the data in the referenced Figure provides the asset condition assessment ("ACA") for the Downtown Area.

QUESTION (D):

d) Page 34: Please provide Figure 36 for the Downtown area and include 2023 data.

RESPONSE (D):

As noted in part (c), the referenced figure provides data for the downtown area. Please refer to part (a) of this interrogatory response for an updated Figure 36 with 2023 actuals.

QUESTION (E):

e) Page 37: Please provide the number of interruptions, customer interruptions (CI) and customer hour interruptions (CHI) for both PILC cable and AILC cable for each of the years 2018 to 2023.

RESPONSE (E):

Toronto Hydro is unable to provide the breakdown requested by cable type. The majority of the downtown underground system contains combinations of PILC, XLPE, TRXLPE and AILC cable. Due to this complexity, it is not possible to breakdown outage incidents by type. However, Toronto Hydro is able to provide reliability data for defective cable as shown in the table below.

Table 2: Reliability Performance for Defective Equipment – Downtown Cables (2018-2023)

Year	Number of Interruptions	Customer Interruptions (CI)	Customer Hours Interrupted (CHI)
2018	56	26,002	39,730
2019	58	21,216	36,212
2020	47	22,965	56,003
2021	45	9,374	16,069
2022	40	16,998	43,587
2023	27	20,105	51,197

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-60

References: **Exhibit 2B, Section E6.5**

QUESTION (A):

a) Please add 2023 data to Figure 2, Figure 5, Figure 6, Figure 9, Figure 15, and Figure 20.

RESPONSE (A):

Please see Figures 1-6 below for the updated figures.

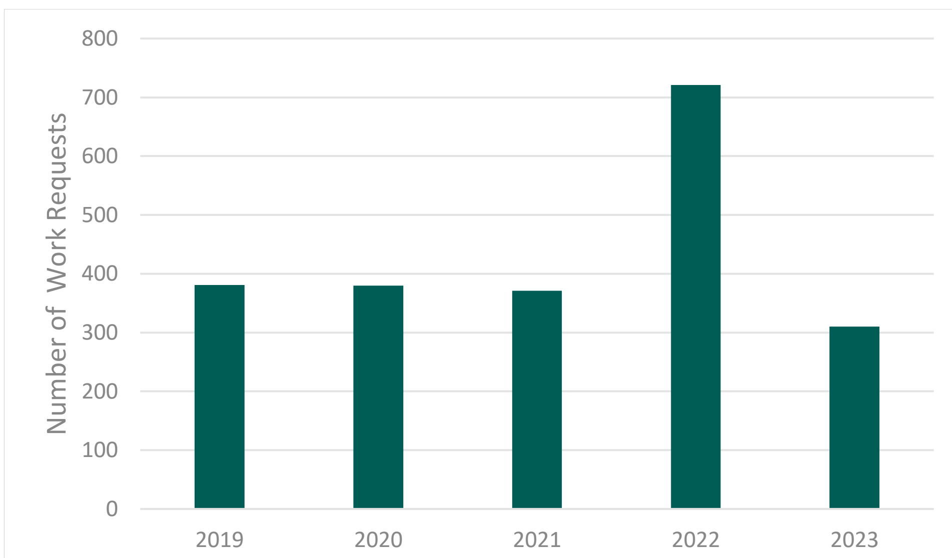


Figure 1: Reactive Work Requests to Replace Overhead Assets from 2019-2023

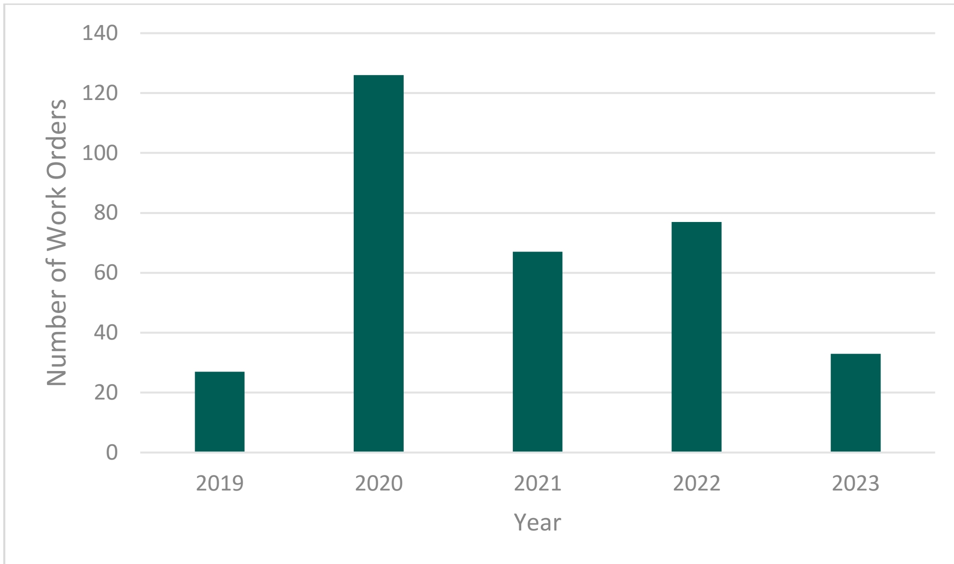


Figure 2: Reactive Work Requests for Pole-top Transformer Replacement

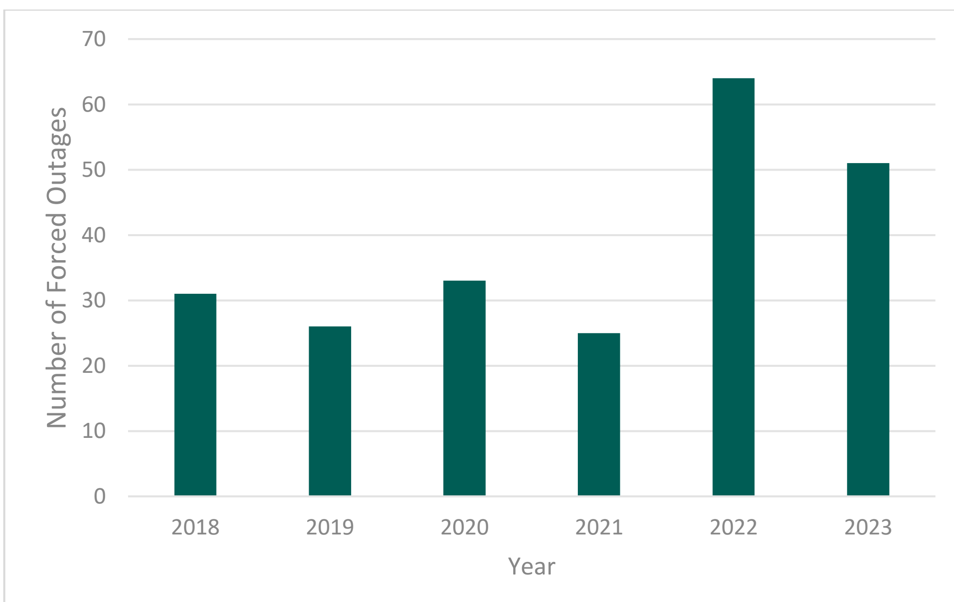


Figure 3: Forced Outages for Pole-top Transformers

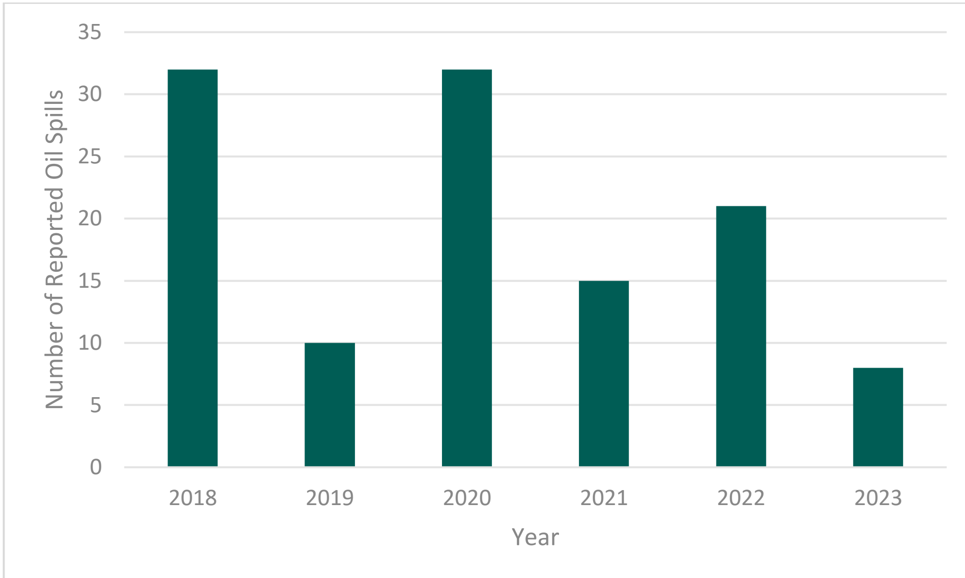


Figure 4: Number of Reported Pole-top Transformer Oil Spills

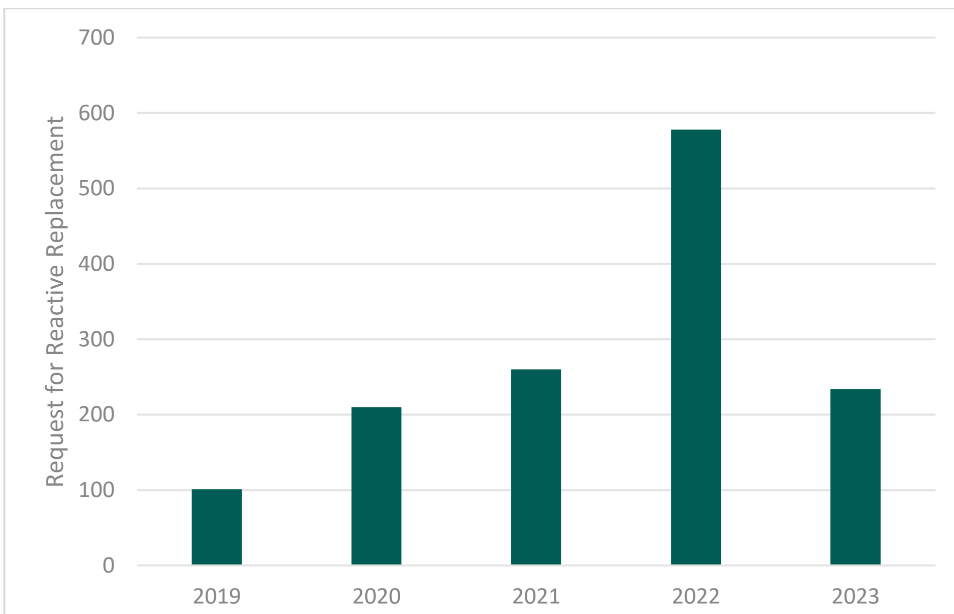


Figure 5: Reactive Work Requests for Pole replacement

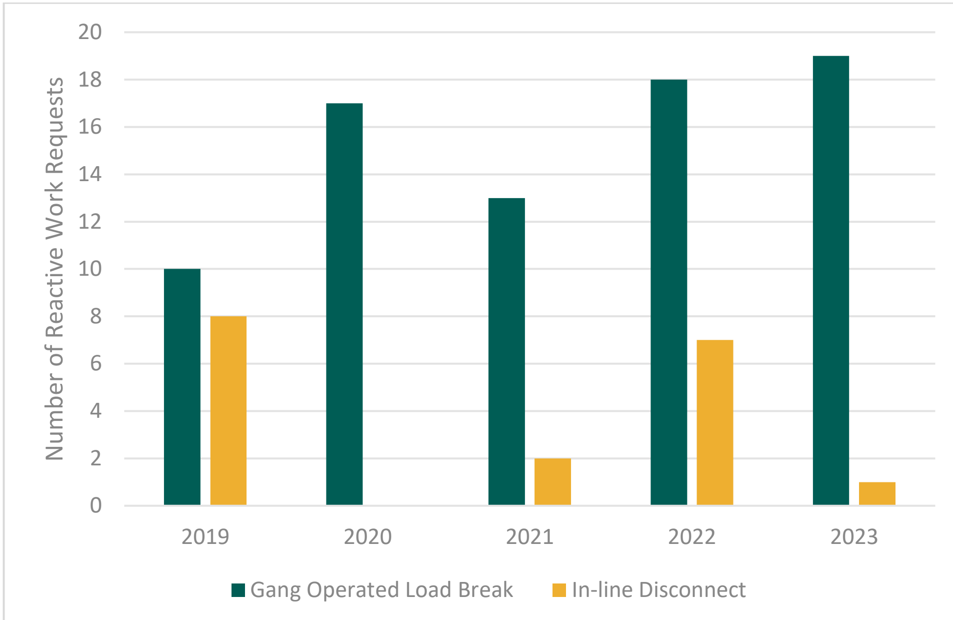


Figure 6: Reactive Work Requests for Overhead Switches

QUESTION (B):

b) Please provide the number of outages on the Overhead System for each of the years 2013 to 2023.

RESPONSE (B):

Please see Figure 7 below for the number of forced outages on the Overhead System over 2013-2023.

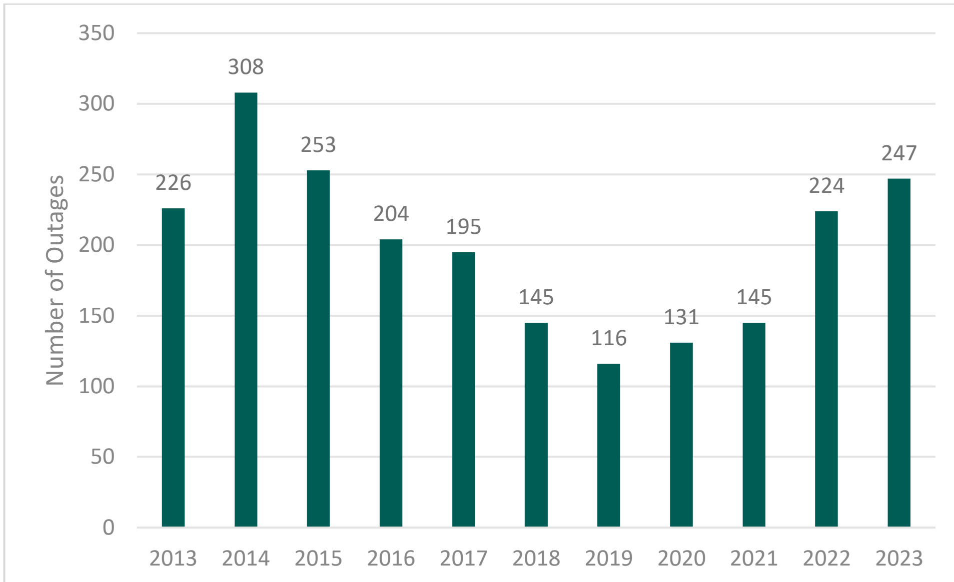


Figure 7: Forced Outages on the Overhead System 2013-2023

QUESTION (C):

c) Please provide the number of outages for Pole-top Transformers, Poles and Pole Accessories, Overhead Switches and Conductors for each of the years 2018 to 2023.

RESPONSE (C):

Please see Figures 8-11 below for the number of outages over 2018-2023 for the listed assets.

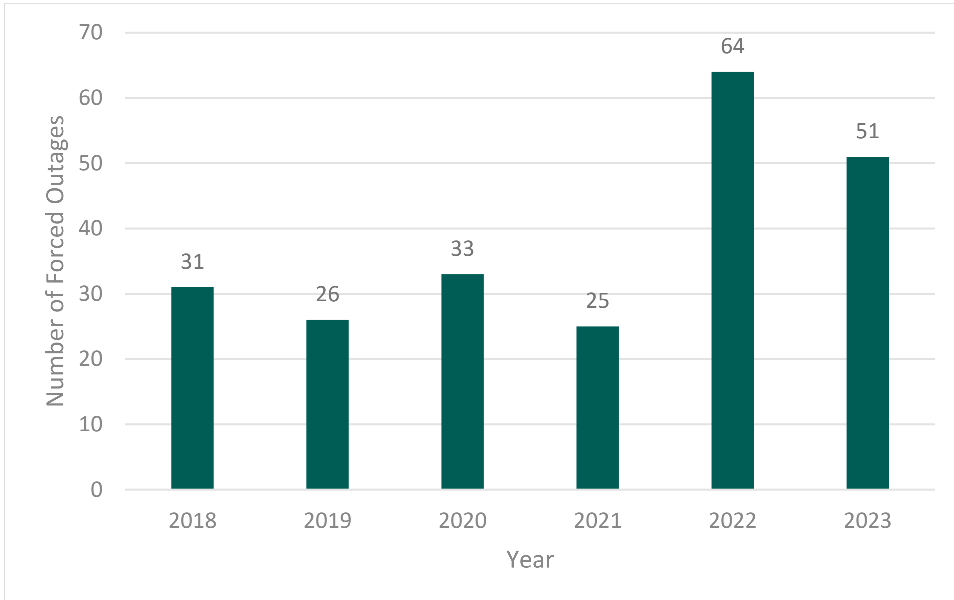


Figure 8: Forced Outages for Pole-Top Transformers 2018-2023

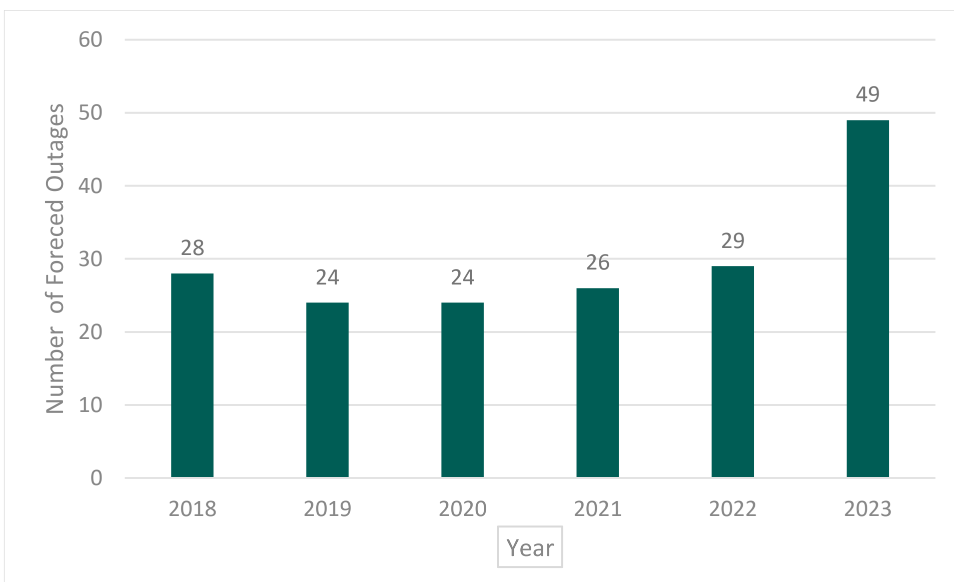


Figure 9: Forced Outages for Pole and Pole Accessories 2018-2023

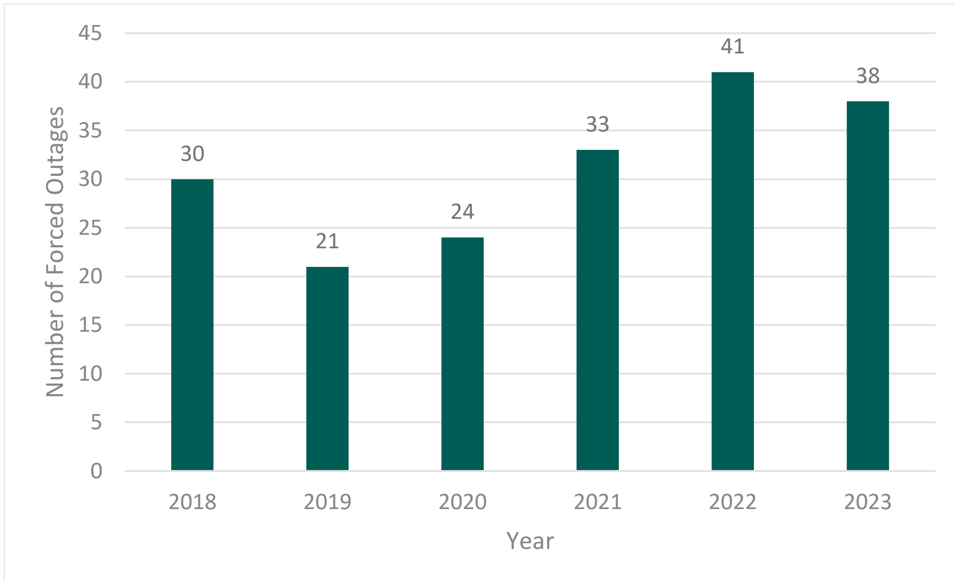


Figure 10: Forced Outages for Overhead Switches 2018-2023

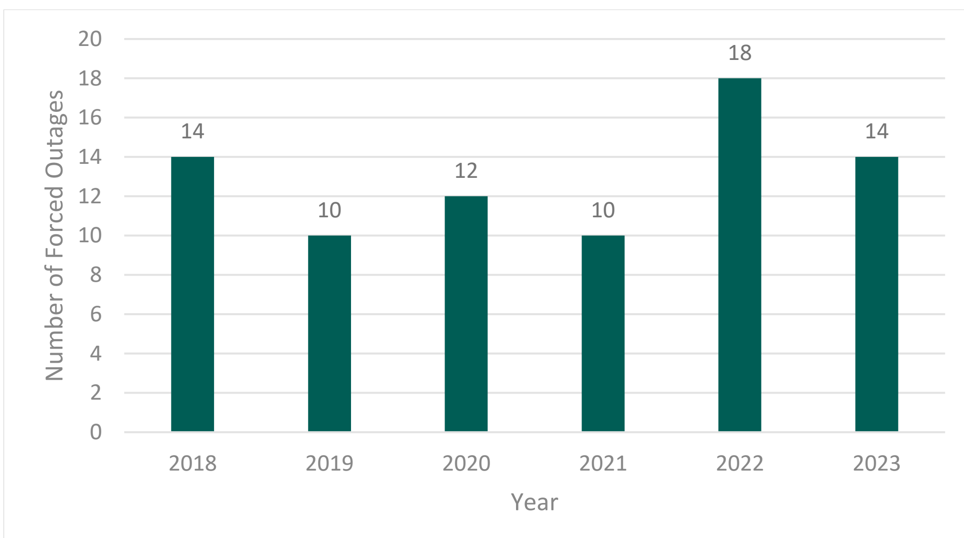


Figure 11: Forced Outages for Overhead Primary Conductors 2018-2023

QUESTION (D):

d) Page 38: The total number and timing of the areas targeted will depend on the specific locations and required scope and level of investment for projects selected (which have not yet been determined). Please discuss when the targeted areas will be determined.

RESPONSE (D):

Toronto Hydro will determine the targeted areas at the time of scoping, which is 12-18 months prior to construction. Please see Exhibit 2B, Section E6.5 at pages 28-33 for a high-level targeting and prioritization of feeders.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-61

REFERENCE: Exhibit 2B, Section E6.6, p. 42

QUESTION:

For each of the segments in Table 24, please provide a table that sets out the total quantity of assets by asset type replaced for each of the years 2020-2029.

RESPONSE:

Please see Table 1 below updated to 2023 actuals and 2024 bridge.

Table 1 – Total Number of Assets by Asset Type for 2020-2029

Asset by Type	Actuals				Bridge	Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
TS Switchgear	-	1	1	1	-	1	1	2	-	3
TS Outdoor Breakers	2	-	3	5	2	2	2	2	4	2
TS Outdoor Switch	3	6	18	23	19	6	15	10	16	16
MS Switchgear	2	5	1	-	1	2	2	2	3	3
MS Power Transformer	1	4	2	-	2	3	3	3	3	3
MS Primary Supply	1	-	1	-	2	-	-	1	-	-
TS RTU	2	2	2	1	5	4	3	4	4	4
MS RTU	17	6	11	8	5	2	3	3	3	3
TS Relay	2	4	-	12	28	26	24	26	22	23
MS Relay	-	-	-	-	-	19	23	26	27	35
Copper	3	1	2	9	2	-	-	-	-	-
Battery Units	16	8	10	15	7	12	9	12	11	11
Charger Units	15	8	8	5	5	1	2	2	2	1
Sump Pump Installations	-	1	-	-	-	1	-	-	1	1
Station Service Transformer	3	-	1	1	1	1	1	-	1	-
AC Panels	1	-	-	-	-	1	1	1	1	1

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-62
References: Exhibit 2B, Section E6.7

QUESTION (A):

a) Page 1: Please provide the number of major asset failures by asset type by year for the each of the years 2020 to 2023 addressed under the Reactive and Corrective Capital.

RESPONSE (A):

Please see Table 1 below.

Table 1: Major Asset Failures by Major Asset Type Addressed by Reactive and Corrective Capital

Major Asset	2020	2021	2022	2023
Overhead Switches	70	69	63	67
Underground Switchgear	21	25	17	13
Overhead Transformers	135	67	96	41
Poles	170	206	558	224
Underground Cables	28	16	11	6
Underground Transformers	712	260	297	209

QUESTION (B):

b) Page 8: Please provide the number of interruptions, CI and CHI for each of the assets in Table 4 for each of the years 2018-2023.

RESPONSE (B):

Please see Tables 2-7 below.

Table 2: 2018 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	33	980	541
Underground Switchgear	17	1,867	1,410
Overhead Transformers	31	84	178
Poles	35	732	524
Underground Cables	198	727	637
Underground Transformers	62	487	332

Table 3: 2019 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	26	493	401
Underground Switchgear	15	1,295	1,322
Overhead Transformers	26	62	77
Poles	27	1,917	995
Underground Cables	137	768	600
Underground Transformers	42	760	426

Table 4: 2020 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	32	1,791	946
Underground Switchgear	12	758	423
Overhead Transformers	33	192	97
Poles	29	1,055	442
Underground Cables	146	858	1,154
Underground Transformers	32	498	312

Table 5: 2021 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	45	1,016	480
Underground Switchgear	23	1,083	1,504
Overhead Transformers	25	98	98
Poles	26	1,604	1,210
Underground Cables	156	1,043	724
Underground Transformers	24	587	262

Table 6: 2022 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	53	993	528
Underground Switchgear	7	561	303
Overhead Transformers	64	119	134
Poles	30	693	314
Underground Cables	198	1,005	795
Underground Transformers	41	677	261

Table 7: 2023 Interruptions, CI, and CHI by Asset

Asset	Number of Interruptions	Average Customers Interrupted (CI)	Average Customer Hours Interrupted (CHI)
Overhead Switches	48	220	121
Underground Switchgear	18	655	342
Overhead Transformers	51	228	153
Poles	50	947	349
Underground Cables	134	774	798
Underground Transformers	51	672	318

QUESTION (C):

c) With respect to Figure 6, please provide the underlying data and include 2023 data.

RESPONSE (C):

Please see Table 8 below.

Table 8: Reactive Capital Work Requests Issued by System Type[1]

	Overhead	Stations	Underground
2019	377	65	1174
2020	356	20	971
2021	415	30	486
2022	693	5	550
2023	311	26	432

QUESTION (D):

d) Page 12: Please provide the total number of deficiencies (P1+P2+P3) by major asset type by year for the each of the years 2020 to 2023 addressed under Reactive and Corrective Capital.

RESPONSE (D):

Please see Table 9 below.

Table 9: Number of Deficiencies by Major Asset Type and Priority Addressed by Reactive and Corrective Capital

Major Asset	Priority	2020	2021	2022	2023
Overhead Switches	**P1**	32	17	15	20
	P2	26	38	29	28
	P3	12	14	19	19
	Total	**70**	**69**	**63**	**67**
Underground Switchgear	**P1**	2	8	3	4
	P2	10	6	11	5
	P3	9	11	3	4

[1] In drafting this response, Toronto Hydro discovered that it had provided incorrect values for 2022 in Figure 6 of Exhibit 2B, Section E6.7. The correct numbers are included in this table.

Major Asset	Priority	2020	2021	2022	2023
	Total	**21**	**25**	**17**	**13**
Overhead Transformers	**P1**	11	7	14	18
	P2	64	40	22	12
	P3	60	20	60	11
	Total	**135**	**67**	**96**	**41**
Poles	**P1**	17	13	23	25
	P2	102	88	131	41
	P3	51	105	404	158
	Total	**170**	**206**	**558**	**224**
Underground Cables	**P1**	13	10	5	3
	P2	11	5	6	3
	P3	4	1	0	0
	Total	**28**	**16**	**11**	**6**
Underground Transformers	**P1**	184	46	37	39
	P2	145	72	80	64
	P3	383	142	180	106
	Total	**712**	**260**	**297**	**209**

QUESTION (E):

e) Please provide the number of P4 deficiencies for each of the years 2020-2023 and the number addressed under Reactive Capital 2020-2024.

RESPONSE (E):

Please see Table 10 below. Toronto Hydro did not address any P4 deficiencies under Reactive Capital over 2020-2023 (work requests are not issued for P4 deficiencies) and does not have a forecast of the number of P4 deficiencies for future years.

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Table 10: Reactive P4 Deficiencies over 2020-2023

P4 Deficiencies (Reactive)	2020	2021	2022	2023
	62	49	23	11

QUESTION (F):

f) Page 13: Please provide Table 7 for 2020-2024.

RESPONSE (F):

Please see Table 11 below.

Table 11: Reactive Meter Replacement Costs (2020-2024)

	2020	2021	2022	2023	2024	Total
Meter Replacement (Units)	5,351	3,707	2,848	4,438	4,895	21,239
Meter Replacement Costs ($ Millions)	2.82	2.76	3.18	3.92	3.96	16.64

QUESTION (G):

g) Page 14: Please add 2023 data to Table 8, Figure 14,

RESPONSE (G):

Please see Table 12 below.

Table 12: Number of FESI-7 feeders compared to Total Number of Feeders

	2018	2019	2020	2021	2022	2023
# FESI-7 feeders	17	7	9	10	27	27
Total # feeders	1521					
% FESI-7/total	1.12%	0.46%	0.59%	0.66%	1.78%	1.78%

In regards to Figure 14, please refer to Toronto Hydro's response to Interrogatory 2B-Staff-239 part (c) for an updated figure showing data for 2023.

QUESTION (H):

h) Please identify the FESI-7 Feeders in each of the years 2018 to 2023.

RESPONSE (H):

Please see Table 13 below for the feeders identified as FESI-7 at the end of each year 2018-2023.

Table 13: FESI-7 Feeders 2018-2023

2018	2019	2020	2021	2022	2023
NAE5-2M3	34M4	51M32	80M9	51M29	51M21
88M11	NAR26M36	88M16	80M21	11M14	NT63M6
NAR43M23	NAR43M23	55M28	35M9	NAR43M29	34M2

2018	**2019**	**2020**	**2021**	**2022**	**2023**
85M25	35M10	88M43	SS68-F7	NA502M22	R30M9
XGF3	NAH9M23	34M2	A22L	85M8	NAR43M27
53M10	A12L	NAR43M29	35M2	ZJF2	38M7
80M1	NAR43M32	SS68-F6	55M8	YBF1	34M1
34M4		NAR43M31	35M10	NAR43M23	NAH9M30
NAR26M36		80M21	NAH9M30	NAR26M34	NAH9M26
34M6			NA47M14	A13L	35M4
NAR26M34				80M1	NA502M29
NAR43M31				85M5	A14L
51M26				NA47M14	NT47M1
34M2				35M2	NAR43M32
55M28				34M6	55M23
51M27				35M10	NAR43M23
35M10				11M26	NAR43M28
				A21L	80M3
				NAR43M21	NAR43M30
				34M7	34M6
				38M7	55M8
				11M13	NAR43M31
				NAR43M32	NA502M23
				85M24	35M5
				NAH9M30	R29M3
				SS58-F3	35M8
				11M19	55M7

QUESTION (I):

i) Please identify the FESI-6 Large Customer Feeders in each of the years 2018 to 2023.

RESPONSE (I):

Please see Table 14 below for the feeders identified as FESI-6 Large Customer at the end of each year 2018-2023.

Table 14: FESI-6 Large Customer Feeders between 2018-2023

2018	2019	2020	2021	2022	2023
34M4	NAR43M23	NAR43M30	NAR43M30	NAR43M23	NAR43M23
85M25	NAR26M36	NAR26M36	NAR43M28	NAR26M36	NAR43M30
NAR26M34	34M4	34M4	NA47M14	34M6	NAR43M28
NAR26M36	NAR43M21	34M7	80M9	NA47M14	34M6
34M6	NAH9M23	85M25	NT47M7	34M7	55M23
NAR43M23		51M32		55M23	85M25
51M27		88M43		NAR43M21	88M12
85M27		53M28		88M12	35M4
NAH9M27		NAE5-1M24		11M14	NAR43M27
NAR43M21		R30M4		85M8	51M21
				51M26	NT47M1
				85M23	55M7
					NAH9M26
					NAR43M32
					80M3
					NT63M6
					11M13
					51M6
					NAE5-2M3
					NAR43M26
					R30M10

QUESTION (J):

j) In addition to FESI-7 and FESI-6 Large Customer metrics, Toronto Hydro has begun to track a new metric, Customers Experiencing Multiple Sustained and Momentary Interruptions, or CEMSMI-10. Please provide the methodology to calculate the metric and provide the calculation using available data.

RESPONSE (J):

Toronto Hydro utilizes Ion meters to identify instances when large critical customers experience poor reliability (including power quality). The Ion meter registers events every time the associated customer experiences a momentary or sustained interruption. Upon accumulation of any combination of 10 momentary or sustained outages by an Ion meter, the associated customer is included in the CEMSMI-10 metric. The metric score is computed based on the aggregate number of customers reaching the 10-outage threshold divided by the total count of customers utilizing Ion meters at the start of the year.

For example, Customer 'A' with an Ion meter experiences 5 momentary interruptions and 3 sustained interruptions for a total of 8 interruptions. This does not meet the threshold of 10 and they are, therefore, not counted as a CEMSMI-10 customer. Customer 'B' with an Ion meter experiences 6 momentary interruptions and 5 sustained interruptions for a total of 11 interruptions. This surpasses the threshold of 10 interruptions and they are, therefore, counted as a CEMSMI-10 customer. At the end of the reporting period, the metric score is calculated by dividing the total number of customers exceeding the 10-interruption threshold (in this example, 1) by the population size (in this case, 2), resulting in a CEMSMI score of 50 percent in this hypothetical scenario with 2 Ion metered customers. Note that customers with new Ion meters do not contribute to the CEMSMI-10 calculation until the start of the following year in which it was installed.

$$CESMSI - 10 = \frac{\sum(Customer\ ION\ Meters \geq 10\ Momentary\ and\ Sustained\ Outages)}{\sum(Active\ Customer\ ION\ Meters)} * 100$$

QUESTION (K):

k) Page 18: Figure 11 shows the breakdown of asset types replaced under the WPF segment between 2020-2022. Please provide the number of assets replaced under the WPF segment for each of the years 2020 to 2023 for all six asset types included in Figure 11.

RESPONSE (K):

Please see Table 15 below.

Table 15: Breakdown of Assets Replaced Under the WPF Segment 2020-2023[2]

Asset Type	2020	2021	2022	2023
Switch	45	115	124	376
Insulator	65	4	62	46
Underground Transformer	39	65	0	0
Pole	0	1	63	116
Switchgear	23	2	1	0
Overhead Transformer	0	0	8	23
Underground Cable	0	0	2	2

QUESTION (L):

l) Page 23: Please add the numerical values to Figure 15.

RESPONSE (L):

Please see Table 16 below for the numerical values.

Table 16: Actual and Forecast Reactive Capital Work Requests

Year	Actual	Projection
2019	1909	-
2020	1582	-
2021	984	-
2022	1284	-
2023	1193	-
2024	-	1215
2025	-	1279
2026	-	1287
2027	-	1266
2028	-	1271
2029	-	1272

[2] During drafting of this response Toronto Hydro discovered that the number of underground transformers replaced over 2020-2022 as indicated in Figure 11 in Exhibit 2B, Section E6.7 was incorrect. The correct numbers are reflected in this table.

QUESTION (M):

m) Please provide the WPF addressed for each of the years 2020 to 2029.

RESPONSE (M):

Please see Table 17 below for the Worst Performing Feeders addressed over 2020-2023. Due to the reactive and dynamic nature of this program in addressing deficiencies and trends as they emerge, Toronto Hydro is unable to forecast information for future years.

Toronto Hydro notes that the specific feeders it addresses through the Worst Performing Feeder segment in each year are driven by a rolling 365-day view of FESI-6 and FESI-7 feeders, which can change on a daily basis. The feeders listed in Tables 13 and 14 in parts (h) and (i) are just a snapshot of that view at the end of each year. Furthermore, the Worst Performing Feeder segment is not the only contributor to mitigating worst performing feeders. For example, Toronto Hydro may issue work requests for deficiencies with high risk of imminent failure so they can be addressed on a more urgent basis through the Reactive Capital segment or Corrective Maintenance (Exhibit 4, Tab 2, Schedule 4). In addition, Toronto Hydro may address some of the larger or more widespread issues through planned renewal programs or in some cases assets on worst performing feeders may have already been included in the scope of existing projects.

Table 17: Worst Performing Feeders Addressed 2020-2023

2020	2021		2022	2023	
26-M21	26-M34	85-M7	26-M36	11-M13	47-M8
26-M34	29-M5	88-M46	26-M22	11-M14	51-M21
26-M36	38-M1	DB-F4	30-M8	11-M19	53-M10
30-M2	47-M1	E5-1M24	35-M2	11-M28	53-M25
34-M1	47-M17	E5-2M3	35-M9	30-M2	53-M26
34-M2	47-M3	E5-2M5	38-M21	30-M9	53-M5
34-M4	47-M6	H9-M29	43-M23	34-M2	53-M6
35-M10	502-M21	JG-F2	43-M26	34-M6	55-M2
502-M23	502-M22	PJ-F2	43-M28	35-M10	55-M22
502-M26	502-M23	YB-F1	43-M29	35-M2	55-M25
502-M28	502-M24		43-M32	35-M24	55-M28

2020	2021		2022	2023	
53-M24	502-M29		47-M18	35-M3	55-M32
53-M4	51-M24		51-M24	35-M5	63-M6
53-M9	51-M3		55-M2	35-M7	80-M1
55-M21	51-M6		55-M8	35-M8	80-M29
55-M24	53-F6		80-M23	38-M12	80-M6
55-M3	53-M1		80-M5	38-M20	80-M9
63-M5	53-M10		80-M8	38-M24	85-M24
80-M8	53-M24		85-M34	38-M6	85-M5
85-M30	53-M25		85-M7	38-M7	85-M9
85-M32	53-M26		E5-M21	43-M21	E5-2M3
85-M6	53-M27		E5-M22	43-M23	E5-2M4
E5-1M21	53-M28		E5-2M6	43-M24	E5-2M5
E5-2M6	53-M5		SG-F2	43-M26	E5-2M6
E5-2M9	55-M2			43-M29	E5-2M8
H9-M32	55-M29			43-M30	E5-M24
	55-M30			43-M32	E5-M26
	55-M7			47-M13	E5-M29
	63-M12			47-M14	FK-F3
	63-M4			47-M17	GE-F3
	63-M8			47-M6	VA-F3
	80-M29			47-M7	

QUESTION (N):

n) With respect to Reactive Capital spend, please provide the total number of assets replaced by major asset type for each of the years 2020-2023.

RESPONSE (N):

Please see Table 18 below.

Table 18: Assets Replaced under Reactive Capital by Major Asset 2020-2023

Major Asset	2020	2021	2022	2023
Overhead Switches	565	451	447	389
Underground Switchgears	66	55	28	50
Overhead Transformers	434	337	253	250
Poles	287	309	336	466
Underground Cable (km)	34	20	32	25
Underground Transformers	852	308	226	217

QUESTION (O):

o) Please provide the percentage of Reactive Capital spend in the Downtown area for each of the years 2020-2023.

RESPONSE (O):

Please see Table 19 below.

Table 19: Percentage of Reactive Capital Investments in Downtown Area 2020-2023

	2020	2021	2022	2023
Downtown Percentage	21%	32%	26%	31%

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-63

Reference: **Exhibit 2B, Section E7.1, Page 25**

For each expenditure segment in Table 6, please provide the volume of work for each of the years 2020-2029.

RESPONSE:

Please see Table 1 below.

Table 1: Actual and Forecast Volumes Installed

<table>
<tr><th rowspan="2"></th><th colspan="4">Actual</th><th>Bridge</th><th colspan="5">Forecast</th></tr>
<tr><th>2020</th><th>2021</th><th>2022</th><th>2023</th><th>2024</th><th>2025</th><th>2026</th><th>2027</th><th>2028</th><th>2029</th></tr>
<tr><td colspan="11">Contingency Enhancement</td></tr>
<tr><td>SCADA Switches</td><td>7</td><td>5</td><td>8</td><td>5</td><td>7</td><td>61</td><td>88</td><td>64</td><td>37</td><td>49</td></tr>
<tr><td>Reclosers</td><td>-</td><td>-</td><td>-</td><td>-</td><td>26</td><td>44</td><td>44</td><td>44</td><td>44</td><td>44</td></tr>
<tr><td>Undersized circuit replaced (km)</td><td>10.9</td><td>7.9</td><td>-</td><td>4.5</td><td>3.6</td><td>5</td><td>3</td><td>21</td><td>20</td><td>21</td></tr>
<tr><td colspan="11">Downtown Contingency</td></tr>
<tr><td>Station Ties</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td colspan="5">1</td></tr>
<tr><td colspan="11">Customer-Owned Substation Protection</td></tr>
<tr><td>Switch Units</td><td>-</td><td>16</td><td>7</td><td>24</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>

Toronto Hydro is unable to provide specific units for System Observability investments as the Request for Proposal process is ongoing and the number of units is dependent on the technology and vendor selected.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-64

Reference: EB-2018-0165 Exhibit 2B, Section 8.3, Page 10

Table 5 provides Life Cycle Analysis Replacement Criteria. Please advise of any updates to the data.

RESPONSE:

Since EB-2018-0165, there were no updates made to Toronto Hydro’s fleet life cycle analysis replacement criteria.

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-65

Reference: EB-2018-0165 Exhibit 2B, Section 8.3, page 12

QUESTION (A):

a) Please update Tables 6 and 7 with actuals/updated forecast.

RESPONSE (A):

Table 6: Replacement Costs for Heavy Duty Vehicles for the 2020 to 2024 Period ($ Millions)

Description	2020		2021		2022		2023		2024		Total
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	Cost
Cube Van	3	$0.7	0	-	0	-	0	-	6	$ 1.6	**$2.3**
Van with Aerial Device	0	-	3	$0.5	0	-	0	-	0	-	**$0.5**
Line Truck	1	$0.3	2	$ 0.4	0	-	2	$ 0.4	1	$ 0.2	**$1.3**
Single Bucket Truck	5	$1.6	0	-	0	-	1	$0.9	8	$ 4.5	**$7.0**
Double Bucket Truck	0	-	5	$2.2	5	$2.2	5	$2.4	19	$ 9.1	**$15.9**
Cable Truck	0	-	0	-	0	-	0	-	0	-	**-**
Small Crane Truck	0	-	0	-	0	-	0	-	0	-	**-**
Large Crane Truck	0	-	0	-	0	-	0	-	0	-	**-**
Small Derrick Truck	0	-	0	-	0	-	0	-	0	-	**-**
Large Derrick Truck	1	$0.4	0	-	0	-	0	-	5	$ 2.9	**$3.3**
Dump Truck	0	-	0	-	0	-	0	-	0	-	**-**
Pickup	0	-	0	-	1	$0.1	0	-	0	-	**$0.1**
Total	**10**	**$ 3.0**	**10**	**$ 3.1**	**6**	**$ 2.3**	**8**	**$ 3.7**	**39**	**$ 18.3**	**$30.4**

Table 7: Replacement Costs for Light Duty Vehicles for the 2020 to 2024 Period ($ Millions)

Description	2020		2021		2022		2023		2024		Total Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Sports Utility Vehicle	0	-	17	$0.8	3	$0.2	6	$0.3	0	-	**$1.3**
Pickup Truck	18	$1.0	0	-	9	$0.7	17	$1.3	7	$0.7	**$3.7**
Minivan - Passenger	0	-	0	-	0	-	0	-	0	-	**-**
Minivan - Cargo	0	-	0	-	20	$1.6	0	-	9	$0.9	**$2.5**
Full Size Van - Cargo	0	-	0	-	19	$1.6	1	$0.1	5	$0.7	**$2.4**
Car	0	-	5	$0.3	0	-	0	-	0	-	**$0.3**
Total	**18**	**$1.0**	**22**	**$1.1**	**51**	**$4.1**	**24**	**$1.7**	**21**	**$2.3**	**$10.2**

QUESTION (B):

b) Please provide Tables 6 and 7 with 2025-2029 data.

RESPONSE (B):

Table 6: Replacement Costs for Heavy Duty Vehicles for the 2025 to 2029 Period ($ Millions)

Description	2025		2026		2027		2028		2029		Total Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Cube Van	1	$ 0.7	0	-	17	$ 4.0	4	$1.8	5	$1.0	**$ 7.5**
Van with Aerial Device	3	$ 1.5	0	-	0	-	0	-	0	-	**$ 1.5**
Line Truck	0	-	0	-	0	-	0	-	0	-	**-**
Single Bucket Truck	0	-	2	$ 0.8	2	$ 0.8	5	$2.0	7	$2.8	**$6.4**
Double Bucket Truck	0	-	3	$ 1.5	1	$ 0.8	2	1.6	0	-	**$3.9**
Cable Truck	0	-	0	-	0	-	0	-	0	-	**-**
Small Crane Truck	0	-	1	$ 0.5	0	-	0	-	0	-	**$0.5**
Large Crane Truck	1	$ 1.0	4	$ 2.0	0	-	0	-	0	-	**$3.0**
Small Derrick Truck	0	-	0	-	0	-	0	-	0	-	**-**
Large Derrick Truck	1	$ 1.0	3	$1.6	3	$ 1.6	0	-	0	-	**$4.2**
Dump Truck	4	$ 2.0	0	-	0	-	0	-	0	-	**$2.0**
Pickup	0	-	0	-	0	-	0	-	0	-	**-**
Total	**10**	**$6.2**	**13**	**$6.4**	**23**	**$7.2**	**11**	**$5.4**	**12**	**$3.8**	**$29.0**

Table 7: Replacement Costs for Light Duty Vehicles for the 2025 to 2029 Period ($ Millions)

Description	2025		2026		2027		2028		2029		Total Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Sports Utility Vehicle	0	-	7	$ 0.5	0	-	0	-	17	$1.4	**$1.9**
Pickup Truck	9	$ 1.1	0	-	0	-	12	$1.8	18	$2.4	**$5.3**
Minivan - Passenger	6	$ 0.7	0	-	0	-	0	-	0	-	**$ 0.7**
Minivan - Cargo	2	$ 0.2	12	$ 1.7	0	-	0	-	0	-	**$ 1.9**
Full Size Van - Cargo	0	-	7	$ 1.1	2	$ 0.3	0	-	5	$0.8	**$2.2**
Car	0	-	0	-	8	$ 0.6	0	-	0	-	**$0.6**
Total	**17**	**$ 2.0**	**26**	**$ 3.3**	**10**	**$ 0.9**	**12**	**$1.8**	**40**	**$4.6**	**$12.6**

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-66

Reference: Exhibit 2B, Section E8.3

QUESTION (A):

a) Please provide the total number of vehicles in Toronto Hydro's fleet for the years 2018 to 2029 broken down by heavy duty vehicles and light duty vehicles.

RESPONSE (A):

The total number of vehicles in Toronto Hydro's fleet for the year 2018 to 2029 broken down by heavy duty ("HD") and light duty ("LD) vehicles is available in Table 1.

Table 1: Toronto Hydro Fleet Breakdown – 2018 to 2029

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Light Duty	259	231	228	220	208	215	212	211	211	210	210	210
Heavy Duty	204	185	178	166	170	151	148	150	150	152	153	153

QUESTION (B):

b) Please provide the number of EV and hybrid vehicles in the fleet at the end of 2023.

RESPONSE (B):

At of the end of 2023, Toronto Hydro's fleet included 15 fully electric vehicles and 58 hybrid and plug-in hybrid vehicles.

QUESTION (C):

c) Please provide the number and cost of EV and hybrid vehicles to be added for each year 2024-2029.

RESPONSE (C):

Please see Table 2.

Table 2: Replacement Costs for EV and Hybrid Vehicles for the 2024 to 2029 Period ($ Millions)

Description	2024		2025		2026		2027		2028		2029		Total Cost
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
EV	12	1.4	20	4.5	26	2.6	12	2.8	17	3.3	40	4.0	**18.6**
Hybrid	14	1.3	8	3.1	0	0	0	0	0	0	0	0	**4.4**
Total	**26**	**2.7**	**28**	**7.6**	**26**	**2.6**	**12**	**2.8**	**17**	**3.3**	**40**	**4.0**	**23.0**

QUESTION (D):

d) Please provide the average age of the fleet for each of the years 2020 to 2029 assuming planned investments.

RESPONSE (D):

Please see Table 3.

Table 3: Toronto Hydro Fleet Age – 2020 to 2029

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Average Age	7.9	6.8	5.7	5.4	4.9	5.0	4.8	5.3	5.9	5.4

QUESTION (E):

e) Please provide the average age of each heavy duty and light duty vehicle type for each of the years 2020 to 2029 assuming planned investments.

RESPONSE (E):

Please see Table 4.

Table 4: Toronto Hydro Average Vehicle Age – 2020 to 2029

Description	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Heavy Duty	**8.2**	**8.1**	**9.1**	**9.6**	**9.2**	**6.8**	**6.7**	**6.5**	**5.7**	**5.8**
Cable truck	11.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Crane truck	10.3	11.2	12.2	13.2	14.2	10.2	11.2	3.3	4.3	3.4
Cube van	7.1	7.6	8.6	9.3	10.3	8.1	8.1	9.1	3.5	3.2
Digger derrick	9.7	9.8	10.8	11.8	12.8	7.2	8.2	6.8	4.3	4.2
Double bucket	10.8	10.2	11.2	10.6	7.1	4.8	5.2	5.0	5.6	6.6
Dump truck	11.0	12.0	13.0	14.0	15.0	16.0	1.0	2.0	3.0	4.0
Line truck	7.4	4.8	5.8	6.8	3.2	4.2	5.2	6.2	7.2	8.2
Single bucket	4.8	5.2	6.2	7.2	8.2	6.2	7.0	7.2	8.2	7.9
Single bucket-van mount	9.5	10.5	11.5	12.5	13.5	9.0	3.0	4.0	5.0	6.0
Light Duty	**6.4**	**5.4**	**6.4**	**4.9**	**4.8**	**4.5**	**4.7**	**4.7**	**5.3**	**5.8**
Car	5.5	1.8	2.8	3.8	4.8	5.8	6.8	7.8	3.3	4.3
Cargo minivan	5.1	5.8	6.8	7.1	4.5	3.2	4.2	3.0	4.0	5.0
Full-size van	6.8	7.4	8.4	5.2	5.9	4.8	5.8	4.7	5.1	6.1
Passenger minivan	4.5	5.5	6.5	7.1	5.4	6.4	1.8	2.8	3.8	4.8
Pick-up	6.8	5.9	6.9	4.5	5.0	4.6	4.4	5.4	6.4	6.1
SUV	7.8	3.1	4.1	2.4	3.4	4.4	5.4	4.7	5.7	6.7

QUESTION (F):

f) For each vehicle replaced 2020-2029, please provide the age and mileage (km) for each vehicle and other criteria that Toronto Hydro used to determine need for replacement.

RESPONSE (F):

The criteria for vehicle replacement are explained in pages 2-3 of Exhibit 2B, Section E8.3, subsection E8.3.1.1, “Toronto Hydro's Fleet Asset Management Strategy”. Please refer to the appendix to this interrogatory response for a list of all vehicles decommissioned during 2020-2029, along with their age, recommended lifecycle analysis ("LCA") age, and mileage when decommissioned (in kilometres). Toronto Hydro also notes that over the 2020-2024 rate period the number of fleet vehicles will experience a net reduction, as the utility is not replacing all vehicles that are decommissioned.

QUESTION (G):

g) Please provide a copy of Toronto Hydro's Fleet Asset Management Strategy.

RESPONSE (G):

Please refer to Toronto Hydro's response to 2B-Staff-268(a).

QUESTION (H):

h) Please provide the vehicle replacement rate for the years 2020 to 2029.

RESPONSE (H):

Please see Table 5.

Table 5: Toronto Hydro Vehicle Replacement Rate – 2020 to 2029

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Replacement Vehicles	69	56	39	36	36	33	39	34	23	62
Total Number of Vehicles	406	386	378	366	360	361	361	362	363	363
Replacement rate	17%	15%	10%	10%	10%	9%	11%	9%	6%	17%

RESPONSES TO ASSOCIATION OF MAJOR POWER CONSUMERS IN ONTARIO INTERROGATORIES

INTERROGATORY 2B-AMPCO-67

Reference: Exhibit 2B, Section E8.4

Please provide the following metrics for each for each of the years 2025-2029.

QUESTION (A):

a) IT Spend as a % of Revenue

RESPONSE (A):

Revenue is comprised of three items, Distribution Revenue, Energy Sales and Revenue Offsets. Of the three, Toronto Hydro has a forecast of Distribution Revenue and Revenue Offsets[1]. The Energy Sales are not published for the 2025 – 2029 time period. Therefore, the calculation presented below is based on IT Operational and IT Capital spend as a percentage of Distribution Revenue and Revenue Offsets.

We have included the IT spend as a % of Distribution Revenue and Revenue Offsets for 2017 and 2022 below because a Gartner IT Benchmark study was completed for those years.

Table 1: IT Spend as % of Distribution Revenue & Revenue Offset

Year	2017	2022	2025	2026	2027	2028	2029
IT Spend as a % of Distribution Revenue and Revenue Offset	12.8%	13.4%	12.1%	12.0%	12.0%	10.8%	10.6%

[1] Exhibit 3, Tab 2, Schedule 2 Appendix H

Toronto Hydro would also caution that the metrics in the table above not be compared to the IT Spend as a % of Revenue metric presented in page 4 of the Toronto Hydro Enterprise IT Cost Benchmark and Functional Maturity Assessment, submitted as part of 2B-D8, Appendix A. The metrics provided in the table below are derived from Distribution Revenue and Revenue Offsets alone whereas the Revenue metric on page 4 of the Toronto Hydro Enterprise IT Cost Benchmark and Functional Maturity Assessment also includes revenue from passthrough costs (e.g., commodity and transmission charges).

QUESTION (B):

b) IT FTEs as a % of Employees

RESPONSE (B):

The Gartner definition of IT FTE includes insourced IT full time employees and external staff augmentation or contractors. Therefore, the IT FTE used in this calculation would not be the same as the IT FTE reflected in the pre-filed evidence.

Table 2: IT FTEs as % of Employees

Year	2017	2022	2025	2026	2027	2028	2029
IT FTEs as % of Employees	15.4%	19.1%	19.1%	19.0%	18.8%	18.8%	18.7%

The metrics reported above consider IT FTEs as the sum of insourced IT full time employees and external IT staff augmentation or contractors.

QUESTION (C):

c) IT Spend as a % of Operating Expense

RESPONSE (C):

Please note that Toronto Hydro's Operating Expense used in the calculations to derive the below metrics does not include Energy Purchases.

We have included the IT spend as a % of Operating Expense for 2017 and 2022 below because a Gartner IT Benchmark study was conducted for those years.

Table 3: IT Spend as a % of Operating Expense

Year	2017	2022	2025	2026	2027	2028	2029
IT Spend as a % of Operating Expense	20.1%	19.7%	19.6%	19.6%	19.3%	17.9%	17.4%

Toronto Hydro would caution that the metrics in the table above are not to be compared to the IT Spend as a % of OpEx metric presented in page 4 of the Toronto Hydro Enterprise IT Cost Benchmark and Functional Maturity Assessment, submitted as part of 2B-D8, Appendix A. The metrics provided in the table below are derived from Operating Expense alone.

RESPONSES TO BUILIDING AND OPERATORS MAINTENANCE ASSOCIATION INTERROGATORIES

INTERROGATORY 2B-BOMA-1

Reference: Exhibit 2B, Section D4, page 4 of 18, Section D4.1.1.3 Hyperscale Data Centre Demand Driver Analysis

Preamble:

In the referenced evidence, Toronto Hydro identified hyperscale data centre connections as a new driver of significant peak demand growth over the 2025 to 2029 period.

QUESTION:

Does Toronto Hydro expect all these hyperscale data centres will be connected as "Large User" (i.e. the Large User Rate Class)? If not, what other rate classes will these hyperscale data centres go to?

RESPONSE:

Customers with an account where demand load is 5000 kW and above are typically classified as Large Users as per the 2006 Electricity Distribution Rate Handbook. The initial classification is generally based upon the customer service and metering configuration, and is applied per account. If a hyperscale data centre project has a peak demand load of 20MW, for example, and it is configured with a single service, single or multiple meters (e.g., Class 5 meters) all under one account, this would be classified as a "Large User". In cases where the demand load is less than 5000 kW the connecting hyperscale data centre project would be classified as a Class 4 customer.

RESPONSES TO BUILIDING AND OPERATORS MAINTENANCE ASSOCIATION INTERROGATORIES

INTERROGATORY 2B-BOMA-2

Reference: Exhibit 2B, Section D4, Appendix A, page 2 of 12, Section 1 - Public Policies and Objectives, lines 6 to 8

Preamble:

In the referenced evidence, Toronto Hydro identified "City of Toronto's Toronto Green Standard" as one of the policies that drives its Future Energy Scenarios and stated that:

"….The most recent version all but eliminates the use of natural gas in new buildings."

QUESTION:

How does the "City of Toronto's Toronto Green Standard" policy impact Toronto Hydro's 2025 to 2029 commercial load forecast? Please quantify the impact on both the kWh and kW forecast.

RESPONSE:

Assuming the term "commercial load forecast" pertains to Toronto Hydro's distribution revenue load forecast, Toronto Hydro did not utilize the Toronto Green Standard in formulating its load and billing demand forecast for this rate application. Toronto Hydro through its Future Energy Scenarios work did have regard for the Toronto Green Standard and the broader City of Toronto Net Zero 2040 Strategy. To the extent that those municipal policies lead to a variance in distribution revenue due to greater building electrification or greater energy efficiency, those revenue variances would track to the Demand Related Variance Account (revenue variance subaccount).

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-4.1

Reference: **Exhibit 2B, Section D3, Appendix D, Nexant Report, Toronto Hydro-Electric Service Limited: 2018 Value of Service Study, Page 6, 1 Executive Summary, 1.1 Response to Survey and Table 1-1: Total Number of Completed Surveys by Customer Class.**

Preamble:

"The primary objective of the VOS study was to estimate system-wide outage costs by customer class. The VOS analyses are based on data from three separate surveys (one for each customer class) conducted between January and April 2018. The responses were used to estimate the value of service reliability for each customer segment, using procedures that have been developed and validated over the past 25 years by the Electric Power Research Institute (EPRI) and other parties."

QUESTION (A):

a) The quoted paragraph mentions the primary objective of the study. What were other objectives?

RESPONSE (A):

As part of the study, other objectives included:

- Determining a breakdown of the results at greater granularity levels (where feasible), through geographic, usage, time intervals, or other relevant segmentations;
- Gaining an understanding of customers' perception of their reliability experience and reliability preferences; and
- Impact of renewables and electric vehicles on both event and duration costs.

QUESTION (B):

b) Please confirm that the study found that customers who have higher electricity costs have higher outage costs

RESPONSE (B):

The study found that larger users had higher outage costs. The only exception is the 8-hour duration scenario, where the cost per average kW and cost per unserved kWh were found to be highest for Small/Medium Business customers (Tables 1-3 and 1-4 in the referenced study).

QUESTION (C):

c) Considering that the study was conducted four years ago, have any changes occurred since then that would affect the results?

RESPONSE (C):

The energy economy is always changing to some degree, and Toronto Hydro expects the complexity and pace of change to increase in the future. Since the study was performed, the world has gone through a number of major changes, including a pandemic and its lasting effects on the economy. Despite these changes, Toronto Hydro believes the study results remain reasonable for the applications in which they are deployed. It is important to note that Toronto Hydro generally relies on the blended values from this study, which reduces the significance of any relative shift in outage cost between customer classes. Furthermore, the primary way in which the utility has applied these blended rates is as a means of assigning economic value to outages for assessing benefits and risk values in dollar terms. These analyses are usually broad-based and high-level in nature and are not overly sensitive to moderate changes in the absolute value of blended outage costs.

Toronto Hydro does not believe that it is appropriate to update Value of Service assumptions often. This is both because Value of Service studies are expensive and because a lack of consistency in value framework inputs such as Customer Interruption Costs can be destabilizing and inefficient in the context of long-term asset management planning and decision-making.

QUESTION (D):

d) The paragraph mentions costs and value. Based on Nexant's use of the two words is cost an objective measure and is value a subjective measure? Please discuss.

RESPONSE (D):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. Toronto Hydro notes that the consultant firm changed owners and the authors of the report do not provide consulting services on behalf of consulting firm's successor.

Nexant used established and objective approaches to ascertain customer interruption cost estimates, which ultimately allow Toronto Hydro to develop an understanding of the value of service reliability to its customers.

QUESTION (E):

e) Considering the very small sample sizes for Small/Medium Business and Large Commercial & Industrial customer classes what confidence should the OEB have in the results of the study?

RESPONSE (E):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. Toronto Hydro notes that the consultant firm changed owners and the authors of the report do not provide consulting services on behalf of consulting firm's successor.

Toronto Hydro believes that the OEB should place a high degree of confidence in the results of the study. Nexant relied on experts with extensive experience in value of service studies to establish the approaches and sample sizes to allow Toronto Hydro to understand the costs of interruptions to its customers. They also relied on proven statistical methods to stratify these samples accordingly. Nexant confirmed within the report that the studies are valid and representative at the system level, as indicated in the report: "The study results are valid but obtaining results by smaller geographic regions within the service territory (as with residential customers) was not feasible".

Per the above, given the lower response rate, Nexant was not able to stratify results to lower levels of granularity (such as geographic separations) and these results carry wider confidence interval bands in comparison to residential customer results. Toronto Hydro believes that the responses and resulting values are reflective of its customer population.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-4.2

Reference: **Exhibit 2B, Section D3, Appendix D, Nexant Report, Toronto Hydro-Electric Service Limited: 2018 Value of Service Study, Page 7, 1.2 Outage Cost Estimates, Table 1-2: Cost per Outage Event Estimates by Customer Class**

Preamble:

"Cost per outage event is the average cost per customer incurred from each outage duration. Given the dynamic survey instrument design which accounted for historical outage onset times, these values represent the average outage cost across all time periods."

QUESTION (A) AND (B):

a) How were the costs determined? Did customers provide their own estimates of cost per event to Nexant or did Toronto Hydro provide the costs to Nexant?

b) The quoted paragraph suggests that the time of day and outage duration were averaged out. Please explain how this was done.

RESPONSE (A) AND (B):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. Toronto Hydro notes that the consultant firm changed owners and the authors of the report do not provide consulting services on behalf of consulting firm's successor. However, the utility notes that Section 3 – Survey Methodology (page 18 of the report) provides a detailed description of the survey implementation approach by customer class, survey instrument design, sample design and data collection procedures for each customer class. As noted in Section 3.1, the estimated costs were derived on the basis of data that Nexant collected directly from customers. The survey instruments used by Nexant for the different classes of customers are shown in Appendix B, C, and D of the report.

Section 4 – Outage Cost Estimation Methodology (page 24 of the report) provides an overview of the outage cost estimation methodology and describes the six metrics that were derived from the responses.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-4.3

Reference: **Exhibit 2B, Section D3, Appendix D, Nexant Report, Toronto Hydro-Electric Service Limited: 2018 Value of Service Study, Page 38, 6. Small & Medium Business Results**

Preamble:

"Table 6-1 summarizes the survey response for SMB customers. With 245 total completed surveys, customer response was below the overall sample design target of 800. The study results are valid but obtaining results by smaller geographic regions within the service territory (as with residential customers) was not feasible and the confidence bands are wider than they otherwise would have been if the targets had been reached. The original sample design had a sample draw of 3,200 customers for an expected response rate of 25 percent. Once the customers in the first sample draw had been contacted and it was clear that the response rate was below target, Nexant worked with THESL to boost responses by increasing incentives from $50 to $100 and adding 3,200 customers to the sample. Even with the increased incentives, the response rate remained low. It was similar across the four usage categories, ranging only from 3.5 percent to 4.2 percent."

QUESTION (A) – (B):

a) How was the sample design target of 800 customers determined?
b) How was the original sample design of 3,200 customers determined?

RESPONSE (A) – (B):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. Toronto Hydro notes that the consultant firm changed owners and the authors of the report do not provide consulting services on behalf of consulting firm's successor.

However, the utility notes that Section 3.2 of the Survey Methodology (page 20 of the report) provides an overview of the sample design methodology.

QUESTION (C):

c) The quoted paragraph indicates that another 3,200 were added to the sample for a total of 6,400 customers. Were all of these customers randomly selected?

RESPONSE (C):

Toronto Hydro was unable to obtain a response from the consulting firm within the timelines of the interrogatory process. However, to the best of Toronto Hydro's knowledge, the additional 3,200 customers were added based on the same approach as the original 3,200 customers and selected randomly.

QUESTION (D):

d) Of the 6,400 customers contacted, only 245 customers responded to the survey. Considering the low response rate and the diversity of small and medium customers, are the results representative of the entire population of small and medium business customers of Toronto Hydro?

RESPONSE (D):

Please see Toronto Hydro's response to interrogatory 2B-CCMBC-4.1 part (e).

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-4.4

Reference: **Exhibit 2B, Section E1, Pages 4 and 5, Table 3: Investment Category Trigger Drivers**

<u>Preamble:</u>

"System Access - Customer Service requests - Toronto Hydro strives to connect demand and DER customers to its system as efficiently as possible in alignment with its obligation under the Distribution System Code. This obligation holds unless it poses safety concerns for the public or employees or compromises the reliability of the distribution system. In situations where the existing infrastructure falls short of enabling a connection, the utility undertakes system expansions or enhancements to accommodate the customer's needs."

"System Service - Capacity Constraints - Expected load changes can impact service consistency and demand requirements for the system. To address this, Toronto Hydro proactively adjusts and expands its infrastructure to optimize reliability and meet evolving customer needs."

QUESTION (A):

a) Please explain the decision-making process that Toronto Hydro uses to identify capacity constraints, particularly as they relate to large condominium developments at Yonge and Eglinton, Yonge and St. Clair, Bayview and Eglinton and Mount Pleasant and Eglinton.

RESPONSE (A):

In the development of its System Peak Demand Forecast for the 2025-2029 period, Toronto Hydro through its Development Planning team, considered the impact of the Secondary Plans for several large projects, which include the Municipal Energy Plans for the redevelopment of Downsview, Port Lands, and Scarborough Golden Mile. For more details, please refer to Exhibit 2B, Section D4.

QUESTION (B):

b) Does Toronto Hydro charge developers of such large condominium developments to pay a contribution for the cost of expanding infrastructure to relieve capacity constraints? If the answer is yes, how is the amount of contribution determined? If the answer is no, please explain why not.

RESPONSE (B):

Customer connections are evaluated in accordance with *Distribution System Code* Section 3 Connection and Expansions subject to connection asset and expansion asset requirements in order to connect the customer. Where system expansion is required to connect the customer, Toronto Hydro uses the OEB's economic evaluation model (as described in Appendix B of the *Distribution System Code)*. This evaluation determines the amount of capital contribution that will be required by the customer for the expansion work.

QUESTION (C):

c) Please file Toronto Hydro's policies for dealing with customer service requests and the requirements for contributions from customers.

RESPONSE (C):

Toronto Hydro's policies dealing with the requirements for contributions from customers are outlined in Toronto Hydro's Conditions of Service (January 1, 2024) Section 2.1.2 Expansions / Offer to Connect. The requirements outlined within this section are compliant with *Distribution System Code* Section 3, Connection and Expansions. This section also outlines the business processes used by Toronto Hydro, including notification and timing provisions.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-5

Reference: Exhibit 2B, Section 5.1, Page 7

Preamble:

"These connections primarily relate to larger residential and commercial developments. These customers typically engage Toronto Hydro years before service is expected to be required. Figure 3 provides a year-over year comparison of the volume of new formalized high voltage requests that Toronto Hydro receives on an annual basis. High voltage connections increased by 27.6 percent for the period 2020 to 2022. As per section 7.2.2 of the DSC, these service requests must be completed within ten business days from the day on which all applicable service conditions are satisfied, or at a later date as agreed to by the customer and distributor."

QUESTION (A):

a) Did Toronto Hydro perform an economic evaluation of each of these high voltage connections as required by Appendix B of the DSC?

RESPONSE (A):

Toronto Hydro performed economic evaluations for these connecting customers in accordance with Distribution System Code Section 3. Economic evaluations are performed on projects that require expansion work.

QUESTION (B) and (C):

b) What was the cost of these connections in each of the three years?
c) What was the total amount of contributions collected from these customers in each of the three years?

RESPONSE TO (B) AND (C):

Table 1 provides High Voltage connection gross costs, and capital contribution by year:

Table 1: High Voltage Connection Amounts by Year – 2020 to 2022

Amount ($M)	2020	2021	2022
Gross Costs	90.3	113.6	116.3
Recoveries	61.7	38.7	57.7

Note: Capital contributions are recognized only when construction spend for a project begins, not when the offer to connect is executed.

QUESTION (D):

d) Did the cumulative increase in load as a result of this connections use up available capacity that required investments to increase capacity in subsequent years? If the answer is no, please discuss the amount of excess capacity on the Toronto Hydro system. If the answer is yes, please provide the costs of capacity expansion that was and will be required in 2023, 2024, 2025 and subsequent years as a result of the high voltage connections in 2020, 2021, and 2022.

RESPONSE (D):

The cumulative increase in load as a result of connections did result in capacity constraints at either the stations or regional level. The Load Demand program is used to alleviate emerging capacity constraints to efficiently connect customers to Toronto Hydro's distribution system. See Exhibit 2B, Section E5.3 for more details on the Load Demand program. Where the Load Demand program cannot effectively manage the constraints alone, the Stations Expansion program addresses the capacity needs. See Exhibit 2B, E7.4 for the required investments to increase capacity during the 2025-2029 period.

Toronto Hydro anticipates that the number of customer service requests and the size of the requested connections will continue to trend up to accommodate growing residential and commercial needs in the 2025-2029 period. See Exhibit 2B, E5.1 for more information on the Customer Connections program.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-6

Reference: **Exhibit 2B, Section D2, Appendix A, Page 6**
Table 2: Climate parameters and data sources used in the 2015 Study and the current (2022) study

Preamble:

"Annual probabilities were estimated for the baseline period (1981-2010), the 2030s (2021-2050) and the 2050s (2041-2070), by dividing the number of event occurrences, by 30 years. The annual probabilities were then translated to study period probabilities by estimating the likelihood of occurrence over a 28-year period (from 2022 to 2050). Because seven years have passed since the 2015 Study (study period from 2015 to 2050), the length of the study period has changed, which influences the climate parameter probability of occurrence."

QUESTION (A):

a) Why were annual probabilities estimated for the baseline 1981 to 2010 period since actual experience is known?

RESPONSE (A) FROM STANTEC:

On further reflection, the word "estimated" is better replaced by the word "calculated" when referring to the historical period (1981-2010) as it better reflects the procedures for evaluating probability scores. Probability scores are calculated using actual observational data based on records from Pearson International Airport, with contributions from Buttonville and Toronto Island Airports, following the same methodology as in the 2015 study. For more information, see the complete description as explained in Appendix C, section 3.1.2.

QUESTION (B):

b) Please compare and discuss the estimated probabilities for the 1981 to 2010 period with actual experience for the same period.

RESPONSE (B) FROM STANTEC:

As noted in response (A), the word “estimated” should be replaced with the word “calculated” when considering the historical period of 1981-2010. All historical values are calculated for the referenced time periods. For further information on calculation procedures, see Appendix C, section 3.1.2.

QUESTION (C):

c) Please compare and discuss the probabilities of occurrences predicted by the 2015 Study with actual experience since then.

RESPONSE (C) FROM STANTEC:

As shown in Appendix A of the report, there are minor differences in the calculated frequencies for some parameters in the historical and future projected periods. As detailed in the table, minor differences are found for days of 35°C or greater (0.75 days per year versus 0.80 days per year in 2015 versus 2022), snowfall days with 10cm (1.5 days per year versus 1.4 days per year), snowfall days with 5cm (5.0 days per year versus 5.2 days per year), extreme rainfall days with 100 mm in <1 day + antecedent (0.04 days per year versus 0.02 days per year), and lightning (1.12 to 2.24 flashes per year per km^2 versus 1.43 flashes per year per km^2). In most cases, these minor differences did not have any impact on the rated probability scores, outside of lightning, which was scored at a probability of 1 in the 2022 study rather than a range of 0 to 2 in the 2015 study. For further information, consult Appendix A in the 2022 report.

QUESTION (D):

d) Has Stantec used the same data as the 2015 Study extended by 7 years?

RESPONSE (D) FROM STANTEC:

The scope of work for the 2022 study by Stantec was to consult updated climate change modeling information available from the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment report (AR6) and supporting 6th Coupled Model Intercomparison Project (CMIP6). The 2015 study utilized projections from the IPCC Fifth Assessment Report (AR5) and the 5th Coupled Model Intercomparison Project (CMIP5). For more details see Section 2.1.1 and 2.1.2 of the 2022 Study.

QUESTION (E):

e) Of the climate parameters listed in Table 6, none deal with low temperature. Please explain why low temperature is not listed as a climate parameter.

RESPONSE (E) FROM STANTEC:

The scope of the 2022 study was to provide updates to the same parameters selected by AECOM in the 2015 study and not add any additional parameters. Stantec was not part of the decision-making process for the 2015 study that selected parameters. In the 2015 study, only one low temperature related parameter (Frost) was selected due to the potential for frost heaving issues but was deemed to be low risk (see Appendix C, Section 5.1).

QUESTION (F):

f) The table indicates that different data sources were used for some of the Climate Parameters in the 2022 Study than in the 2015 Study. For example, for the High Winds climate parameter Cheng et Al. (2012) was used in the 2015 Study but Cannon et Al (2020) was used in the 2022 Study. Please explain how and why data sources were selected and used by Stantec.

RESPONSE (F) FROM STANTEC:

As seven years have passed following the completion of the 2015 study, scientific datasets, papers, have seen improvements in the methodology used for estimating climate change effects on extremes, particularly complex parameters such as wind and freezing rain. Stantec conducted a fulsome review of relevant literature along with updated analytical techniques to revisit how projected future conditions may have changed. For example, the Cannon et al. (2020) study used in the 2022 study was not available when the initial study was completed and provides a detailed analysis of how climatic design data relevant to users of codes and standards might change as the climate warms. While the reference documents have changed and given more detail into how events might manifest in a warming climate, many of the underlying probability scores have not changed, as shown in Appendix A and noted in Section 3.2 of the 2022 report.

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-7

References: **Exhibit 2B, Section D2, Appendix A, Stantec, Climate Change Vulnerability Assessment Update, Page 7, Table 3: Probability score classes applied in this study and the 2015 Study (from Engineers Canada, 2011), Table 4: Updates to climate parameter probabilities, and Page 9.**

<u>Preamble:</u>

"There is a decrease in the estimated number of days with maximum temperatures exceeding 40°C in the 2030s and 2050s, compared to the 2015 Study. As a result, the estimated probability of 40°C temperatures occurring over the study period is about 90% and is classified as a probability score of 6, a decrease from the 2015 Study score of 7."

QUESTION (A):

a) What was the probability of Days > 40°C in the 2015 Study?

RESPONSE (A) FROM STANTEC:

As shown in Appendix A of the 2022 study, the 2015 study historical frequency of >40°C events was ~0.01 per year, based on data from Toronto City Center station, resulting in a PIEVC probability score of 1. Projected frequency in the 2015 study ranged from 0.3 to 2 days per year in the 2030 and 2050s period and 1-7 days per year in the study period, resulting in PIEVC probability scores of 4-7 and 7 for the 2030s and 2050s and study period, respectively.

QUESTION (B):

b) Were there any Days > 40°C were experienced in Toronto since 2015? Please provide dates and the duration in hours of > 40°C.

RESPONSE (B) FROM TORONTO HYDRO:

There have not been any Days > 40°C in Toronto since 2015.[1]

QUESTION (C):

c) Do all areas of Toronto experience the same temperature or are some areas, such as near Lake Ontario cooler?

RESPONSE (C) FROM TORONTO HYDRO:

Toronto does experience varying temperatures across the city and can be evaluated through the various different weather stations across Toronto made available by the Canada's Environment and Natural Resources, see https://www.canada.ca/en/services/environment/weather.html.

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[1] Government of Canada, Weather, Climate and Hazard: https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

RESPONSES TO COALITION OF CONCERNED MANUFACTURERS AND BUSINESSES OF CANADA INTERROGATORIES

INTERROGATORY 2B-CCMBC-8

Reference: **Exhibit 2B, Section D2, Appendix A, Stantec, Climate Change Vulnerability Assessment Update, Page 20**

Preamble:

"The only climate parameter probability scores that changed as a result of this analysis include extremely hot days (>40°C), and 25mm freezing rain events, both of which are projected to occur less frequently over the study period than was estimated in the 2015 Study. Though these decreases resulted in a downgrading from high to medium risk for multiple infrastructure asset classes, we do not recommend relaxing any of the adaptation measures provided in the 2015 Study.

Please confirm that the 2022 Study by Stantec did not find any increase in risk of incidents of severe weather events.

RESPONSE FROM STANTEC:

As the study only evaluated the material change in risk score for hazards where probability scores changed as part of the assessment, no other changes to overall risk scores for any other hazard were observed. As noted in Section 6 of the report and shown in Appendix A and Appendix B, the only parameters that have shown a change in probability are extremely hot days (>40°C) and 25mm freezing rain events. The 2022 study did not show any increased probability of events, however, many of the probability scores were already at the maximum value (score of 7). Some parameters see an increase in frequency in the 2022 study. For example, days above 35°C increase in the 2050s for the 2022 study (9.2 days) compared with the 2015 study (8 days). Similarly, other temperature related parameters see similar increases as well. While the probability scores do not change, the exposure to more days for these thresholds is increased in the 2022 study.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY EXHIBIT 2B-DRC-7

Reference: Exhibit 2B, Section E5.1 (Customer Connection program)

Preamble:

THESL's investment plan and Capital Expenditure Plan provide that the connection of DER facilities under the Customer Connection program supports the achievement of the public objectives with respect to facilitating innovation and supporting DER integration within Ontario's electricity system.

QUESTION (A):

a) Please provide any and all analysis, reports, studies, presentations, data or other documentation with respect to past and forecast (2023-2029) DER uptake in THESL's service territory.

RESPONSE (A):

Toronto Hydro's DER forecast is outlined in Exhibit 2B, Section E3.2 at page 3 and Exhibit 2B, Section E5.1.3.2, page 14 and relies on Toronto Hydro's historical DER connection trends, project pipeline, economic environment; and energy policies at the time of the forecast.

QUESTION (B):

b) Do you accept that the services THESL provides to support the adoption and integration of DERs and EVs influence customer behaviour and adoption of these technologies. If yes, please discuss how THESL perceives its impact on customer demand in relation to the services THESL provides related to DERs and EVs. If not, please discuss why THESL does not believe that its DER- and EV-related services and programs do not influence customer behaviour and adoption.

RESPONSE (B):

Toronto Hydro will continue to support and facilitate the connection of DERs and EVs to the distribution system. Additionally, THESL is making efforts to increase capacity of the system to connect DERs (please reference Exhibit 2B Section E5.5 for more details).

Toronto Hydro accepts that support of DER and EV programs is integral to customer adoption of these technologies. While it is the customer's choice to opt-in to DER and EV technologies, Toronto Hydro recognizes its efforts towards enabling these investments has a favorable impact on customer demand.

QUESTION (C):

c) Please indicate whether THESL considers EVs to be DERs and discuss the related implications for THESL's distribution system and system capacity.

RESPONSE (C):

Toronto Hydro considers EVs to be net new loads on the distribution system during the rate period.. Within the Innovation Program of the Grid Modernization Strategy, Toronto Hydro plans for an EV Load Management project that investigates technical hardware and control technologies to enable demand response events with electric vehicles. Further information of the pilot project can be referenced in Exhibit 2B, Section D5.

QUESTION (D):

d) Please provide any and all analysis, reports, studies, presentations, data or other documentation with respect integrating DERs as a driver of THESL's investment plan.

RESPONSE (D):

As part of its 2025-2025 Distribution System Plan ("DSP"), Toronto Hydro's intends to undertake a number of investments to enable the connection of DERs to the grid. These investments include the Customer Connections (Exhibit 2B, Section E5.1),Generation Protection, Monitoring and

Control (Exhibit 2B, Section E5.1), Non-Wires Solutions (Exhibit 2B, Section E7.2), and Stations Expansion (Exhibit 2B, Section E7.4) programs to support the safe, timely and cost efficient connection of DERs to the grid, in accordance with the utility's generation connections forecast.

QUESTION (E):

e) Please list any other common constraints to DER installation and comment on any improvements THESL has implemented over the past five years to address these constraints.

RESPONSE (E):

Short circuit capacity constraints, anti-islanding condition for DERs, as well as system thermal limits and load transfer capabilities affect the distribution system's ability to accommodate DERs. These are described in Exhibit 2B, Section E3.3 at pages 9-13. Details regarding Toronto Hydro's investments over the 2020-2024 period to address these constraints are provided in the Generation, Protection, Monitoring and Control program (Exhibit 2B, Section E5.5.4).

QUESTIONS (F) TO (H):

f) Please comment on whether there are areas within THESL's larger distribution system that are worse for the constraints listed in d) above than in other areas.

g) Please indicate the areas in THESL's service territory that are expected to be areas of significant DER growth over the next five years.

h) Please indicate and provide comment on areas of THESL's service territory that have are currently unable to meet DER installation demand and comment whether these areas will continue to be unable to meet demand or whether there are new areas anticipated to be unable to meet demand over the next five years and beyond. In your response, please comment on how this is expected to vary by neighbourhood.

RESPONSE (F) TO (H):

Exhibit 2B, Section E3.3 provides details regarding the constraints listed in (e) above.

QUESTION (I):

i) Please comment on known barriers to EV adoption in THESL's service territory, including for multi-unit rental residential, and how the Application seeks to address these barriers and ensure equitable access to charging infrastructure for all customers.

RESPONSE (I):

Toronto Hydro works directly with its customers and stakeholders to address barriers that are within the utility's jurisdiction. Toronto Hydro ensures equitable access to charging infrastructure by responding to customer requests for service expansion requests. In the event that a service upgrade is required at a customer's service address, Toronto Hydro will work with the customer and their contractor through the connections process.

A 2019 report produced by Pollution Probe outlines 14 barriers to EV charging installation in multi-unit residential buildings [https://www.pollutionprobe.org/wp-content/uploads/2023/11/ZEV-Charging-in-MURBs-and-for-Garage-Orphans-1.pdf]

QUESTION (J):

j) Does THESL have any programs to support the upgrading of supply infrastructure to enable EV charging infrastructure when THESL is planning expansion or upgrades? If yes, please provide details. If no, please discuss what types of programs could be developed to support proactive and future infrastructure upgrades to enable equitable access to EV charging infrastructure.

RESPONSE (J):

As noted in its response to part (c), Toronto Hydro considers EVs to be distribution loads. Through its capacity plan outlined in Exhibit 2B, Section D4,[1] the utility's investments over the 2025-2029 period are intended to ensure that the distribution system is adequately sized to deliver reliable electricity to its customers and enable customers to install their EV charging infrastructure. These

[1] Updated January 29, 2024

include the Customer Connections (Exhibit 2B, Section E5.1), Load Demand (Section E5.3),[1] and Stations Expansion (Section E7.4)[1] programs.

QUESTION (K):

k) Please provide THESL's views on any barriers to EV adoption for residents of multi-unit complexes in THESL's service area. Among any other views, please provide specific comment on whether multi-unit residential complexes represent one of the more challenging venues for EV adoption, and whether THESL agrees that addressing those challenges should be prioritized. Please explain THESL's position on each of these points.

RESPONSE (K) :

Please see response to part (i).

QUESTION (L):

l) Please describe any ongoing activities or initiatives proposed by THESL that can help to address challenges specific to EV transition in multi-unit residences by way of proactive infrastructure upgrades or future upgrades. Please include any planned or anticipated initiatives at the system-wide level in addition to any more localized initiatives.

RESPONSE (L):

Please see response to part (j).

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-8

Reference: Exhibit 2B, Section E8.3

Exhibit 4, Tab 3, Schedule 18

Preamble:

THESL indicates that it is seeking to transition its commercial fleet to low or zero emission technology, including increasing the rate of EVs.

QUESTION (A):

a) Please provide any and all reports, working papers, analysis or other materials that have been prepared (in draft or in final form) in connection with the transitioning of THESL's commercial fleet to low or zero emission technology.

RESPONSE (A):

Please refer to the following documents:

- Electric Vehicle Phase-In Plan by Richmond Sustainability Initiatives, which will be appended to Toronto Hydro's response to interrogatory 2B-Staff-266;[1] and
- THESL Fleet Benchmarking Findings and Recommendations and Electric Vehicle Addendum by Metsco in Appendices A and B to Toronto Hydro's response to interrogatory 1B-SEC-5.

QUESTION (B):

b) The federal government provides financial incentives for qualified zero emission vehicles purchased or enhanced capital cost allowance deductions.

[1] Toronto Hydro is in the process of obtaining disclosure consent from the consultant that authored the report referenced, and will file the report as an appendix to 2B-Staff-266 as soon as reasonably possible.

i. Please advise whether THESL's planned fleet renewal investments qualify for any federal financial incentives and/or enhanced capital cost allowance deductions.

ii. Please advise whether the capital expenditure figures reported reflect federal financial incentives and/or enhanced capital cost allowance deductions.

RESPONSE (B):

Please refer to Toronto Hydro's response to interrogatory 1-Staff-97, part (h). For an overview of funding that Toronto Hydro leveraged in the 2020-2024 rate period, please see Toronto Hydro's response to interrogatory 3-DRC-14(c).

QUESTION (C):

c) Please complete the following chart indicating the breakdown of vehicle type in THESL's current vehicle fleet:

Vehicle Type	Fully Electric	Hybrid	Non-EV/Hybrid	Total
Heavy Duty Vehicles				
Medium Duty Vehicles				
Light Duty Vehicles				

RESPONSE (C):

Toronto Hydro considers medium duty vehicles to be part of the heavy duty category and does not track such vehicles separately.

Table 1: Breakdown of Vehicle Type

Vehicle Type	Electric	Hybrid	Non-EV/Hybrid	Total
Heavy Duty	1	3	145	149
Light Duty	14	55	141	210
Total	15	58	286	359

QUESTION (D):

d) What proportion of THSEL's planned fleet renewal investment will involve fully electric and/or hybrid vehicles? Please complete the following chart indicating THESL's anticipated breakdown of vehicle type in THESL's planned fleet renewal investment (2025 to 2029):

Vehicle Type	Fully Electric	Hybrid	Non-EV/Hybrid	2025-2029 Total
Heavy Duty Vehicles				
Medium Duty Vehicles				
Light Duty Vehicles				

RESPONSE (D):

Table 2: Anticipated Breakdown by Vehicle Type

Vehicle Type	Electric	Hybrid	Non-EV/Hybrid	Total
Heavy Duty	9	8	136	153
Light Duty	106	0	104	210
Total	115	8	240	363

QUESTION (E):

e) Please indicate the estimated quantum of efficiency savings (including fuel cost savings and greenhouse gas emission reductions) that THESL anticipates it will achieve by utilizing hybrid vehicles and EVs rather than traditional internal combustion engine vehicles over the rebasing period (2025-2029).

RESPONSE:

Please refer to Toronto Hydro's response to interrogatory 1B-Staff-47 part (i).

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-9

References: Exhibit 2B, Section D8

Exhibit 2B, Section E8.4

<u>Preamble:</u>

THESL proposes an Information Technology Investment Strategy, which includes an identification of and response to certain threats relating to cybersecurity.

QUESTION (A):

a) Please describe THESL's perspective on cybersecurity risks over the proposed rate term and beyond as they apply to the integration of DERs.

RESPONSE (A):

Toronto Hydro expects that the increasing adoption of DERs will change the cyber security landscape. During the 2025-2029 rate period, the utility expects to increase its utilization of DERs to effectively manage demand response and improve capabilities to monitor, schedule, control, and dispatch DERs through a centralized platform.[1] These operations would require DER technology to be integrated with Toronto Hydro's critical Information Technology and Operational Technology (IT/OT) systems to be effective. The integration of DERs carries with it cyber security risks, particularly as such resources start to incorporate intelligent capabilities and network connectivity.[2] Toronto Hydro expects these inherent risks to intensify over the 2025-2029 rate period. To mitigate these risks and enable the secure integration of DERs, the utility plans to invest

[1] Exhibit 2B, Section D5, subsection D5.2.2.2 "Leveraging DER Connections" at p. 31.

[2] For example, a poorly secured DER could serve as an entry point to manipulate wider systems.

into its robust cyber security infrastructure[3] and the acquisition and training of skilled resources.[4] Toronto Hydro also plans to measure its performance in the area of system security enhancements to ensure continuous improvement in achieving and maintaining robust cyber security.[5]

QUESTION (B):

b) Please describe THESL's perspective on cybersecurity risks over the proposed rate term and beyond as they apply to the adoption of smart grid or similar technologies used in support of the integration of DERs.

RESPONSE (B):

As the deployment of emerging technologies like network connected DERs and smart grid components gains pace, Toronto Hydro expects increasing risk to its systems and customer data, leading to a more complex cyber security landscape. As discussed in the response to subpart (a), the utility's capital and OM&A expenditures for IT/OT for the 2025-2029 rate period include investments in measures to mitigate such cyber security risks. Examples of such measures include perimeter control mechanisms such as firewalls and intrusion detection systems to address sophisticated attacks that may use of artificial intelligence. In addition, lifecycle upgrades are performed on a regular basis to ensure that the organization will maintain secure role-based access to resources and accurate records to facilitate auditing and forensic analysis.

QUESTION (C):

c) Please describe any efforts THESL has undertaken or will undertake to identify the full extent of risks to cybersecurity in the context of DERs and use of smart grid technology.

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[3] Exhibit 2B, Section E8.4; see especially subsection 8.4.3.1, subpart 2 "IT Cybersecurity Practice" at p. 7-9.
[4] Exhibit 4, Tab 2, Schedule 17; see especially section 5 "Security and Enterprise Architecture Segment" at p. 13-20.
[5] Exhibit 1B, Tab 3, Schedule 1, subsection 2.1.3 "System Security Enhancements" at p. 21-23.

RESPONSE (C):

As outlined in Toronto Hydro's Information Technology Investment Strategy,[6] the utility leverages its investment planning process to develop and prioritize investments in an agile manner that is responsive to external drivers such as the integration of DERs and associated emerging cyber security risks. This involves a holistic business case development process and the evaluation of cyber security risks against Toronto Hydro's established IT standards, polices and enterprise architecture principles, as well as the OEB Cyber Security Framework and industry best practices.[7] The business case development process ensures a consistent and thorough assessment of each cybersecurity risk. In addition, regular assessments of the Toronto Hydro cybersecurity posture are performed to ensure continuous evaluation and adoption to the changing landscape.

QUESTION (D):

d) Please identify any portions of the record that THESL believes address these (or generally related) issues.

RESPONSE (D):

Please refer to the following evidence:

- Exhibit 1B, Tab 3, Schedule 1, subsection 2.1.3 "System Security Enhancements" at p. 21-23.
- Exhibit 2B, Section D8; see especially subsections D8.4 "IT Cyber Security Standards" and D8.5 "IT Investment Planning Process" at p. 6-10.
- Exhibit 2B, Section E8.4; see especially subsection 8.4.3.1, subpart 2 "IT Cybersecurity Practice" at p. 7-9.
- Exhibit 4, Tab 2, Schedule 17; see especially section 5 "Security and Enterprise Architecture Segment" at p. 13-20.

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[6] Exhibit 2B, Section D8; see especially subsections D8.4 "IT Cyber Security Standards" and D8.5 "IT Investment Planning Process" at p. 6-10.

[7] *Supra* footnotes 3 and 4.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-10

Reference: **Exhibit 2B, Section A**

Preamble:

THESL states that customers are showing a continued interest in participating in the electricity system as both consumers and producers of power and that DER connections have grown in recent years as result of government policies and declining costs of technologies such as solar panels.

QUESTION (A) AND (B):

a) Please elaborate on customer interest related to solar power since the last rebasing period.
b) Please provide any other common constraints to DER installation and comment on (i) any improvements THESL has implemented over the past five years to address these constraints and (ii) whether there are areas within THESL's larger system that are worse for these constraints than others.

RESPONSE (A) AND (B):

Please refer to Exhibit 2B, Section E3, for information regarding Toronto Hydro's ability to accommodate renewable energy generation and other distributed energy resource ("DER"). This includes renewable DER applications (such as solar), overall DER connection projections, the distribution system's ability to connect, as well as known constraints on the distribution system.

For information regarding investments made over the 2020-2024 period, please refer to the Generation Protection Monitoring and Control program in Exhibit 2B, Section E5.5.

QUESTION (C):

c) Please indicate where there are expected areas of DER growth in THESL's service territory.

RESPONSE (C):

DER connection location probability greatly varies and is determined by customer demand. The DER forecast is based on growth trends using historical data. DER growth forecasted in specific station areas is determined based on generation types and pipeline information. For further details, please refer to Exhibit 2B, Section E3.

QUESTION (D) :

d) Please indicate the areas of THESL's service territory that THESL has been unable to meet DER installation demand and indicate whether there are any other areas where installation demand will not be met over the rebasing period and beyond.

RESPONSE (D):

A restricted feeder list posted on Toronto Hydro's website identifies the stations with no additional short circuit capacity, i.e. unable to connect generation facilities (DERs). This list is updated regularly and a snapshot is provided in Exhibit 2B, Section E3. Toronto Hydro's DER forecast identified stations expected to have no available short circuit capacity in the next 5 years. Over the 2025-2029 period, the utility proposes investments in the Generation Protection Monitoring and Control (Exhibit 2B, Section E5.5), Non-Wires Solutions (Section E7.2) and Stations Expansion (Section E7.4) programs to alleviate these constraints.

QUESTION (E) :

e) Please provide any comments and insights from THESL's perspective on the adoption and integration of DERs at a more granular level, such as at the neighbourhood level (which neighbourhoods are seeing a significant increase in DER and EV adoption, which neighbourhoods are not seeing any or an increase in demand for DERs and EVs, etc.). If known, please discuss the characteristics of THESL's customers that are adopting these technologies (age, income, location, residential type etc.).

RESPONSE (E):

The table below is provides the number of DERs connected to each substation. As described in Exhibit E3, Toronto Hydro's investments seek to alleviate constraints at the bus/feeder level. The utility does not track the requested information at that level of detail, however, from the data provided below, downtown locations appear to have lesser DER adoptions, which could indicate that space constraints may be a determining factor.

Table 1: Number of DERs Connected to Each Substation

	Number of Connected DERS (as of 2022)
East York	**96**
Leaside	96
Etobicoke	**371**
Horner	88
Manby	117
Rexdale	63
Richview	95
Woodbridge	8
North York	**552**
Bathurst	105
Bermondsey	90
Fairchild	101
Finch	144
Leslie	112
Scarborough	**675**
Agincourt	64
Cavanagh	59
Ellesmere	94
Malvern	37
Scarborough	137
Sheppard	142
Warden	142
Toronto	**548**
Basin	14
Bridgman	33
Carlaw	68

	Number of Connected DERS (as of 2022)
Cecil	54
Charles	14
Copeland	2
Dufferin	132
Duplex	30
Esplanade	24
Gerrard	7
Glengrove	34
John	7
Main	56
Strachan	33
Terauley	8
Wiltshire	32
York	**182**
Fairbank	106
Runnymede	76
Grand Total	**2424**

QUESTION (F) :

f) Please discuss the downside risks of underinvesting and inadequate capital expenditures on EVs and DERs servicing and system infrastructure over the rebasing period and the implications for the 2030-2040 period.

RESPONSE (F):

Under-investing in renewable enabling improvement (“REI”) investments could become a barrier to the adoption of these technologies. Capital programs such as the Generation Protection, Monitoring and Control (GPMC) (Exhibit 2B, Section E5.5), Non-Wires Solutions (Exhibit 2B, Section E7.2), and Stations Expansion (E7.4) are meant to provide an environment that is conducive to the connection of more DERs. Growth and City Electrification programs as summarized in Exhibit 2B, Section E3, aim to alleviate future load constraints due to growth resulting from EV uptake.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-11

Reference: Exhibit 2B, Section D4, Appendix B
TransformTO Net Zero Strategy ("TransformTO")

<u>Preamble:</u>

THESL engaged Element Energy ("EE") to develop the Future Energy Scenarios model report (the "FES Report") to offer a range of plausible trajectories on the path toward decarbonization.

QUESTION (A):

a) Please place the TransformTO Net Zero Strategy materials on the record in this proceeding.

RESPONSE FROM TORONTO HYDRO (A):

Please refer to the TransformTO Net Zero Strategy:
https://www.toronto.ca/legdocs/mmis/2021/ie/bgrd/backgroundfile-173758.pdf

QUESTION (B):

b) Please explain why THESL and/or EE chose the TransformTO scenarios and any advantages or disadvantages in terms of the reliability of these scenarios for THESL over the next five years.

RESPONSE FROM TORONTO HYDRO (B):

As noted on page 3 of Section 2 of the FES report, the TransformTO scenarios were used as a "reference point to define the overall level of ambition modelled in the four scenario worlds." The TransformTO inputs were complemented by numerous other inputs, including the scenario worlds framework used by National Grid in the U.K., which defines scenario worlds according to their level of societal change and speed of decarbonization. Ultimately, the final scenario worlds in the FES model and report were shaped by internal stakeholder discussion and consensus, and did not simply adopt the TransformTO scenarios without scrutiny. Toronto Hydro regards the modelled scenarios as being reasonable and fit for the purpose of the exercise, which was to illustrate the range of uncertainties in the low carbon energy transition.

QUESTION (C):

c) Please discuss the implications of the four central scenarios in the FES Report specifically for DERs, EVs, storage.

RESPONSE FROM TORONTO HYDRO (C):

These scenarios reinforce the fact that the rates of uptake of DERs, EVs, and storage are highly uncertain and will depend on numerous economic and policy factors, which as a consequence, creates uncertainty for system planning.

QUESTION (D):

d) Please explain what the drivers are for EV transition in the steady progression scenario and whether it’s a gradual or concentrated transition.

RESPONSE FROM ERM (D):

Please see Section 4.3 of the FES report for details regarding the electrification of transport. Regarding the Steady Progression scenario world, Table 17 outlines how each of the modeled parameters map to the scenario world. For example, the details and graphs which outline or refer to the “Low” scenario in Section 4.3.2 detail the key inputs, methodology, and modeling that feed into the EV transition, for cars and light trucks, in the Steady Progression scenario world.

QUESTION (E):

e) Please explain how THESL’s assumed EV adoption is aligned with TransformTO and why that is the standard that TH adopted. As part of your response, please also discuss whether any other metrics were considered by THESL and whether there are any disadvantages to relying on a plan that was developed in 2020.

RESPONSE FROM ERM (E):

Please see section 4.3.1 which outlines the modelling approach for EV adoption and states that "Element Energy's "Electric Car Consumer model" (ECCo) was used to generate bottom-up technology uptake scenarios for cars and light trucks, which consist of a varying mixture of full electric, hybrid and alternative-fuels based transport options." As noted in the same section, TransformTO data was used to derive an annual growth factor for the stock of cars and light trucks, which was applied to the base year stock to give an absolute number of cars and light trucks in the city each year; this feeds into the vehicle stock rather than the relative proportion or adoption of EVs as part of that stock. Detailed further in Section 4.3.2, it is reiterated that a bottom-up modelling approach was taken: "ECCo was used to model the development of the car stock from the common starting point derived as described in Section 4.3.1. By varying the assumptions related to policy, vehicles costs and infrastructure, three uptake scenarios for BEVs and PHEVs were developed representing a range of ambition levels."

QUESTION (F):

f) Please explain what the drivers are for solar power adoption in the steady progression scenario and whether it's a gradual or concentrated transition.

RESPONSE FROM ERM (F):

Please see Section 4.4.2 of the FES report for the details regarding solar photovoltaics. Regarding the Steady Progression scenario world in particular, Table 26 outlines how each of the modeled parameters map to the scenario world. For example, the details and graphs which outline or refer to the "Low" scenario in section 4.4.2 detail the key inputs, methodology, and modeling that feed into the solar power adoption in the Steady Progression scenario world

QUESTION (G):

g) Please elaborate on the moderate increase anticipated in the System Transformation scenario for distributed renewable generation.

RESPONSE FROM ERM (G):

Please see Section 4.4.1 (including Table 28) of the FES report for the general approach used for modelling the uptake of distributed generation (including the distributed renewable generation). For details regarding the uptake for each of the distributed renewable generation types, please see Sections 4.4.2, 4.4.3, and 4.4.5. Regarding the System Transformation scenario world in specific, Table 26 outlines how each of the modeled parameters map to the scenario world. For example, the details and graphs which outline or refer to the “Medium” scenario in section 4.4.2 and 4.4.5 (and the “Low” Scenario in section 4.4.3) detail the key inputs, methodology, and modeling that feed into the uptake of each of the distributed renewable generation types modelled.

QUESTION (H):

h) Please discuss what would be involved in assessing the probability of any specific outcome taking place.

RESPONSE FROM ERM (H):

As outlined in Section 2, this project’s scenario-based modeling is used to represent a range of uncertainties in the low carbon energy transition. The modeling is not meant to comment on the probability of any of these scenarios.

Ultimately, assessing probabilities would require establishing views on macroeconomic factors, policies, and the other drivers which influence the model. The purpose of scenario-based modelling is to demonstrate the wide range of outcomes in future which stem from the uncertainty in societal and technological change. It is important to note that certain scenarios require much more change than others.

One benefit of a scenario-based model such as FES is that the utility can track developments as they occur and determine which scenario is more closely being followed.

QUESTION (I):

i) Please elaborate on drivers behind what THESL considers falling technology costs relevant to the distributed renewable generation that was identified as a possibility in the FES Report.

RESPONSE FROM TORONTO HYDRO (I):

With respect to the Future Energy Scenarios, the falling energy costs are referring to capital cost reductions as noted in sources 1 and 53 of the report prepared by Element Energy and linked below for reference.

1. CER, Canada's Energy Future[1], 2021
53. NREL, Solar Futures Study[2], 2021

QUESTION (J):

j) Please explain how the scenarios capture "the impact of flexibility options such as energy storage, smart charging and vehicle to grid options for electric vehicles".

RESPONSE FROM ERM (J):

The impact of smart charging and vehicle-to-grid options is discussed in section 4.3.7 of the FES report. Please see section 4.5 for details regarding energy storage.

QUESTION (K):

k) Please provide the full list of attributes used in the EE's "Electric Car Consumer model" and indicate which attributes THESL considers to be the most significant and describe how it affects EV uptake.

RESPONSE FROM ERM (K):

[1] https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/
[2] https://www.nrel.gov/analysis/solar-futures.html

Please see Section 4.3.1 for the relevant modelling approach (including figure 44). The following section of the report (4.3.2), details regarding the inputs (e.g., policy, vehicle costs, infrastructure) are provided. For example, table 18 outlines the assumptions in the low electric transport uptake scenario**.**

QUESTION (L):

l) Please indicate whether THESL accepts that consumer preferences and related consumer behaviour is changing and discuss how this and any such changing attitudes are incorporated into the analysis performed in the FES Report?

RESPONSE FROM ERM (L):

This project's scenario-based modeling represents the range of uncertainties for the distribution system in the future. A significant driver of this uncertainty is consumer behavior and its potential for change over time. In fact, one of the two major axes of change along which the scenario worlds were developed and subsequently modeled is "Level of Societal Change".

Please see section 3.1 for details regarding the bottom-up consumer choice modelling framework used. Additionally, for a specific example of the modeling of shifting consumer behaviour, please see Section 4.3.1.

Different levels of consumer behaviour change are modelled by the scenario worlds; please see Section 2.1 which outlines how they vary within each of the scenario world narratives.

QUESTION (M):

m) Did EE consider any other comparable jurisdictions (USA, Europe)? If, yes please indicate which jurisdictions and discuss how this was included in the analysis. If no, please discuss why no other comparable jurisdictions were included in the analysis.

RESPONSE FROM ERM (M):

Yes, this was considered. As an example, please see Section 4.3.3 which notes that the California Air Resource Board data was used as an input into the High scenario narrative for medium- and heavy-duty trucks. Similarly, in Section 4.3.6, input from the UK is referenced as well. Please see section 4 for all the relevant references to other jurisdictions and how they were included in this analysis.

QUESTION (N):

n) Please indicate whether there were any other factors considered for the purposes of allocating BEV and PHEV to neighbourhoods. If yes, please discuss how they were considered? If no other factors were considered, please discuss why not?

RESPONSE FROM ERM (N):

Please see Section 3.2 which outlines the local factors and customization to Toronto and includes commentary on the city's neighbourhood division. Please also see section 4.1.1 and 4.1.2 on archetype definitions and building stock respectively. Lastly, please see section 4.3.6 which outlines the factors considered, building upon the aforementioned sections.

QUESTION (O):

o) Please elaborate on what you view as the limitations around the business case for bi-directional chargers. As part of your response, please discuss whether these limitations are changing and the likely outlook bi-directional charging over the next 5 and 10 years? Please also discuss what has changed on these or related points since the study from 2019 cited in the FES Report.

RESPONSE FROM TORONTO HYDRO (O):

The limitations around the business case for bi-directional chargers that Toronto Hydro has considered include various factors that prohibit the technology from having a positive cost-benefit relation. These include costs associated with hardware, degradation, and energy along with location, temporal, and regulation and market risks associated with potential revenue streams. A detailed discussion of these limitations is found in the 2019 report titled "V2GB – Vehicle to Grid Britain Requirements for market scale-up (WP4)" as Reference 48 of Exhibit 2B Tab 3 Schedule 4 Appendix B.

Toronto Hydro notes that there are many changes happening throughout the sector, many of which are externally driven (e.g. regulatory, supply chain, global prices, technological development). Toronto Hydro continues to monitor these changes and to consider potential use cases for the technology as the sector evolves. The cited 2019 report was not commissioned by Toronto Hydro and the study was conducted for a regulatory environment outside of Ontario; therefore, Toronto Hydro is not in a position to speculate on how reality has unfolded in that particular environment since the study's publication.

QUESTION (P):

p) Please elaborate on the in-house consumer choice model that EE used to develop solar PV projection and discuss whether or not THESL has analyzed whether solar PV will be evenly distributed across its service territory and how that picture will develop over time.

RESPONSE FROM ERM (P):

Please see Sections 4.4.1 and 4.4.2 of the FES report for details regarding PV uptake. Please also see Sections 4.1.1 and 4.1.2 regarding archetype definitions and building stock respectively. The distribution of the taken up solar PV across Toronto Hydro's service territory is not "even" as it depends on a number of factors. In the near term, the distribution is based on the distribution of already installed solar PV connections and solar PV installations that have an accepted connection agreement with Toronto Hydro. In the long term, the distribution depends on the size of the solar PV system; rooftop solar PV distribution depends on the archetype breakdown across the serviced neighbourhoods and ground-mount solar PV distribution depends on available land space, including parking lots.

QUESTION (Q):

q) Please discuss what additional measures are necessary for the more aggressive transition pathways. For example, how does this pathway alter what constitutes a safe bet and what are the neighbourhood-by-neighbourhood implications if there is greater uptake of DERs and EVs in some areas as compared to others.

RESPONSE FROM TORONTO HYDRO (Q):

Please note that the Future Energy Scenarios report is not intended to produce measures or investment recommendations for any of the scenarios (including what constitutes a safe bet).

In the event that one of the more aggressive scenarios unfolds, the utility could be faced with incremental capacity constraints at a localized level. To address these challenges, Toronto Hydro is proposing a Demand Related Variance Account, please refer to Exhibit 1B, Tab 2, Schedule 1 for information about this proposal.

Note that the more aggressive scenarios require a substantial amount of technological and societal change as compared to the less aggressive ones. Examples of additional investments that would be necessary under more aggressive transition pathways, include demand-driven capital programs aimed at alleviating capacity at transformer stations (e.g. Stations Expansion at Exhibit 2B, Section E7.4) and feeders (e.g. Load Demand at Exhibit 2B, Section E5.3).

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-12

Reference: Exhibit 2B, Section D5

Preamble:

THESL acknowledges it is necessary to accelerate strategic investment in specific field and information technologies that will deliver near-term benefits to customers while setting the utility on a path toward sustainable performance and improved efficiency as the pressures of climate change and the energy transition mount and that electrification, DER proliferation, and worsening climate change will place increasingly complex demands on the utility's system assets and operations.

QUESTION (A):

a) Please identify the jurisdictions that THESL believes provide lessons for successful transformation and discuss the lessons that THESL believes should be taken from these examples.

RESPONSE (A):

Through its engagement with peer utilities, involvement with industry groups and conferences, and general research and industry awareness, Toronto Hydro has taken note of certain jurisdictions and utilities that are comparatively advanced and/or setting a higher pace when it comes to grid modernization, including digital transformation. Toronto Hydro has also participated in benchmarking studies that provide some insight into the range of maturity along different grid modernization dimensions (including the benchmarking studies filed in response to 1B-SEC-5). The United Kingdom, California, Florida, Alberta, Texas, and Australia are just some of the major jurisdictions that Toronto Hydro pays attention to and which are commonly cited as leading the way in different aspects of grid modernization (exactly which aspects tends to vary from one jurisdiction to the next). While Toronto Hydro has not formally studied the drivers of success across these jurisdictions, the utility has observed that sustained success in grid modernization efforts is generally influenced by several key factors, including (but not limited to) the following:

- **Policy, Regulation and Financing:** Successful jurisdictions often have supportive and consistent policy mandates, regulatory frameworks, incentives, and financing mechanisms, which together help to focus, permit, and encourage sustained investment in new technologies and capabilities.
- **Strategy and Implementation:** Utilities who are more successful at sustained grid modernization efforts typically have a clear strategy, with buy-in at all levels of the organization, and management systems to ensure effective execution focused on outcomes and performance. Toronto Hydro has also noted that successful utilities tend to be those who have proactively identified and addressed incremental workforce needs, including new skillsets. This often includes creating sufficiently robust modernization, innovation, data governance and analytics functions, with a particular focus on building strategy implementation and change management competence that enables a sustained organizational focus on transformative activities efforts that go beyond day-to-day operations.

QUESTION (B):

b) Please comment on to what extent, generally, do THESL's 5-year plans take into account the longer-term 2050 net zero scenario trajectories and discuss whether demand for transition will accelerate THESL's ability to accommodate?

RESPONSE (B):

Toronto Hydro has examined potential long-term net zero scenarios through its Future Energy Scenarios ("FES") tool. Generally, as summarized in Exhibit 2B, Section D4.2, Toronto Hydro has leveraged these scenarios as context for developing an investment plan that reflects a "least regrets" planning approach. With respect to capacity investments, this has (for example) resulted in taking a cautious approach toward building for drivers such as the electrification of buildings in the next rate period due to the uncertainty inherent in both the driver of building electrification itself, and offsetting drivers such as thermal efficiency and DERs. As further discussed in Section D4.2, this "least regrets" approach extends to Grid Modernization, where the utility has developed a two-fold strategy:

1. Address emerging challenges and opportunities in a manner that leans first and foremost into the deployment of proven technologies (e.g., reclosers, switches, smart meters, analytics), which will deliver benefits to customers in the near-term (e.g., improved reliability), while laying the foundation for more advanced use cases that will be required in 2030 and beyond.

2. Compliment this focus on proven technology with a secondary emphasis on innovation. There are certain challenges – e.g., cost-effectively increasing the amount of distributed generation that can connect to congested feeders – for which the optimal technological and commercial solutions are not yet settled or mature. In these areas, Toronto Hydro is planning to increase its investment in pilot projects and industry partnerships, which the utility believes can contribute to accelerated progress across the entire sector.

Toronto Hydro submits that the level of investment proposed for modernization in its 2025-2029 investment plan (including the related OM&A requirements described in Exhibit 4) represents the minimum funding necessary to ensure that the utility has the appropriate foundational and enhanced capabilities, including operational flexibility, needed to navigate the incremental challenges, opportunities, and uncertainties in 2030 and beyond, regardless of which net zero scenario materializes.

QUESTION (C):

c) Under what scenarios does THESL anticipate that it may no longer be cost-effective or possible to connect new DERs in its service territory?

RESPONSE (C):

Please refer to 1B-DRC-02, parts (d) and (e).

QUESTION (D):

d) Please provide further detail concerning the timing and nature of the additional modeling or analysis that THESL says it will undertake following the completion of the FES and provide details of all anticipated efforts to enhance demand forecasts and scenario analyses

RESPONSE (D):

As identified in Section D5.2.2.5 of Exhibit 2B, Section D5, Toronto Hydro intends to explore opportunities to further enhance its demand forecasts and scenario analyses. This includes exploring more granular geospatial analytical models which can support improved capacity planning at the neighbourhood level. Toronto Hydro's intention is to settle on the next phases of a roadmap for this capability area in late 2024.

RESPONSES TO DISTRIBUTED RESOURCE COALITION INTERROGATORIES

INTERROGATORY 2B-DRC-13

Reference: Exhibit 2B, Section E3

<u>Preamble:</u>

THESL is seeking to grow its workforce by approximately 25 percent "to have the required resourcing capacity and capabilities to sustain foundations of a safe and reliable grid and meet the imperatives of an urban city and customers who are increasingly relying on electricity to expand, digitize and decarbonize their footprint."

QUESTION (A):

a) What, if any, are factors that THESL believes will influence customer choice as the "key driver of DER demand", in addition to the economic and policy considerations listed, both for the period 2024-2029 and beyond.

RESPONSE (A):

Please refer to 1B-DRC-02, part (c).

QUESTION (B) AND (C):

b) What are the consequences if DER growth rates exceed THESL's forecasts and more closely approximate the highest projection scenarios from the FES Report? Please include in your response a discussion on what challenges will this present in terms of THESL's ability to meet the higher demand and any consequences it may have on THESL's ability to meet demand past 2030 if demand continues to accelerate more quickly than anticipated.

c) What additional investments beyond those set out in E3.3.1 would THESL propose to accommodate the highest projections from the Future Energy Scenarios Report?

RESPONSE (B) AND (C):

Pleas refer to 1B-DRC-02, parts (d) and (e).

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-7

Reference: Exhibit 2B, Section A5.2

QUESTION (A) - (C):

a) Please provide a table showing, for each year from 2025 to 2029, the forecast number of new connections, the forecast contribution to co-incident system peak demand (summer and winter) for those that are gas heated, the forecast contribution to co-incident system peak demand (summer and winter) for those that are electrically heated, the forecast total demand for those that are electrically heated and those that are gas heated.

b) Please provide the information requested in (a) but for the most recent year of historical data.

c) Please provide a list of all expected connection requests during the rate period, the forecast peak (summer and winter) and annual demand of each, and how each is forecast to be heated.

RESPONSE (A) - (C):

As described in Exhibit 2B, Section D4, in the development of its Peak Demand Forecast, Toronto Hydro determined that building electrification (i.e. electrification of space and water heating) is not yet a significant driver of growth over the 2025-2029 period. The utility does not track customer heat source by type (i.e., gas-heated versus electrical) as such Toronto Hydro is unable to provide the requested information. For information regarding Toronto Hydro’s customer connections forecast, please refer to Exhibit 2B, Section E5.1.

QUESTION (D) AND (E):

d) If all new construction in Toronto over 2025 to 2029 were to be heated with efficient heat pumps (i.e., no fossil fuels), would Toronto Hydro be able to provide the required electrical service? If not, what would the shortfall be and how would it arise?

e) If all of the new construction in Toronto over 2025 to 2029 that is expected to be heated by fossil fuels were to switch to heat pumps instead, approximately (i) how much additional revenue would Toronto Hydro collect from those customers due to incremental demand (nominal lifetime and NPV), and (ii) approximately how much additional cost would Toronto Hydro have to invest in its system that would not be covered by contributions in aid of construction from the connecting customers?

RESPONSE (D) AND (E):

Toronto Hydro is unable to undertake the detailed hypothetical analysis that is required to answer this question within the discovery timelines in this proceeding. Furthermore, Toronto Hydro notes that this analysis is not relevant and does not provide probative value to deciding the issues in this proceeding since the hypothetical scenario posed is extremely unlikely to materialize in the 2025-2029 rate period. Please refer to Toronto Hydro’s response to interrogatory 2B-ED-19 parts (a) to (c) for details on how the utility is preparing the grid and its operations for an accelerated pace of electrification expected in the 2030s and beyond.

QUESTION (F):

f) Please provide a sample of the Appendix B DCF calculations for a typical new condominium construction with geothermal heating versus gas heating? Please indicate (i) the electricity connection capital costs for each heating scenario and (ii) the 25-year revenue offset for the connection costs under Appendix B (i.e. how much more distribution revenue would be paid and thus be used to offset the contribution in aid of construction).

For all of the above, please make and state simplifying assumptions as necessary. Please explain the answer and provide calculations.

RESPONSE (F):

With reference to Appendix B, economic evaluations are applied to modifications to Toronto Hydro’s main distribution system (expansion) that are required in order to connect the customer to the distribution system. A key input into this calculation is the peak demand load which is determined and requested by the customer. Toronto Hydro designs the service connections to meet the customer's peak demand load, which does not distinguish between building types, heating systems, HVAC, electric vehicle charging or building/property electrical requirements. The peak demand load provided by the customer is the customer's representation of their total load demand which will be required from Toronto Hydro's distribution system to meet their electrical needs. As such, Toronto Hydro is unable to provide the requested analysis and information.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-8

Reference: Exhibit 2B, Section A5.2

QUESTION (A):

a) Please compare the co-incident peak summer electricity demand from a typical commercial or residential tower that is cooled with geothermal versus traditional air conditioning.

RESPONSE (A):

Please see Toronto Hydro's response to interrogatory 2B-ED-7.

QUESTION (B):

b) Please provide the 20 highest winter demand hours and summer demand hours for each of the past five years for Toronto Hydro's system, including the date, hour, and demand.

RESPONSE (B):

Please see Tables 1-5 for 2018-2022 top 20 coincident system peak demand hours in MW. Toronto Hydro notes that the hour:min represents the time at which the peak was recorded.

Table 1: 2018 Top 20 Coincident System Peak demand (MW)

2018 Winter				System Coincident Peak (MW)	2018 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20180105	17	55	3856	1st	20180705	15	20	4585
2nd	20180104	18	0	3801	2nd	20180905	16	55	4568
3rd	20180102	17	55	3763	3rd	20180816	15	25	4323
4th	20180103	17	55	3743	4th	20180704	16	25	4317
5th	20180106	17	55	3709	5th	20180618	10	10	4303
6th	20180115	17	50	3706	6th	20180828	15	35	4282
7th	20180107	17	40	3689	7th	20180716	11	40	4276
8th	20180117	17	50	3670	8th	20180815	14	55	4268
9th	20180118	17	55	3660	9th	20180724	16	40	4204

2018 Winter				System Coincident Peak (MW)	2018 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
10th	20180208	18	30	3656	10th	20180904	15	50	4190
11th	20180205	18	30	3653	11th	20180703	16	55	4182
12th	20180130	18	25	3650	12th	20180709	16	0	4155
13th	20180108	17	55	3642	13th	20180817	13	40	4138
14th	20171213	17	50	3641	14th	20180710	16	0	4120
15th	20180207	18	35	3628	15th	20180829	13	15	4119
16th	20171212	18	0	3617	16th	20180725	15	40	4115
17th	20180116	18	0	3616	17th	20180713	13	45	4086
18th	20171215	17	30	3612	18th	20180807	14	55	4070
19th	20180202	18	0	3608	19th	20180702	14	40	4068
20th	20180125	17	55	3601	20th	20180814	16	55	4067

Table 2: 2019 Top 20 Coincident System Peak demand (MW)

2019 Winter				System Coincident Peak (MW)	2019 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20190131	18	20	3967	1st	20190719	11	20	4296
2nd	20190128	18	0	3924	2nd	20190705	13	25	4222
3rd	20190121	18	30	3921	3rd	20190729	12	5	4201
4th	20190130	18	25	3909	4th	20190711	12	55	4164
5th	20190122	17	55	3829	5th	20190720	13	30	4120
6th	20190120	18	35	3776	6th	20190717	15	55	4113
7th	20190201	18	0	3739	7th	20190716	13	50	4097
8th	20190227	18	45	3738	8th	20190821	16	0	4071
9th	20190129	18	0	3730	9th	20190704	16	45	4038
10th	20190212	18	0	3687	10th	20190718	16	25	4017
11th	20190110	18	0	3653	11th	20190730	15	30	4003
12th	20190119	17	50	3643	12th	20190726	15	45	3996
13th	20190117	17	55	3639	13th	20190703	15	50	3987
14th	20190107	17	50	3627	14th	20190710	16	40	3944
15th	20190116	18	0	3612	15th	20190706	14	45	3927
16th	20190125	18	0	3603	16th	20190807	14	55	3899
17th	20190111	17	55	3599	17th	20190819	16	55	3867
18th	20190127	18	0	3598	18th	20190820	16	55	3865
19th	20190220	18	0	3595	19th	20190813	15	20	3860
20th	20190226	18	30	3594	20th	20190806	15	40	3845

Table 3: 2020 Top 20 Coincident System Peak demand (MW)

2020 Winter				System Coincident Peak (MW)	2020 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20191218	17	50	3669	1st	20200709	14	35	4516
2nd	20191219	17	30	3639	2nd	20200708	13	0	4495
3rd	20191211	18	0	3587	3rd	20200710	13	55	4441
4th	20200120	18	0	3557	4th	20200727	15	10	4402
5th	20200109	17	55	3543	5th	20200707	15	45	4388
6th	20200108	17	55	3540	6th	20200810	16	50	4349
7th	20200213	18	40	3526	7th	20200824	16	45	4273
8th	20200214	18	20	3511	8th	20200702	15	45	4250
9th	20200117	17	55	3504	9th	20200703	16	0	4180
10th	20200227	18	50	3502	10th	20200706	13	40	4129
11th	20191212	17	20	3492	11th	20200811	16	35	4102
12th	20200206	17	55	3491	12th	20200726	16	55	4052
13th	20191202	17	55	3486	13th	20200813	15	50	4011
14th	20200207	18	0	3478	14th	20200717	16	55	3991
15th	20200122	18	0	3477	15th	20200827	14	5	3972
16th	20191220	17	40	3477	16th	20200718	15	50	3957
17th	20200121	17	55	3477	17th	20200729	14	55	3943
18th	20200220	18	30	3476	18th	20200720	16	25	3941
19th	20200116	17	55	3455	19th	20200728	17	0	3930
20th	20200219	18	30	3452	20th	20200715	16	45	3925

Table 4: 2021 Top 20 Coincident System Peak demand (MW)

2021 Winter				System Coincident Peak (MW)	2021 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20210216	18	30	3551	1st	20210826	14	35	4421
2nd	20201216	17	45	3545	2nd	20210825	12	50	4380
3rd	20210218	18	20	3511	3rd	20210823	13	5	4268
4th	20210128	17	55	3494	4th	20210824	15	35	4250
5th	20210129	18	0	3482	5th	20210811	14	55	4210
6th	20210212	18	25	3471	6th	20210629	12	15	4205
7th	20210208	18	20	3470	7th	20210809	14	45	4160
8th	20210217	18	15	3459	8th	20210628	14	55	4137
9th	20210201	17	55	3429	9th	20210706	15	50	4106
10th	20201217	17	55	3427	10th	20210813	13	50	4102
11th	20210126	17	55	3420	11th	20210812	15	55	4064
12th	20210210	18	0	3418	12th	20210810	11	10	4018

2021 Winter				System Coincident Peak (MW)	2021 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
13th	20210211	18	25	3411	13th	20210820	13	20	4017
14th	20210202	18	15	3404	14th	20210819	13	10	4012
15th	20210209	18	20	3399	15th	20210829	16	50	4003
16th	20210213	18	25	3388	16th	20210609	11	40	3982
17th	20201207	17	50	3385	17th	20210830	14	45	3956
18th	20210127	18	0	3383	18th	20210607	12	40	3936
19th	20201215	17	50	3382	19th	20210720	15	5	3929
20th	20210205	18	0	3373	20th	20210719	14	30	3887

Table 5: 2022 Top 20 Coincident System Peak demand (MW)

2022 Winter				System Coincident Peak (MW)	2022 Summer				System Coincident Peak (MW)
	Date	Hour	Min			Date	Hour	Min	
1st	20220111	17	50	3737	1st	20220719	15	50	4291
2nd	20220126	18	0	3651	2nd	20220720	12	45	4259
3rd	20220124	17	55	3639	3rd	20220622	12	45	4254
4th	20220120	18	0	3605	4th	20220808	13	35	4173
5th	20220128	18	0	3598	5th	20220829	12	30	4143
6th	20220203	17	55	3585	6th	20220722	14	0	4051
7th	20220110	17	55	3578	7th	20220721	13	10	4043
8th	20220127	18	0	3577	8th	20220616	12	10	4009
9th	20220214	18	25	3573	9th	20220807	11	55	3996
10th	20220125	18	0	3561	10th	20220804	13	0	3954
11th	20220121	17	55	3543	11th	20220806	14	25	3912
12th	20220204	18	0	3531	12th	20220723	16	0	3887
13th	20220115	17	55	3482	13th	20220819	13	0	3879
14th	20220114	18	0	3480	14th	20220805	14	45	3877
15th	20220215	18	25	3476	15th	20220824	14	50	3860
16th	20220118	18	0	3474	16th	20220623	16	30	3823
17th	20220225	11	20	3467	17th	20220823	16	25	3810
18th	20220223	18	30	3467	18th	20220803	15	10	3796
19th	20220107	18	0	3447	19th	20220728	11	40	3790
20th	20211208	17	50	3441	20th	20220718	17	0	3788

QUESTION (C):

c) On average, what is the peak demand on Toronto Hydro's system in the summer versus the winter?

RESPONSE (C):

Toronto Hydro's 5-year average (2018-2022) for the system coincident peak demand in Summer and Winter is 4,422 MW and 3,756 MW respectively.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-9

Reference: Exhibit 2B, Section A5.2

QUESTION (A) AND (B):

a) If customer connection costs are higher than forecast, how would Toronto Hydro manage the cost?

b) The Minister of Energy has asked the OEB to consider customer connection costs, including the revenue horizon. Should Toronto Hydro implement a DVA to track any additional costs that might arise from this initiative?

RESPONSE (A) AND (B):

Please see description of the proposed Demand Related Variance Account in Exhibit 1B, Tab 2, Schedule 1 at pages 35-47.

QUESTION (C):

c) Please confirm that DSC allows utilities to apply a longer revenue horizon beyond the standard 25-years for calculating contributions in aid of construction. Has Toronto Hydro ever done this? Would Toronto Hydro consider doing this where the customer implements technology that lowers its impact on the system peak (such as geothermal, which lowers summer cooling requirements)?

RESPONSE (C):

The Distribution System Code Appendix B: Methodology and Assumptions for An Economic Evaluation, Specific Parameters/Assumptions states that:

(b) A maximum customer revenue horizon of twenty five (25) years, calculated from the in service date of the new customers[2].

Where footnote [2] states:

For example, that the revenue horizon for customers connected in year 1, is 25 years while for those connected in year 3, the revenue horizon is 22 years.

Toronto Hydro maintains compliance with the above DSC Appendix B and has not exceeded the 25 year maximum. In the event that the code changes, we may revisit this consideration.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-10

Reference: Exhibit 2B, Section 5.2

QUESTION (A):

a) Please complete the following table:

Toronto Hydro Customers – Characteristics by Sector			
	22		27
tal Customers			
Residential			
Commercial			
Industrial			
Customers with Electrical Space Heating			
Residential			
Commercial			
Industrial			
Annual Consumption (kWh) for Resistance Space Heating for Average Customer			
Residential			
Commercial			
Industrial			
Peak Demand (kW) for Resistance Space Heating for Average Customer			
Residential			
Commercial			
Industrial			
Annual Consumption (kWh) for Resistance Water Heating for Average Customer			
Residential			
Commercial			
Industrial			
Peak Demand (kW) for Resistance Water Heating for Average Customer			
Residential			
Commercial			
Industrial			

RESPONSE (A):

Information related to actual and forecast numbers of customers by rate class is listed in Table 2: Customer Numbers by Rate Class, in Exhibit 3, Tab 1, Schedule 1. Toronto Hydro does not have the requested information for characteristics by sector.

QUESTION (B):

b) Please complete the following table:

Electricity Use – Typical Customer After Conversion to Heat Pumps									
	Average Annual Electricity Consumption – Resistance Heating (kWh)			Average Annual Electricity Consumption (ccASHP & HPWP, HSPF Region 5=10[1]) (kWh)			Average Annual Electricity Consumption (GSHP & HPWP, sCOP=5) (kWh)		
	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating
Average or Typical Single-Family Residential Customer									

RESPONSE (B):

Toronto Hydro is unable to provide the data requested, as it does not have the means to disaggregate customer loads, especially behind the meter.

QUESTION (C):

c) Please complete the following table:

Winter Peak Demand – Typical Customer After Conversion to Heat Pumps			
	Average Peak Demand – Resistance Heating (kW)	Average Peak Winter Demand (ccASHP & HPWP, HSPF Region 5=10[2]) (kW)	Average Peak Winter Demand (GSHP & HPWP, sCOP=5) (kWh)

	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating	Total – Space/ Water	Space Heating	Water Heating
Average or Typical Single-Family Residential Customer									

RESPONSE (C):

Please refer to Toronto Hydro’s response to part (b).

QUESTION (D):

d) Please complete the following table:

Summer Peak Demand – Typical Customer After Conversion to Heat Pumps									
	Average Peak Demand – Traditional Central AC (kW)			Average Peak Winter Demand (ccASHP & HPWP, HSPF Region 5=10[3]) (kW)			Average Peak Winter Demand (GSHP & HPWP, sCOP=5) (kWh)		
	Total – Space/ Water	Space Cooling	Water Heating	Total – Space/ Water	Space Cooling	Water Heating	Total – Space/ Water	Space Cooling	Water Heating
Average or Typical Single-Family Residential Customer									

RESPONSE (D):

Please refer to Toronto Hydro’s response to part (b).

QUESTION (E):

e) Please complete this table of cooling efficiencies:

Cooling Efficiencies of Various Equipment Types			
		SEER	EER
Central air conditioners	Average of current stock (best estimate, Toronto Hydro customers or Ontario average)		
	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Air source heat pumps	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Air source heat pumps in hybrid systems (if different)	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Ground source heat pumps – closed loop	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Ground source heat pumps – open loop	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		
Cold climate heat pumps – variable speed	Standard unit		
	Energy Star rated		
	Energy Star – Most efficient of 2021		

RESPONSE (E):

Please refer to Toronto Hydro's response to part (b).

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-11

Reference: Exhibit 2B, Section A5.2

QUESTION (A):

a) How many electric vehicle charging stations are installed by Toronto Hydro customers now and how many are forecast for each year from 2021 to 2025? Please provide a high-end and low-end estimate.

RESPONSE (A):

Toronto Hydro in unable to provide the requested information because the utility does not collect this data from customers at this time. EV chargers are considered loads similar to appliances or other electrical equipment behind the service point.

QUESTION (B):

b) Is Toronto Hydro confident that it is making all the investments needed to facilitate increases in electric vehicles and electric vehicle charging stations even if its high-end forecasts come to fruition?

RESPONSE (B):

The proposed capacity investment plan can meet the level of EV loads forecasted for the upcoming 2025-2029 rate period. Toronto Hydro is confident that the plans described in Exhibit 2B, Section D4, is responsive to potential changes in EV adoption rates over the near-term.

QUESTION (C):

c) Have any Toronto Hydro customers been unable to install an electric vehicle charging station (e.g., a level 3 station) due to constraints on Toronto Hydro’s distribution system? If yes, how many customers each year?

RESPONSE (C):

Toronto Hydro is not aware of any customers who were unable to install a level 3 charger due to capacity constraints on the distribution system.

QUESTION (D):

d) Have any Toronto Hydro customers been delayed in installing an electric vehicle charging station (e.g., a level 3 station) due to constraints on Toronto Hydro's distribution system? If yes, how many customers each year?

RESPONSE (D):

Toronto Hydro is not aware of any individual EV charging station installations delayed as a result of grid capacity constraints. The timeline to install or upgrade an electrical service varies depending on the level of complexity of the project and is influenced by factors such as project location, site conditions, customer electrical demand and requirements, system availability and constraints. Toronto Hydro works closely with customers to provide guidance and set expectations regarding timelines for a project.

QUESTION (E):

e) Is it Toronto Hydro's goal that all customers will be able to install and use electric vehicle charging stations if they wish to do so? If not, please detail Toronto Hydro's targets in this regard.

RESPONSE (E):

Yes.

QUESTION (F):

f) Is it Toronto Hydro's goal that all customers will be able to install and use electric vehicle charging stations without delay of more than one month if they wish to do so? If not, please detail Toronto Hydro's targets in this regard.

RESPONSE (F):

Toronto Hydro is committed to enabling new service connection requests (including EV charging stations) in a timely manner. To that end, the utility has put forward the composite New Services Connected on Time performance measure as part of its 2025-2029 Custom Scorecard with a target of achieving 99 percent. Please see Exhibit 1B, Tab 3, Schedule 1 at page 24 for more information about this performance commitment.

QUESTION (G):

g) Please list and describe the investments that Toronto Hydro intends to make over 2021-2025 to ensure readiness for electric vehicles.

RESPONSE (G):

To ensure readiness for electric vehicles Toronto Hydro intends to make investments in the following programs:

- Customer Connections, Exhibit 2B, Section E5.1 (to provide customers with timely, cost-efficient, reliable and safe access to the distribution system);
- Load Demand Exhibit 2B, Section 5.3 (to alleviate emerging capacity constraints to ensure the availability of sufficient capacity to efficiently connect customers to the distribution system); and
- Stations Expansion, Exhibit 2B, Section E7.4 (to prepare the system for growth including growth related to EVs, but not exclusively).

For more general information about how Toronto Hydro's 2025-2029 Investment Plan supports electrification please refer to Toronto Hydro's response to interrogatory 1B-PP-08.

QUESTION (H) – (J):

h) Please list and describe the ways in which Toronto Hydro is currently able to use the battery in electric vehicles as a distributed energy resource to provide a service that benefits the distribution system.

i) Please list and describe the ways in which it is possible to use the battery in electric vehicles as a distributed energy resource to provide a service that benefits the distribution system, focusing only on those which Toronto Hydro is not yet capable of undertaking.

j) Is Toronto Hydro able to capitalize on the storage capacity of electric vehicles to reduce distribution system costs by: (i) communicating directly with charging stations to reduce load during peak periods, (ii) communicating directly with charging stations to allow power to be drawn from batteries during peak periods, (iii) drawing energy from car batteries connected to charging stations during peak periods, and (iv) communicating directly with charging stations to ensure energy is drawn from the LDC's system at the optimal times? If not, please explain what additional steps Toronto Hydro is willing to commit to take to explore and implement these things.

RESPONSE (H) – (J):

As noted in Exhibit 2B, Section D5.2.2.5, Toronto Hydro partnered with Plug'n Drive and Elocity Technologies to trial an EV Smart Charging Pilot aimed at understanding EV charging patterns and behaviours in Toronto and gathering information to assist in the development of future EV programs to support current EV drivers and those wishing to switch over to an EV. Benefits of this pilot include supporting the development of additional tools for EV owners to monitor, schedule, and control their charging sessions, and collecting data and insights to understand the impacts of EV charging on the distribution grid.

At this time, it is difficult to quantify the value of EV demand response in terms of ability to defer or avoid capital expenditures due to the low volume of controllable EV chargers. This is an area of innovation that Toronto Hydro intends to continue to explore through EV demand response pilot projects as part of its Innovation Fund proposal, which is outlined in Exhibit 1B, Tab 4, Schedule 2.

The non-wires solutions ("NWS") considered for the 2025-2029 rate period have been outlined in detail in Exhibit 2B, Section E7.2. Toronto Hydro's use of NWSs is targeted and focuses on credible capital deferral opportunities, and thus, the application of these solutions is limited to instances where such deferral opportunities can be identified and measured.

The NWS use case identified at this time applies to bus-level load transfer deferral or avoidance. This can be achieved through the procurement of dispatchable demand response from aggregators or customers. To that end, Toronto Hydro has set an ambitious performance target to procure 30 MW of flexible non-wires system capacity over the next rate term. Please see Exhibit 1B, Tab 3, Schedule 3 starting on page 46 for more information.

When Toronto Hydro runs its Local Demand Response ("LDR") procurements, aggregators are invited to offer capacity. If the volume of controllable EV charging systems reaches levels where the capacity could be aggregated to provide meaningful targeted capacity, aggregators will be welcome to bid this capacity into the LDR process. If the cost of such capacity is competitive, Toronto Hydro will work with these aggregators to leverage the devices mentioned. Toronto Hydro is agnostic to the technology (type of DER) or approach (load curtailment) utilized by aggregators or customers to deliver this demand response capacity. Participants are compensated based on measured and verified performance, utilizing the methodology outlined in IESO's Market Manual 12 – Issue 16.

QUESTION (K):

k) Is Toronto Hydro willing to offer customers special rates to encourage the expansion of electric vehicles?

RESPONSE:

As a licensed distributor, Toronto Hydro is legally bound by OEB codes, the *Electricity Act, 1998* and the *Ontario Energy Board Act, 1998*. As such, it cannot unilaterally offer customers special rates to encourage the expansion of electric vehicles. As demonstrated in the spring of 2023, Toronto Hydro is pleased to support the OEB and the government in launching incentives to encourage EV uptake, such as the Ultra-Low Overnight Electricity Price Plan. Toronto Hydro was one of the first utilities in the province to implement this initiative.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-12

Reference: Exhibit 2B, Section A5.2

QUESTION (A) AND (B):

a) What percent of Toronto's GHG emissions are from the combustion of methane gas?

b) What percent of Toronto's GHG emissions are from the combustion of methane gas in buildings (versus industrial uses)?

RESPONSE (A) AND (B):

Toronto Hydro is unable to provide a response as it does not have the requested information.

QUESTION (C):

c) Please describe potential roles that Toronto Hydro could play in relation to the implementation of electric heat pumps as an alternative to natural gas heating.

RESPONSE (C):

Toronto Hydro's capacity plan ensures that the distribution system is adequately sized to deliver reliable electricity to the utility's customers regardless of their source of heating (Exhibit 2B, Section D4).[1]

Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is also playing a proactive role in supporting the realization of the City's Net Zero Strategy by facilitating and stimulating the growth of emerging local cleantech markets. For more information, please see the latest Climate Action Plan status report.[2]

[1] Updated January 29, 2024.

[2] https://www.torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf

QUESTION (D):

d) How many new homes and businesses are forecast to be built in Toronto Hydro's coverage area in the next 10 years? If available, please provide an annual breakdown.

RESPONSE (D):

Toronto Hydro is unable to provide a response and it cannot speculate the number of homes and buildings to be built within its service territory in the next 10-years.

QUESTION (E):

e) How many new customers does Toronto Hydro expect to hook up in the next 10 years? If available, please provide an annual breakdown.

RESPONSE (E):

Please refer to Toronto Hydro's response to interrogatory 2B-Staff-181 part (b).

QUESTION (F):

f) What assistance could Toronto Hydro provide to developers to promote the installation of electric heat pumps instead of natural gas furnaces in new construction?

RESPONSE (F):

Please see Toronto Hydro's response to part (c).

QUESTION (G):

g) Would Toronto Hydro benefit from regulatory changes in order to play a greater role in promoting the expansion of electric heat pumps in lieu of natural gas? If yes, what are those potential changes?

RESPONSE (G):

Toronto Hydro is unable to provide a response to this question as it requites the utility to speculate on potential changes in policy.

QUESTION (H):

h) Please comment on the report by Ralph Torrie estimating that electricity demand could decline if all heating was converted to electric heat pumps and energy retrofits were increased: https://www.corporateknights.com/channels/built-environment/recovering-stronger-building-low-carbon-future-green-renovation-wave-15875463/.

RESPONSE (H):

The article in the link provided in the question shows no sources to assess the accuracy of the figures or calculations. Toronto Hydro's Future Energy Scenarios ("FES") forecasts varying levels of building retrofits and electrified heating assumptions (please see Sections 4.1 and 4.2 of Exhibit 2B, Section D4, Appendix B). In the most aggressive scenario, FES forecasts that 100 percent of domestic and industrial and commercial ("I&C") buildings are retrofitted by 2050 and that there is a 75 percent gain in electric heating efficiency. Even with these assumptions, electrical demand still increases in the scenario.

If building energy retrofits and energy management controls were always to accompany a conversion to heat pumps, then building electrical demand could decline relative to the current summer peak. Toronto Hydro's past CDM successes have demonstrated that energy efficiency improvements in buildings promoted through incentives are a viable solution. In fact, Toronto Hydro continues to assist the IESO to deliver energy efficiency in Toronto.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-13

Reference: Exhibit 2B, Section A5.2

Preamble:

An expert report filed in EB-2016-0004 by Dr. Stanley Reitsma, P. Eng., outlined significant benefits to the electricity system in reducing peak demand.[1] See page 5 to 13. For example, Dr. Reitsma concludes:

> "Though geothermal relies on electricity as an input (to power the pump), geothermal system actually reduces electricity demand in the summer, and increases it in the winter, relative to traditional methods of heating and cooling (heating with fossil fuels and cooling with traditional AC systems). For Ontario, a summer peaking jurisdiction, a greater reliance on geothermal would reduce peaking power needs and also reduce surplus baseload generation. Coincidentally, the load profile of a geo system is similar to the production profiles of Ontario wind energy facilities." [2]

> "For the cooling of buildings, Geo HP's use about half the electricity to operate compared to air source heat pumps and AC systems, and, geo's electrical demand doesn't spike as it gets hot outside, since the ground loop temperature remains relatively unchanged. They can reduce the "heat wave" electricity system demand spikes by up to 75%."[3]

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[1] Dr. Stanley Reitsma, P. Eng., Ontario's Low Carbon Future: Geothermal Heat Pumps, March 21, 2016 (http://www.rds.oeb.ca/HPECMWebDrawer/Record/521626/File/document).
[2] Ibid. p. 5.
[3] Ibid. p. 6.

QUESTION (A):

a) Does Toronto Hydro agree with the comments in the above-referenced report regarding the benefits that geothermal systems can provide to the electricity system, including a reduction of peak demand? Please explain.

RESPONSE (A):

The technical merits of the referenced report are outside Toronto Hydro's area of expertise for critical analysis. Toronto Hydro notes that this report was published eight years ago and, given the dynamic nature of decarbonization technologies, more recent developments may be relevant to the conclusions reached in the report.

QUESTION (B) AND (C):

b) Does Toronto Hydro agree that the expansion of geothermal systems would reduce peak demand on Toronto Hydro's system, on which distribution system capacity is based?

c) Does Toronto Hydro agree that geothermal systems have the capacity to provide important benefits to the electricity distribution system, especially in comparison to traditional baseboard heating?

RESPONSE (B) AND (C):

Please see Toronto Hydro's response to interrogatory 1B-CCC-29.

Please also see the description of the modelling of low carbon heating in the Future Energy Scenarios report at Exhibit 2B, Section D4, Appendix B at pages 32-44 where ground source heat pumps were one of the modelled heating technologies.

QUESTION (D):

d) Does Toronto Hydro agree that the benefits of geothermal systems are not reflected in the distribution costs paid by residential consumers because those charges do not vary based on coincident peak demand?

RESPONSE (D):

Toronto Hydro confirms that residential distribution rates are fixed, and do not vary based on coincident peak demand.

QUESTION (E):

e) Does Toronto Hydro agree that increases in heat pumps would assist the City in achieving its GHG reduction targets?

RESPONSE (E):

Please see the responses to parts (b) and (c) with respect to the Future Energy Scenarios report.

QUESTION (F):

f) Would Toronto Hydro agree to study the possibility of offering customers with geothermal systems a reduction in their distribution charges that would approximately reflect the benefits those customers provide to the distribution system? Assume the overall rate structure would continue to make Toronto Hydro whole for its revenue requirement.

RESPONSE (F):

From time-to-time, the OEB re-assesses rate design on a sector-wide basis. That continues to be the most appropriate approach, in order to maintain consistency across service areas. As a result, Toronto Hydro does not support a utility-specific study.

QUESTION (G):

g) Please provide Toronto Hydro's best information on the number and proportion of its customers with (i) electrical, (ii) natural gas, (iii) propane, (iv) oil, (v) wood, and (vi) other kind of space heating.

RESPONSE (G):

Toronto Hydro is unable to provide a response as Toronto Hydro is currently unable to disaggregate customer meter data to identify end use. Toronto hydro does not have data reflecting non-electric fuel-based heating.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-14

Reference: Exhibit 2B, Section A5.2

QUESTION(S):

a) What is the appropriate role for Toronto Hydro to play with respect to efforts to ensure that customers with on-street parking can access electric vehicle charging?

RESPONSE (A):

Toronto Hydro (in collaboration with the City of Toronto) completed an on-street pilot project in 2020 with (17) charging stations, the project was extended with another (32) charging stations in 2022. In 2022 it was decided that the existing projects and future on-street charging projects would be constructed and operated by the City's parking agency, the Toronto Parking Authority.

QUESTION (B):

b) Does Toronto Hydro agree that there would be benefits to the electricity system if its customers with on-street parking are able to charge their vehicles at night in front of their homes instead of during the day at a third-party charger?

RESPONSE (B):

With current Ontario/Toronto daily electricity consumption patterns it is beneficial for the electricity system to have new loads consume energy during the overnight period rather than during the daytime where peak demand typically occurs.

QUESTION (C):

c) Has Toronto Hydro considered making efforts to facilitate sidewalk charging cable channels, such as the following:
   i. https://www.kerbocharge.com/

ii. https://www.stormguard.co.uk/stormguard-products/heavy-duty-ev-cable-channel/
iii. https://www.chargegully.com/
iv. https://gul-e.co.uk/

RESPONSE (C):

Toronto Hydro does not have jurisdiction over lands owned by the City of Toronto. Sidewalks and portions of land between the roadway and the municipal road are part of the City road allowance and the jurisdiction of the City of Toronto.

QUESTION (D):

d) If Toronto Hydro has not considered the solution listed in (c), is it willing to do so as a way to promote more charging overnight charging at home (versus charging in the daytime away from home)?

RESPONSE (D):

The suggested products of (c) appear to be physical conduits with implications to City of Toronto property and residential electrical appliances governed by the Ontario Electrical Safety Code. With current Ontario/Toronto daily electricity consumption patterns, Toronto Hydro encourages energy consumption through the overnight period when new loads such as EV charging is added.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-15

Reference: Exhibit 2B, Section A5.2

QUESTION (A):

a) Is Toronto Hydro considering technologies that could cost-effectively allow it to throttle electric vehicles chargers of participating customers who have internet-connected chargers?

RESPONSE:

Toronto Hydro has carried out a smart charging pilot that shifts energy consumption to off-peak times and participated in utility-initiated curtailment events through internet-connected chargers. Toronto Hydro continues to investigate emerging EV charging technologies that can be deployed at scale including vehicle telematics.

QUESTION (B):

b) By 2029, what does Toronto Hydro believe the cost of this kind of software solution may be?

RESPONSE (B):

Electrification technologies continue to develop at a rapid pace. Toronto Hydro continues to investigate solutions that monitor and evaluate a variety of technologies and solutions to identify the most valuable solutions that best support the use of future electrification technologies for our customers and the distribution system.

QUESTION (C):

c) Please describe some of the benefits of curtailable electric vehicle charging for high penetration scenarios (versus time-of-use approaches), such as evenly spreading the demand out over the entire nighttime and avoiding a spike at the beginning of the nighttime low rate.

RESPONSE (C):

As a result of TOU rates along with the newly introduced Ultra Low Overnight Rates, customers are likely to schedule their EV charging to start at the beginning of these periods (during lower rates). As a result, when higher EV penetration occurs, the collective increase of load during the off-peak and ultra-low rates may see high demand on some areas of the distribution system. The ability of managed EV charging, coordinated and controlled by the utility, may be an effective tool to mitigate these high demand scenarios to limit overloading of certain sections of the distribution system resulting in a consistent demand through the overnight period.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-16

Reference: Exhibit 2B, Section A5.2

QUESTION (A) AND (B):

a) Please provide a breakdown of Toronto Hydro's customers by customer type with as much detail and granularity as possible (e.g. industrial, commercial, residential). Please also include a breakdown of the residential customers by type as possible (e.g. detached, semi-detachment, units in buildings, single-meter large buildings, etc).

b) Please provide a table showing the peak (summer and winter) and annual demand for each of customer type.

RESPONSE (A) AND (B):

Toronto Hydro is unable to provide the data requested in part (a) as it does not have the means to disaggregate customer loads.

Toronto Hydro is unable to provide the requested quantification in part (b) due to data limitations. When connecting a customer to Toronto Hydro's distribution system, consideration is given to the customer's requested demand load. The connection is not distinguished by sector or building type.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-17

Reference: Exhibit 2B, Section A5.2 (this is also relevant to D4)

QUESTION (A) AND (B):

a) On a best estimate basis, please provide Toronto Hydro's best estimate of the number of residential customers with different electrical panel sizes (e.g. 60 amp, 100 amp, 200 amp, etc.). Please include houses (i.e. detached and semi-detached) but exclude large buildings (condos).

b) On a best estimate basis, please provide Toronto Hydro's best estimate of the largest electrical panel that can be supported by the conductor leading to each residential customer (e.g., 60 amp, 100 amp, 200 amp, etc.). Please include houses (i.e., detached and semi-detached) but exclude large buildings (condos). In other words, we are looking for the percentage of homes with different conductor sizes leading to them.

RESPONSE (A) AND (B):

Toronto Hydro is unable to provide a response as the utility does not track customer panel sizes as they are located downstream of Toronto Hydro's demarcation point. However, based on experience working with developers, the utility estimates that the vast majority of residential customers in the City of Toronto are equipped with 100A electrical panels. With the increase in popularity of electrification in recent years, new and infill homes are typically being equipped with 200A panels.

QUESTION (C):

c) Customers can sometimes avoid installing a larger electrical panel when installing an electric vehicle charger by using a switch that allows a circuit in the existing panel to be shared as between the vehicle charger and, for instance, a clothes dryer. The switch will stop power flowing to one device (typically the charger) when the other device is on. Is

Toronto Hydro familiar with this kind of device, and if yes, can it provide some examples available in the Ontario market?

RESPONSE (C):

Toronto Hydro is familiar with energy management and switching devices. An example can be found at https://www.blackboxelectrical.com/. These devices are typically installed near the customer's electrical panel, which is beyond Toronto Hydro's demarcation point. These devices are permitted under the Ontario Electrical Safety Code (OESC) and fall under the jurisdiction of the Electrical Safety Authority (ESA). Toronto Hydro is generally not notified of such installations since they do not usually require an isolation from the grid during installation.

QUESTION (D):

d) If a customer installs a switch described in (c), or many customers install such a switch, would that have an impact on distribution capacity needs as estimated by Toronto Hydro (i.e. reducing the needs in comparison to an alternative scenario where a panel is upgraded to allow the new charger connection)? Please describe the mechanism by which this change would show up in Toronto Hydro's capacity forecast (e.g. through reduced peak load measurements used to forecast future load?). If there is an impact, how big is it?

RESPONSE (D):

Deploying an energy management device like the switch described may prevent the need for a customer panel upgrade or adjustments to the service conductor designated to the customer. The variability in customer preferences and adoption rates of such devices is currently unknown and requires further experience to assess the impact on the upstream distribution system. In this period, this technology is not expected to materially impact Toronto Hydro's distribution capacity forecast, as the technology is still in its infancy and not well established. Furthermore, while this technology can avoid a service upgrade for the customer, it is not yet clear to what extent, nor at what scale of adoption, it would impact system demand profiles. Toronto Hydro updates its 10-year peak demand forecast annually and adjusts its investment plans accordingly. As part of this process, Toronto Hydro monitors growth trends in various consumer technology segments and adjusts modelling inputs and assumptions based on historical trends and emerging developments.

QUESTION (E):

e) If the switches described in (c) have a benefit in terms of distribution load management, would Toronto Hydro consider providing an incentive for customers to install those instead of upgrading their electrical panel? Alternatively, would Toronto Hydro provide all panels seeing an electrical upgrade information regarding that option?

RESPONSE (E):

As mentioned in part d) of this interrogatory, the variability in adoption rates of such devices are currently unknown and require further experience to assess the impact to the upstream distribution system, to then consider relevant incentives. Toronto Hydro remains dedicated to breaking down barriers that hinder customers from reducing their emissions. Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is also playing a proactive role in supporting the realization of the City's Net Zero Strategy by facilitating and stimulating the growth of emerging local cleantech markets and engaging in providing solutions for customers contemplating electrification. For more information, please see the latest Climate Action Plan status report.[1]

QUESTION (F):

f) If a customer upgrades their electrical panel, how would that impact the distribution capacity needs as estimated by Toronto Hydro? Please describe in detail. For instance, how far upstream of the electrical panel would potentially be impacted (between the pole-mounted transformer versus the feeder)?

[1] https://www.torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf

RESPONSE (F):

The incremental demand load from the upgrade may have varying impacts on the upstream distribution capacity needs, ranging from no changes, to service wire upgrades, system reconfiguration, transformer additions and/or upgrades. The extent of impact varies based on factors such as customer location, required demand load, load profile, and existing system conditions. Upstream distribution assets that could be affected include, but are not limited to: revenue meter, customer meter base, overhead and underground service wires, distribution bus wires, distribution transformers, civil infrastructure, primary feeder(s), fuses and switches.

The assessment of the impacts on the distribution system is fundamental to our standard practices and is incorporated as part of the forecasted investments for the System Access and System Renewal programs, see Exhibit 2B, Sections E5 and E6, respectively. While localized impacts are anticipated within the 2025-2029 period, the nature of the impact will depend on the constraints of the specific location and customer's requirements.

QUESTION (G):

g) If a customer installs a heat pump or an electric vehicle charger within their existing electrical panel, how would that impact the distribution capacity needs as estimated by Toronto Hydro? Please describe in detail.

RESPONSE (G):

The sizes of equipment such as heat pumps and electric vehicle chargers, along with their respective electrical loads, can vary considerably and are largely influenced by customer requirements and choice. For instance, electric vehicle chargers may range from 15A (3.6 kW) to 80A (19.2 kW), with the typical rating being 30A (7.2 kW). Depending on the equipment size, the customer's existing load and equipment, load profile, and the prevailing system conditions, heat pumps and/or an electric vehicle chargers trigger the same impacts outlined in part (f).

Toronto Hydro has encountered some electric vehicle charger installations and is actively reviewing the impacts of heat pumps. The specific electrical demand load and adoption rates remain uncertain. While localized impacts are anticipated, they are not expected to have a material impact on the 2025-2029 rate period.

QUESTION (H):

h) Please describe how Toronto Hydro sizes equipment at different levels of the distribution system (e.g. service conductor, pole-mounted transformer, feeders, etc.).

RESPONSE (H):

Toronto Hydro sizes its service conductors according to the specific load requirements outlined by the Customer's licensed electrician, in accordance with the OESC. Upstream distribution transformers (pole-mounted, pad-mounted, vault transformers) and feeders (overhead, underground, or mixed), along with any distribution equipment and infrastructure between the customer and transformer, are sized to accommodate multiple customers in the vicinity. This depends on factors such as location, density, area landscape, geography, existing and anticipated future developments, historical customer load, and other relevant considerations.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-18

Reference: Exhibit 2B, Section A5.2 (also relevant to questions on service charges)

QUESTIONS (A):

a) Please provide all charges/fees levied by Toronto Hydro for a residential panel upgrade (e.g. fixed fee, conductor replacement if necessary, pole-mounted transformer replacement if necessary, etc.).

b) Please create a table to compare the charges in (a) to those charged by Alectra, Hydro Ottawa, and Elexicon Energy.

c) Please provide excerpts from the Toronto Hydro conditions of service and the DSC that allow Toronto Hydro to levy the charges/fees described in (a).

d) Please provide all studies and calculations justifying the fixed fees for a panel upgrade charged by Toronto Hydro.

e) Does Toronto Hydro agree that the fixed fees for panel upgrades must not be greater than the actual costs for that service on an aggregate basis? Please provide all the applicable regulatory criteria governing such fees/charges?

f) When were Toronto Hydro's current fixed fees for panel upgrades first set? Please provide the documentation provided at the time to justify the quantum of fee.

g) For each year from 2018 to 2023, please provide (i) the number of residential panel upgrades, (ii) number of each the upgrade type (e.g. 100 to 200 amps), (iii) the aggregate distribution system costs, (iv) a breakdown of those distribution system costs (e.g. conductor replacement, etc.), and (v) the aggregate amount charged to the upgrading customer.

RESPONSE (A) – (G):

Toronto Hydro does not have a fixed fee for residential panel upgrades in its OEB-approved service charges. See Exhibit 8, Tab 2, Schedule 1 at page 2.

Per section 11.7 of the 2006 Electricity Distribution Rate Handbook as referenced in DSC 6.1.2, a distributor may choose to recover the costs for services offered to a Customer either through an approved service charge, or at actual cost. Toronto Hydro recovers the relevant costs for upgraded services based on cost recovery principles and in accordance with section 2.1.1.1 of Toronto Hydro's Conditions of Service.

Toronto Hydro does not track upgrade type (e.g., by panel size). Toronto Hydro is unable to provide the requested cost breakdowns due to its data limitations. The number of new and low voltage upgrades since 2020 has been provided in Toronto Hydro's response to Interrogatory 2B-AMPCO-49.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-19

Reference: Exhibit 2B, Section A5.2 and Section D4

QUESTION (A) – (C):

a) If all Toronto Hydro residential customers were to convert to cold climate air-source heat pumps over the next 15 years, please provide a general description of the distribution system equipment that would need to be upgraded, including various conductors and transformers at different parts of the electrical system.

b) Please provide a high-level cost for replace the equipment described in (a) both as a gross figure and as a cost per kWh for the forecast incremental load over 40 years?

c) Please described some measures that Toronto Hydro could take to reduce those costs and the work that is being done to explore those options.

RESPONSE (A) – (C):

Toronto Hydro has not conducted the detailed hypothetical analysis that would be required to respond to the detailed questions posed above. This is because customer adoption rates of air-source heat pumps and other technology to decarbonize heat remains uncertain at this time, and are not expected to have a material impact on investment plans for the 2025-2029 rate period.

To prepare the grid and its operations for an accelerated pace of electrification that is expected to unfold in the 2030s and beyond, in the 2025-2029 rate period, Toronto Hydro is proposing to invest in technology to modernize its grid and improve system observability in order to be able to better detect and forecast distribution investment requirements to accommodate emerging demand drivers such as air-source heat pumps. These capabilities are necessary to maximize the utilization of existing assets and enable the utility to address distribution system constrains posed by electrified technologies in a targeted, measured and proactive manner to maintain the stability, reliability and safety of the electrical grid. For more information, please refer to Toronto Hydro's Grid Modernization Strategy at Exhibit 2B, Section D5.

QUESTION (D) AND (E):

d) Please confirm that there are electric thermal storage units available in Ontario (e.g. those from SSi Energy, Stash, and Steffes).[1]

e) (e) If all homes were electrified, how much could the peak winter demand (MW) be reduced through electric thermal storage units (e.g. those from SSi Energy, Stash, and Steffes)?[2]

RESPONSE (D) AND (E):

Confirmed based on the link shared. However, Toronto Hydro is unable to comment on the impact of this technology on its grid as those impacts have not yet been evaluated for the reasons noted in above.

QUESTION (F):

f) If all homes were electrified, how much could the peak winter demand (MW) be reduced through bi-directional chargers for electric vehicles?

RESPONSE (F):

Toronto Hydro is unable to undertake the detailed hypothetical analysis that is required to answer this question within the discovery timelines in this proceeding. Furthermore, Toronto Hydro notes that this analysis is not relevant and does not provide probative value to deciding the issues in this proceeding since the hypothetical scenario posed is extremely unlikely to materialize in the 2025-2029 rate period.

[1] See https://www.ssie.ca/products/, https://stash.energy/en/product/, and https://www.steffes.com/ets/comfort-plus-forced-air/.

[2] See https://www.ssie.ca/products/, https://stash.energy/en/product/, and https://www.steffes.com/ets/comfort-plus-forced-air/.

QUESTION (G):

g) Please describe the incentives available for Electric Thermal Storage in Quebec, Nova Scotia, and PEI.

RESPONSE (G):

Toronto Hydro is unable to comment on incentive structures in other jurisdictions.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-20

Reference: Exhibit 2B, Section A5.2 / D4

If all Toronto Hydro residential customers were to install electric vehicle chargers, please provide a general description and approximately cost of the distribution system equipment that would need to be upgraded, including various conductors and transformers at different parts of the electrical system under the following two scenarios:

i. No panel upgrades are necessary; and

ii. All upgrades are achieved with a circuit sharing smart switch.[1]

Please assume that all cost-effective measures to manage this load are undertaken.

RESPONSE :

Toronto Hydro is unable to undertake the detailed hypothetical analysis that is required to answer this question within the discovery timelines in this proceeding. Furthermore, Toronto Hydro notes that this analysis is not relevant and does not provide probative value to deciding the issues in this proceeding since the hypothetical scenario posed is extremely unlikely to materialize in the 2025-2029 rate period.

[1] Customers can sometimes avoid installing a larger electrical panel when installing an electric vehicle charger by using a switch that allows a circuit in the existing panel to be shared as between the vehicle charger and, for instance, a clothes dryer. The switch will stop power flowing to one device (typically the charger) when the other device is on.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-21

Reference: Exhibit 2B, Section A5.2 / D4

For all of the lines and transformers that Toronto Hydro plans to replace to build new over the rate term, what percent would need to be replaced to accommodate full electrification of heating and transportation? Please assume that all cost-effective measures to manage these new loads are undertaken.

RESPONSE:

Toronto Hydro is unable to undertake the detailed hypothetical analysis that is required to answer this question within the discovery timelines in this proceeding. Furthermore, Toronto Hydro notes that this analysis is not relevant and does not provide probative value to deciding the issues in this proceeding since the hypothetical scenario posed is extremely unlikely to materialize in the 2025-2029 rate period.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-22

Reference: Exhibit 2B, Section A5.2 and Section D4

a) Knowing that Toronto is summer-peaking, approximately how many homes and what percent of homes could convert to air-source heat pumps without requiring substantial investments in incremental distribution system infrastructure? Please do not include potential individual service line replacements that may be needed and assume a relatively even distribution of conversions across the city.

RESPONSE:

For the 2025-2029 rate period Toronto Hydro expects to continue to operate as a summer peaking utility as outlined in the System Peak Demand forecast in Exhibit 2B, Section D4.3. Heat pumps impacts the winter capacity of the system, which is inherently greater than the summer capacity. Please refer to the system peak demand forecast Table 1 response to 2B Staff-158 (a). The variance between the summer versus winter peaks amounts to approximately 341MVA, which could be leveraged to support heating loads if needed.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-23

Reference: Exhibit 2B, Section A5.2 and Section D4

QUESTION (A):

a) Please provide the historic 5-year and forecast 10-year forecast of peak demand attributable to electric water heaters.

RESPONSE (A):

The impact of water heating is not a material growth driver in the Peak Demand Forecast, which is presented in Exhibit 2B, Section D4. As such, the inputs are modeled as part of the overall base load growth of the system over the near term.

QUESTION (B) – (D):

b) How much would it cost per home to implement an electric water heater demand response program for CTA-2045 enabled water heaters. Please provide a breakdown by (i) incremental equipment/installation costs, (ii) advertising, and (iii) incentives. If only (i) is available, please provide just that figure. Please provide a breakdown of the equipment/installation costs.
c) Please estimate the cost of (b) by 2030.
d) What investments would be needed today to lower that cost?

RESPONSE (B) – (D):

Toronto Hydro cannot answer these questions as the utility does not have plans to control electric water heaters through a demand response program. Please refer to Toronto Hydro’s response 1B-Staff-88 parts (a) and (b) for general information about the use of demand response as a non-wires solution.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-24

Reference: Exhibit 2B, Section A5.2 / D4

QUESTIONS (A) - (C):

a) Modern electrical water and space heating systems can be connected to the internet through a thermostat (e.g. for air source heat pumps) or built-in connectivity (e.g. smart water heaters). This allows for utility control though TCP/IP protocol without any incremental customer installation. Please describe all efforts that Toronto Hydro is taking to explore this option and all the results of this exploration thus far.

b) Please confirm whether Toronto Hydro is considering use of equipment described in (a) for demand response (e.g. holding off on heating a water tank during coincident demand periods or slightly reducing or delaying space or water heating during those periods).

c) Is Toronto Hydro currently able to conduct a demand response program using the equipment described in (a)? If yes, what is the cost to implement it per customer (please provide a breakdown).

RESPONSE (A) - (C):

Exhibit 2B Section E7.2 describes Toronto Hydro's non-wires solutions investments over the 2025-2029 period. The utility's use of NWSs is targeted and focuses on credible capital deferral opportunities, and thus, the application of these solutions is limited to instances where such deferral opportunities can be identified and measured.

The use case identified at this time is limited to bus-level load transfer deferral or avoidance, through procurement of dispatchable demand response from aggregators or customers. Toronto Hydro is agnostic to the technology (type of DER) or approach (load curtailment) utilized by aggregators or customers to deliver this demand response capacity.

When Toronto Hydro runs its LDR procurements, aggregators are invited to offer capacity. If the volume of controllable electrical water and space heating systems reaches levels where the capacity could be aggregated to provide meaningful local capacity, aggregators will be welcome to bid this capacity into the LDR process. If the cost of such capacity is competitive, Toronto Hydro will work with these aggregators to leverage the devices mentioned.

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QUESTION (D):

d) Does Toronto Hydro agree that electric space and water heating equipment will be internet connected in greater and greater numbers over time? What percent penetration of internet connection electric space and water heating does Toronto Hydro predict by 2029 and 2035?

RESPONSE (D):

Directionally yes; however, Toronto Hydro is unable to comment on or speculate with respect to specifics (i.e. what percentage of equipment and over what period of time).

QUESTION (E) AND (F):

e) What open standards exist today to allow for cross-vendor communication for utility control of electric heating equipment?

f) Please compare the equipment and software cost for controlling internet-connected electric space and water heating equipment now, versus the forecast cost in 2029 and 2035?

RESPONSE (E) AND (F):

Toronto Hydro does not monitor nor collect information about these products or devices and is therefore unable to provide a response.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-25

Reference: Exhibit 2B, Section A5.2, D4

QUESTION (A):

a) What barriers exist to installing EV chargers in existing multi-residential buildings?

RESPONSE (A):

A 2019 report produced by Pollution Probe outlines barriers to installing EV chargers in multi-unit residential buildings in Ontario.[1] Toronto Hydro notes that infrastructure-related barriers to installing EV chargers in multi-residential buildings are typically past Toronto Hydro's demarcation point.

QUESTION (B):

b) What roles does Toronto Hydro typically play with respect to the installation of EV chargers in the parking area of multi-residential buildings.

RESPONSE (B):

As the local distribution company serving the city of Toronto, Toronto Hydro's role is to deliver electricity to the service connection point of each of our customers. When a multi-residential building requests an electrical service upgrade to install EV chargers, Toronto Hydro works closely with the customer and their consultants to establish plans and designs for grid connection. Once the design is completed, Toronto Hydro will complete the necessary construction work to enable the connection. Thereafter, Toronto Hydro operates and maintains assets within Toronto Hydro's jurisdiction.

[1] https://www.pollutionprobe.org/wp-content/uploads/2023/11/ZEV-Charging-in-MURBs-and-for-Garage-Orphans-1.pdf

QUESTION (C):

c) Please provide a breakdown of the number of and percent of multi-residential buildings in each rate class, with a description of how distribution charges are levied in each class (fixed, per kWh, or per kVA?).

RESPONSE (C):

Table 1: Number and Percent of Multi-Residential Buildings per Rate Class

RATE CLASS	BUILDINGS	PERCENTAGE OF MULTI-RESIDENTIAL BUILDINGS IN EACH RATE CLASS	DISTRIBUTION CHARGE TYPE
Residential	3,510	23.72%	Fixed
Competitive sector multi-unit residential service	365	100.00%	Fixed
General service less than 50 kw service	871	1.20%	Fixed and per kWh
General service 50 to 999 kw service	2,347	23.65%	Fixed and per kVA
General service 1,000 to 4,999 kw service	56	11.59%	Fixed and per kVA
Net metering service 50 to 999 kw service	12	27.27%	Fixed and per kVA
TOTAL	**7,161**		

QUESTION (D):

d) If distribution system upgrades are required to allow a multi-residential building to install EV chargers, how are the costs to be paid by the building customer calculated? Is the forecast incremental revenue from the incremental load considered as part of those calculations? If not, why not. Please describe two cases: (i) with individual meters for each unit and (ii) a single meter for the property.

RESPONSE (D):

With regards to distribution system upgrades costs and incremental revenue, please refer to Toronto Hydro's response to Interrogatory 1B-EP-2 c) and d). Incremental revenue consideration only occurs when expansion work is required and is evaluated through the economic evaluation model as described in the above referenced interrogatory. Incremental revenue is not applicable to connection asset work. The economic evaluation model considers buildings connected via a single bulk meter or Toronto Hydro-supplied unit submetering, based on the customer's preference.

QUESTION (E):

e) How many and what percent of multi-residential buildings have a meter for each unit?

RESPONSE (E):

There are 3,875 multi-residential buildings that have a Toronto Hydro meter for each unit. This represents 54% of all multi-residential buildings in Toronto. The balance of the multi-residential buildings are bulk metered and Toronto Hydro does not have complete information on the metering arrangements of the units behind bulk meters.

QUESTION (F):

f) What additional steps could Toronto Hydro take to ease the connection of EV chargers in multi-residential buildings?

RESPONSE (F):

Toronto Hydro works closely with new and existing customers to support the installation and connection of EV chargers in multi-residential buildings. Toronto Hydro is also participating in the Ontario Energy Board Electric Vehicle Charging Connections Process Working Groups to improve the experience for our customers.

Toronto Hydro remains dedicated to breaking down barriers that hinder customers from reducing their emissions. Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is also playing a proactive role in supporting the realization of the City's Net Zero Strategy by facilitating and stimulating the growth of emerging local cleantech markets and engaging in providing solutions for customers contemplating electrification. For more information, please see the latest Climate Action Plan status report.[2]

[2] https://www.torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-26

Reference: Exhibit 2B, Section D4 (also relevant to questions on service charges)

QUESTION (A):

a) Please provide all charges/fees levied by Toronto Hydro for microgeneration connection.

RESPONSE (A):

For a microgeneration connection (≤10kW), a connection deposit of no more than $500+HST may be collected if a site assessment is required. A connection charge is also applied. The connection charge is site and scope dependent and recovers the basic connection and connection asset costs required to safely connect the customer to the Toronto Hydro grid. For further information, please refer to section 2.2.4 of Toronto Hydro's Conditions of Service, Reference #3 - Distributed Energy Resource Requirements.

QUESTION (B):

b) Please create a table to compare the charges in (a) to those charged by Alectra, Hydro Ottawa, and Elexicon Energy.

RESPONSE (B):

Toronto Hydro is unable to provide a listing of microgeneration connection charges and fees as they are typically site and scope dependent. Utilities may provide some charges publicly, however, these do not typically include the listing of all applicable charges.

QUESTION (C):

c) Please provide excerpts from the Toronto Hydro conditions of service and the DSC that allow Toronto Hydro to levy the charges/fees described in (a).

RESPONSE (C):

Toronto Hydro's charges and fees described in part (a) are supported by the Distribution System Code, the OEB's Distributed Energy Resources Connection Procedure ("DERCP"), and Toronto Hydro's Conditions of Service, Reference Document #3 - Distributed Energy Resource Requirements. Excerpts from these documents are as follows:

Distribution System Code

Section 3.1.5A:

"For micro-embedded generation facility customers, a distributor shall define a basic connection and recover the cost of the basic connection through a charge to the customer. The basic connection for each micro-embedded generation facility customer shall include, at a minimum, the supply and installation of any new or modified metering."

Section 3.1.6:

"All customer classes shall be subject to a variable connection charge to be calculated as the costs associated with the installation of connection assets above and beyond the basic connection. A distributor may recover this amount from a customer through a connection charge or equivalent payment."

The OEB's DERCP:

Section 5.3.6:

"If a site assessment is needed, the distributor may charge a $500 connection deposit for preparing the offer to connect, which shall be payable in the form of cash, cheque, electronic funds transfer, letter of credit from a bank, or surety bond."

Toronto Hydro's Conditions of Service Reference Document #3

Section 2.2.4, Page 9:

"If the connection of the micro-embedded DER facility will require a site assessment, then Toronto Hydro may collect a connection deposit for the preparation of the CA. The connection deposit shall not be more than $500 per CA".

Section 2.4, Connection Cost and Meter Charges, Page 14:
"Toronto Hydro will recover costs associated with the installation of connection assets. Connection costs and Meter charges vary with the type and size of DER facility".

QUESTION (D) – (E):

d) Please provide all studies and calculations justifying the fees charged by Toronto Hydro in (a).

e) Does Toronto Hydro agree that the fees charged for micro connections must not be greater than the actual costs for those connections on an aggregate basis? Please provide all the applicable regulatory criteria governing such fees/charges?

RESPONSE (D) – (E):
Please refer to Toronto Hydro's response to parts (a) and (c) above. The connection charge, which consists of the basic connection and connection asset, will not be greater than the actual costs for those connections.

QUESTION (F):

f) When were Toronto Hydro's current fixed fees for micro connections first set?

RESPONSE (F):
Toronto Hydro does not charge fixed fees for micro generation connections. Please refer to Toronto Hydro's response to parts (a) and (d) above.

QUESTION (G):

g) For each year from 2018 to 2023, please provide (i) the number of microgeneration connections, (ii) the aggregate distribution system costs, (iii) a breakdown of those distribution system costs, and (iv) the aggregate amount charged by the customer installing the DER.

RESPONSE (G):

The number of annual microgeneration connections are provided within Table 1 below.

Table 1: Annual number of microgeneration connections.

	2018	2019	2020	2021	2022	2023
Microgeneration Connections (Annual)	260	19	25	49	81	190

Toronto Hydro tracks generation connection costs at the program level and is unable to disaggregate the costs for microgeneration connections. For the program level costs, please see Exhibit 2B, Section E5.1.4.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-27

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Does Toronto Hydro require customers with net meters to move to tiered rates? If not, how is the billing accomplished in light of the SME not collecting and remitting generation information? If yes, what changes are necessary to allow customers to remain on TOU rates if they have a net meter.

RESPONSE (A):

No, Toronto Hydro does not require customers with net meters to move to tiered rates. Net metering customers have the ability to choose their price plan under the Regulated Price Plan ("RPP"), including Time of Use ("TOU"), Tiered, and Ultra Low Overnight ("ULO") pricing. Toronto Hydro's internal systems have the automated capability to bill customers with net meters across all RPP price plans.

QUESTION (B):

b) What is the monthly incremental cost to a customer for a net meter? Please fully justify this cost with details of the incremental costs to Toronto Hydro.

RESPONSE (B):

There is no monthly incremental cost to a customer with a net meter.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-28

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Approximately how many vehicles are owned by Toronto Hydro customers?

RESPONSE (A):

There are approximately 1,100,000 passenger vehicles in the City of Toronto.

QUESTION (B):

b) If approximately 20% of all cars in Toronto were connected to bi-directional chargers with a 10 kW export capability, what would their collective capacity be?

RESPONSE (B):

The premise of this question is based on untested assumption that each vehicle could export 10 kW to the grid, and that this capacity can be aggregated in a targeted manner to provide grid-value, when and where it is needed. For demand response to provide value, it must be dispatchable and available reliably in areas of need. Please see the evidence in Exhibit 2B, Section E7.2 and the response to 1B-ED-11 for more information about Toronto Hydro's experience with demand response and openness to working with third-parties (e.g. aggregators) to leverage this capacity if and when it is available and can provide cost-effective value to the distribution system as a whole.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-29

Reference: **Exhibit 2B, Section D4**

QUESTION (A):

a) Please comment on the potential for car batteries to be used to reduce building loads with bi-directional chargers at the time of distribution peaks and thus reduce the need for distribution infrastructure.

RESPONSE (A):

Toronto Hydro is willing to consider the use of bi-directional chargers as demand response once volumes of controllable, dispatchable installations reach levels that can be aggregated to provide grid value. The utility is open to working with third-parties (e.g. aggregators) to leverage this capacity when and if it is available and if it can provide cost-effective value to the distribution system as a whole. The current use-case of non-wires solutions is outlined in Exhibit 2B Section E7.2.

QUESTION (B):

b) Please describe all steps Toronto Hydro is taking to (a) assist its customers in installing or purchasing electric vehicle chargers and (b) install electric vehicle chargers for its own use.

RESPONSE (B):

Through its website, Toronto Hydro provides customers with the process required to install an EV charger, which includes recommendations to work with licensed electrical contractors. However, in the event that a service upgrade is required at a customer's service address, Toronto Hydro works with the customer and their contractor through the connections process.

Through non-rate regulated business activities, which do not form part of this application, Toronto Hydro is also playing a proactive role in supporting the realization of the City's Net Zero Strategy by facilitating and stimulating the growth of emerging local cleantech markets. For more information, please see the latest Climate Action Plan status report.[1]

For its own use, the utility installs electric vehicle chargers in tandem with its investments to replace internal combustion engine fleet vehicles with electric and hybrid vehicles (see Exhibit 2B, Section E8.3 for more details).

QUESTION (C):

c) With respect to Toronto Hydro's efforts to install electric vehicle chargers, what proportion will be bi-directional chargers?

RESPONSE (C):

Toronto Hydro supports, facilitates and enables the installation of electric vehicle chargers as requested by customers. The utility does not require customers to install specific charges models or types, outside of compliance with codes and standards. Toronto Hydro has explored bi-directional charging capabilities for its own fleet vehicles and has determined the technology is not ready for deployment at this time. As charging technologies develop, Toronto Hydro will investigate opportunities to implement bi-directional charging.

QUESTION (D) AND (E):

d) Nova Scotia Power is undertaking a bi-directional charger pilot project involving 20 bi-directional chargers of 4 different types. David Landrigan, vice-president of commercial for Nova Scotia Power stated as follows: "I think we can call it a game-changing resource". Would Toronto Hydro consider a similar pilot? Would this require additional regulatory approvals if it were to occur prior to 2029?

[1] https://www.torontohydro.com/documents/20143/193303016/climate-action-plan-2023-status-report.pdf

e) The following utilities are piloting bi-directional chargers:

- San Diego Gas & Electric in California (10 V2G busses, 25 kW/bus, 250 kW)
- Con Edison in New York (5 V2G busses, 10 kW/bus, 50 kW)
- EDF Energy in the UK (Customer-facing V2G program based on ABB equipment)
- National Grid in Rhode Island (Fermata V2G bidirectional pilot, 15-20 kW)
- Roanoke Electric Cooperative in N. Carolina (Fermata V2G system, 15-20 kW)
- Green Mountain Power in Vermont (Fermata V2G bidirectional pilot, 15-20 kW)
- Austin Energy in Texas (V2G/V2B pilot)
- Snohomish County Public Utility District in Washington State (V2G pilot)

Is Toronto Hydro considering similar pilots? If not, why not. Would this require additional regulatory approvals if it were to occur prior to 2029? Please explain.

RESPONSE (D) AND (E):

Toronto Hydro believes bi-directional charging has the potential to provide grid benefits in the future. Future pilots would be proposed and selected through the Innovation fund summarized in section 2.5.3 and detailed in Exhibit 1B, Tab 4, Schedule 2 and Appendix A.

QUESTION (F) AND (G):

f) Please provide 6 examples of bi-directional charges available in North America (3 AC and 3 DC) and list their charge/discharge rate (kW) and approximate price. This could include chargers from wallbox, dcbel, ABB, Fermata, Siemens, etc.

g) Please compare the price of bi-directional chargers to one-directional chargers. Is this price differential expected to decrease?

RESPONSE (F) AND (G):

Toronto Hydro does not collect commercial information with respect to products that would be purchased, installed, owned and operated by third-parties.

QUESTION (H) - (J):

h) Please comment on the following potential non-wires-alternative to traditional infrastructure and whether Toronto Hydro would consider pursuing this if cost-effective:
   - School bus companies incentivized to install V2G bi-directional chargers
   - The bus batteries can be used to serve the grid during distribution peaks
   - Busses have big batteries
   - Commercial DC chargers are very fast (e.g. 125 kW)
   - School buses usually plugged in at peak times
   - Can help pay for fleet electrification
   - 20,000+ school buses in Ontario

i) Please comment on the following potential non-wires-alternative to traditional infrastructure and whether Toronto Hydro would consider pursuing this if cost-effective:
   - Incentivize municipalities to use grid-connected bi-directional chargers when electrifying on-street parking and city lots
   - Low incremental cost because a new grid connection is likely required regardless
   - Grid connection and protection simplified b/c the connection is not shared with other loads
   - Can leverage existing connections between LDCs and municipalities
   - Can be piloted and then implemented at scale
   - Can help to support electrification of on-street parking and city lots

j) Please comment on the following potential non-wires-alternative to traditional infrastructure and whether Toronto Hydro would consider pursuing this if cost-effective:
   - Key design elements:
     - Consumers offered a $X discount on a bi-directional charger
     - Participants must opt-into an EV rate structure
     - The strong TOU price signal increases the incentive to charge off-peak and to discharge to offset household demand on-peak o Equipment is pre-set with optimal settings (e.g. discharge threshold levels, timing for charging/discharging, etc.)

    - Consumer has full control over equipment settings and when to charge/discharge o Charger is vehicle-to-building (i.e. not exporting to the grid)
- Consumer take-up driven by:
    - Desire for back-up power
    - Desire for high-speed charger (at a discount)
    - Reduced household electricity charges from load shifting and load offsetting o Upfront incentive payment (i.e. discount on bidirectional charger)
    - Marketing and technical advice
    - Ability to retain full control over vehicle charging/discharging times
- Utility considerations:
    - Reduces distribution peaks and increases reliability
    - Very low cost
    - No need for expensive or complicated communication equipment, grid connection, active control, or ongoing contractual arrangements/payments
    - Demand reductions must be modelled in aggregate, similar to CDM programs because the resource is not dispatchable

RESPONSE (H) - (J):

Please see 2B-ED-24 parts (a) to (c).

QUESTION (K):

k) Please comment on the following reasons why bi-directional chargers should be a priority and could be a lost opportunity if not pursued early:
    - It is cheaper to incentivize bi-directional charging sooner, before millions of “dumb” and “one-directional” chargers are purchased
    - About 1 million customers will start charging EVs at home between now and 2030; many commercial EV chargers will be purchased over that time

- The opportunity to upgrade to bi-directional chargers is greatest before the initial purchase (i.e. the incremental cost is lowest)
- The lead time for a vehicle-to-building/grid program is likely long (needs OEB policy changes, LDC program development, program approval by OEB, etc.)

RESPONSE (K):

Please see response to part (e).

QUESTION (L):

l) Does Toronto Hydro have an EV Charging Station Technical Installation Guide akin to this one from Hydro Quebec: https://www.hydroquebec.com/data/electrification-transport/pdf/technical-guide.pdf If not, why not? Is one under consideration?

RESPONSE (L):

Toronto Hydro does not have an EV charger technical installation guide. Due to the continuous evolution of the industry, and the variety of established EV charger vendors, specific EV charger installation guides are well documented by the respective manufacturers. Aside from specific manufacturer specifications, Toronto Hydro approaches installation of EV chargers similar to other electrical appliances and provides information on its website to assist customers in making informed decisions about purchasing an EV and installing EV chargers at the home. This information can be found here: https://www.torontohydro.com/electric-vehicles.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-30

Reference: **Exhibit 2B, Section D4**

QUESTION (A):

a) Please provide a table showing the forecast spending on distributed energy resources (DER) in each year, and total over the five-year term, with a breakdown by (i) type of DER (efficiency, demand response, storage, etc.), (ii) cost amount by source of funding (ratepayers, government, etc.), (iii) capital versus operational spending, and (iv) whether the spending is likely to be on new DERs facilities versus existing DERs (e.g. contracting for an addition service from a pre-existing generator).

RESPONSE:

Please see Table 1 below; please note that this table covers equipment or programs owned and operated by Toronto Hydro and does not address privately owned DERs.

Table 1: Forecasted Spending on DERs

DER Type	Forecasted Rate-based spend	Forecasted Provincial spend	Leveraging existing assets (yes/no)
Local Demand Response[1]	$5.7 million (OPEX)	None	Yes, contracts for services from existing customer owned DERs
Energy Storage[2]	$1.4 million (CAPEX)	$21.2 million (CAPEX)	No, these are new assets

Please note that all project expenses and operational costs to facilitate the connections of DER are recovered from customers. Toronto Hydro does not propose any net expenditure for DER Connections for the years 2025 to 2029.

[1] Non-Wires Solutions Program, Exhibit 2B, Section E7.2, pages 1-17.
[2] Non-Wires Solutions Program, Exhibit 2B, Section E7.2, pages 13-34.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-31

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Please discuss how forecast customer connections are factored into Toronto Hydro's demand forecasting for the purpose of capacity planning. Please explain in detail.

RESPONSE (A):

In the Toronto Hydro's peak demand forecast, the load from new Customer Connections is assumed to materialize over 5 years from the in-service date as follows: 35% in first year, 20% in the second year, and 15% in each of the remaining years.

QUESTION (B):

b) For the purposes of capacity planning, how does Toronto Hydro account for incremental connections of single-family dwellings with 200 amp service? For instance, how many kW are assumed (either explicitly or implicitly) to be added to co-incident system peak for such a dwelling? For instance, would that be the maximum kWs the dwelling could consume, the average, or some other number?

RESPONSE (B):

Toronto Hydro Peak demand forecast does not forecast customer connections below 2MVA. These loads are captured in the base load growth trends shown in Figure 4 of Exhibit 2B, Section D4.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-32

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Please describe what DERMS are.

RESPONSE (A):

As noted in Exhibit 2B Section D5.3.6, a Distributed Energy Resource Management System ("DERMS") is a powerful software tool which can be used to integrate, aggregate monitor, and where appropriate, control Distributed Energy Resources ("DERs") in real-time.

QUESTION (B):

b) Please describe the difference in cost and characteristics between utility-grade DERMS equipment and standard internet-connected power control systems (PCS).

RESPONSE (B):

Utility-grade DERMS equipment and standard internet-connected PCS play essential roles in power management, but they are tailored for different applications. DERMS equipment is designed to handle distributed energy resources at a utility-scale. It offers advanced functionalities like real-time monitoring, control, and optimization of various energy resources. This includes managing solar panels, wind turbines, battery storage systems, and more while ensuring grid stability and efficiency. However, DERMS equipment tends to be more expensive due to its complexity and scalability.

On the other hand, standard internet-connected PCS is better suited for smaller-scale applications with more straightforward integration needs. These systems are typically used for localized power distribution and control within buildings, microgrids, or small-scale energy systems. PCS is more cost-effective and easier to implement. They offer basic control features for managing power flows and system operations within a limited scope.

QUESTION (C):

c) Is Toronto Hydro considering software that would allow it to control smaller DERs through an internet-connected PCS at the customer site? What additional investments are needed by Toronto Hydro to make this possible? What are the barriers and how is Toronto Hydro exploring solving them?

RESPONSE (C):

Toronto Hydro does not at this time directly control devices owned and installed behind-the-meter by its customers. Toronto Hydro is open to working with aggregators or other commercial parties with the ability to control and aggregate such devices, if and when it can be established that such devices can provide meaningful, cost-effective grid services.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-33

Reference: Exhibit 2B, Section D4

QUESTION (A):

a) Please describe all the steps that Toronto Hydro is considering implementing to increase the capacity of its system to connect DERs but which it has not yet decided to implement. For each, please indicate when a decision is likely to be made and whether incremental funding from what is sought in this application would be needed.

RESPONSE (A):

Toronto Hydro is working with our transmitter, HONI, on methods to alleviate short circuit capacity constraints. Currently, Toronto Hydro is considering bus-tie reactors to increase the capacity of the system to connect DERs. Please reference Exhibit 2B Section E5.5 for more details on the Generation Protection, Monitoring, and Control (GPMC) program that describes the bus-tie reactor plan. Toronto Hydro plans to explore several initiatives under the Grid Innovation program as part of its Grid Modernization Strategy. The utility recognizes that achieving system optimization through improved dynamic system control is integral to both enhancing the capacity to connect as well as leverage DER's for Grid benefit. However, maturity in the Grid Observability domain is essential in achieving favorable outcomes in a dynamic grid of the future with high levels of DER penetration. It is for this reason, Toronto Hydro has opted to first invest in technology to improve it grid observability as outlined in Exhibit 2B, Section D5. Subsequent to this, Toronto Hydro intends to explore technologies that enable the use dynamic as opposed to static ratings of grid assets to better leverage and optimize load and generation connections to balance supply and demand across increasing larger portions of the grid.

QUESTION (B):

b) Please confirm that Toronto Hydro is allowed to treat applications with over 10 kW nameplate capacity as a microgeneration connection under the DSC. Would Toronto Hydro consider raising its internal threshold for microgeneration connections in order to facilitate the connection of use cases somewhat larger than 10 kW (like solar battery combinations)?

RESPONSE (B):

Confirmed.

Toronto Hydro has not contemplated a DSC exemption to increase the threshold for microgeneration connections. The utility’s view is that such a change to the DSC would be best addressed on a generic basis in order to ensure fairness and consistency for customers and third-party DER providers across the province

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-34

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) Does Toronto Hydro agree with the following sources suggesting that Ontario's RNG potential is roughly 2.5% of the current fossil-based gas consumption:

Feasible RNG Potential – Percent of Current Fossil Gas Consumption	
Canadian Biogas Association Study	2.5%[10] (Ontario)
IESO, Pathways to Decarbonization Study (Interpreting Torchlight Bioresource Report)	2.5%[11] (Ontario)
Canada Energy Regulator, Canada's Energy Future 2023	3%[12] (Canada-wide)

RESPONSE (A):

Toronto Hydro does not forecast or analyze RNG to any capacity and is therefore unable to comment on the RNG potential noted in the sources in the table above.

QUESTION (B):

b) Does Toronto Hydro agree with out interpretation of those reports?

RESPONSE (B):

Toronto Hydro agrees that the figures represented in the table above reflect the figures in the reports, but cannot comment on Environmental Defense's interpretation of those reports.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-35

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) Under the "system transformation" scenario, what percent of Toronto's current gas use is replaced with RNG?

RESPONSE FROM ERM (A):

Future Energy Scenarios models Toronto Hydro's electrical distribution system and does not model gas (including RNG). This was out of scope.

QUESTION (B):

b) Did Element Energy conduct an assessment of whether that is actually feasible?

RESPONSE FROM ERM (B):

No, as noted in a) the modelling of gas was out of scope.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-36

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) Please comment on the analysis in the following submissions starting at page 6 suggesting that decarbonization of building heating is likely to take place mostly through electrification, not low-carbon gases: https://www.rds.oeb.ca/CMWebDrawer/Record/815078/File/document

RESPONSE FROM TORONTO HYDRO (A):

Toronto Hydro cannot comment on the method in which decarbonization of building heating is likely to take place. The Future Energy Scenarios ultimately does not place probabilities on any of the scenarios or technologies becoming reality. The scenarios themselves vary the levels of electrified heating and do not make conclusions on the methods in which non-electrified heating takes place.

QUESTION (B):

b) Please ask Element Energy to comment on the analysis in the following submissions starting at page 6 suggesting that decarbonization of building heating is likely to take place mostly through electrification, not low-carbon gases, including each specific reason provided therein: https://www.rds.oeb.ca/CMWebDrawer/Record/815078/File/document

RESPONSE FROM ERM (B):

This is not in-scope for the Future Energy Scenarios report, which models Toronto Hydro's electrical distribution system. The modelling is not intended to comment on the probability of any of these scenarios or technological developments, and therefore cannot comment on the likelihood of one technology over another.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-37

Reference: Exhibit 2B, Section D4, Appendix B, Figure 5

QUESTION (A):

a) The report states: "The resulting peak network load for Toronto Hydro is shown in Figure 5, which illustrates how the two most ambitious decarbonization scenarios (Consumer Transformation and Net Zero 2040) have the lowest peak demands by 2050 when the full benefits of appliance and building fabric efficiency measures, demand side flexibility and renewable generation." Pease provide the full underling calculations and a table showing the quantify of peak demand reduction achieved by each measure.

RESPONSE FROM ERM (A):

The full set of underlying calculations would constitute the entire modelling methodology within the FES Model. The uptake methodologies for the drivers are provided in section 4 of the report. For details on how the load is modelled, please review section 5.1 of the report.

The amount of demand reduction achieved by each measure was not modelled as that would entail a completely separate modelling exercise that takes into account each permutation of the drivers for each scenario. Please refer to Figure 75 of the report which shows the scale of the impact of flexibility, efficiency and behind-the-meter renewable generation on the summer and winter peaks in the Consumer Transformation and Net Zero 2040 scenario worlds.

QUESTION (B):

b) For each scenario shown in figure 5 please provide, for each 5-year interval (i) the percent of buildings with gas, electric, or hybrid heat and (ii) the average demand per building for heating per heating type.

RESPONSE FROM ERM (B):

Please note that the average demand per building for heating per heating type is calculated only as part of the larger interim-calculations and is not an explicit output produced from the FES Model and so is not in-scope as something that can be provided.

Please see the percent of buildings split out by heating type across the scenario worlds below:

		Proportion of domestic buildings						
Scenario	**Heating type**	**2021**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Steady Progression	Electric	5.6%	7.5%	10.7%	14.0%	15.7%	16.2%	16.0%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.4%
	Air Source Heat Pump	0.6%	1.6%	3.1%	4.9%	10.4%	18.8%	27.1%
	Hybrid Heat Pump	0.1%	0.2%	0.9%	1.8%	2.7%	3.1%	3.2%
	Gas Furnace	93.2%	90.2%	84.7%	78.8%	70.8%	61.5%	53.3%
	Other	0.6%	0.6%	0.6%	0.5%	0.3%	0.2%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
System Transformation	Electric	5.6%	7.4%	9.3%	12.5%	16.8%	19.3%	19.6%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.1%	0.2%	0.5%	1.0%
	Air Source Heat Pump	0.6%	1.3%	3.7%	10.6%	29.4%	47.2%	60.6%
	Hybrid Heat Pump	0.1%	1.4%	3.8%	6.8%	12.0%	16.0%	18.8%
	Gas Furnace	93.2%	89.4%	82.6%	69.7%	41.4%	17.0%	0.0%
	Other	0.6%	0.6%	0.5%	0.3%	0.2%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Consumer Transformation	Electric	5.6%	7.4%	9.3%	12.3%	16.2%	19.0%	20.6%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.2%	0.6%	1.2%	1.9%
	Air Source Heat Pump	0.6%	2.2%	7.8%	16.8%	41.3%	61.8%	77.5%
	Hybrid Heat Pump	0.1%	0.3%	0.8%	4.1%	3.7%	3.0%	0.0%
	Gas Furnace	93.2%	89.6%	81.7%	66.4%	38.2%	14.9%	0.0%
	Other	0.6%	0.6%	0.4%	0.2%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Net Zero 2040	Electric	5.6%	7.4%	13.6%	17.6%	21.4%	20.5%	21.3%
	Ground Source Heat Pump	0.0%	0.0%	0.1%	0.4%	0.9%	1.4%	2.1%
	Air Source Heat Pump	0.6%	2.3%	28.5%	55.4%	77.7%	78.1%	76.6%
	Hybrid Heat Pump	0.1%	0.3%	0.3%	0.2%	0.0%	0.0%	0.0%
	Gas Furnace	93.2%	89.5%	57.2%	26.3%	0.0%	0.0%	0.0%
	Other	0.6%	0.6%	0.4%	0.2%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

						Proportion of I&C buildings		
Scenario	**Heating type**	**2021**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Steady Progression	Electric	4.9%	4.7%	4.7%	4.5%	4.4%	4.3%	4.1%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Air Source Heat Pump	1.3%	1.2%	1.0%	1.1%	6.8%	14.0%	21.8%
	Hybrid Heat Pump	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%
	Gas Furnace	93.3%	93.7%	93.9%	94.0%	88.6%	81.6%	74.0%
	Biomass Boiler	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
	Other	0.4%	0.3%	0.3%	0.2%	0.1%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
System Transformation	Electric	4.9%	4.7%	4.6%	4.4%	4.1%	3.9%	3.8%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Air Source Heat Pump	1.3%	1.2%	1.0%	5.9%	25.4%	45.8%	61.7%
	Hybrid Heat Pump	0.0%	0.0%	0.1%	0.1%	13.2%	24.7%	34.5%
	Gas Furnace	93.3%	93.7%	93.9%	89.4%	57.2%	25.5%	0.0%
	Biomass Boiler	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
	Other	0.4%	0.3%	0.3%	0.1%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Consumer Transformation	Electric	4.9%	4.7%	4.6%	4.4%	4.1%	3.9%	3.7%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Air Source Heat Pump	1.3%	1.2%	1.2%	6.1%	38.7%	70.6%	96.2%
	Hybrid Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gas Furnace	93.3%	93.7%	93.9%	89.4%	57.1%	25.4%	0.0%
	Biomass Boiler	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
	Other	0.4%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Net Zero 2040	Electric	4.9%	4.7%	4.6%	4.3%	4.0%	3.7%	3.5%
	Ground Source Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Air Source Heat Pump	1.3%	1.2%	33.3%	65.0%	95.9%	96.2%	96.4%
	Hybrid Heat Pump	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Gas Furnace	93.3%	93.7%	61.8%	30.5%	0.0%	0.0%	0.0%
	Biomass Boiler	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%
	Other	0.4%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%
	Sum	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

QUESTION (C):

c) Please provide a table showing the differences as between the consumer transformation and consumer transformation low scenarios in terms of both inputs and outcomes.

RESPONSE FROM ERM (C):

For inputs, please review table 1 of the FES report which outlines the technology uptake scenarios that make up each of the four scenario worlds and the "Low" sensitivity cases applied to Consumer Transformation and Net Zero 2040. Additionally, please review the narrative for Consumer Transformation (including "Consumer Transformation – Low Efficiency") provided in section 2.1. Outcomes can be found outlined in the Executive Summary and section 4 and 5.

QUESTION (D):

d) Please provide a table showing the differences as between the net zero 2040 and new zero 2040 low scenarios in terms of both inputs and outcomes.

RESPONSE FROM ERM (D):

For inputs, please review table 1 of the FES report which outlines the technology uptake scenarios that make up each of the four scenario worlds and the "Low" sensitivity cases applied to Consumer Transformation and Net Zero 2040. Additionally, please review the narrative for Net Zero 2040 (including "Net Zero 2040 – Low Efficiency") provided in section 2.1. Outcomes can be found outlined in the Executive Summary and section 4 and 5.

QUESTION (E):

e) The net zero 2040 scenario winter peak demand reaches a peak in 2040 or so before declining. What causes the winter peak to decline at that stage.

RESPONSE FROM ERM (E):

As outlined in the text underneath figure 5 of the report, "The 2030s see the time of network peak shifting to winter, with loads increasingly being driven by heat pump uptake and electric vehicles. As these technologies become more established, they are adopted in large numbers, especially in the more ambitious net zero compliant scenarios. These trends continue into the 2040s; however, increasing electricity demands are moderated by the uptake of renewable generation and storage, which also see an accelerated growth in the later years. The impact of efficiency measures is assumed to increase at an approximately constant rate over the full modelled timeline, with the more ambitious scenarios seeing a more rapid acceleration in the early years, followed by diminishing improvements in later years." A full low carbon energy technology uptake by around 2040 is seen in the Net Zero 2040 scenario, while having energy efficiency measures continue to be deployed. This means that a peak is seen (as the electric demand technologies are taken up to a maximum) around 2040 and then declines thereafter (accounting for the continued deployment of energy efficiency measures, but limited increases in electric demand technologies).

QUESTION (F):

f) Please provide a table breaking down the incremental peak demand for each scenario by (i) customer growth, (ii) electrification of transportation, and (iii) electrification of buildings.

RESPONSE FROM TORONTO HYDRO (F):

Incremental peak between 2021 and 2050 is shown for each scenario by (i) baseload (customer growth), (ii) transportation, and (iii) heating (electrification of buildings) in Table 1 below.

Table 1: Incremental Peak Between 2021 and 2050 for Each Scenario

		Unit	SP	ST	CT	CT Low	NZ	NZ Low
2021 Peak	**Baseload**	*(MW)*	3,871	3,871	3,871	3,871	3,871	3,871
	Transportation	*(MW)*	18	18	18	18	18	18
	Heating	*(MW)*	23	23	23	23	23	23
2050 Peak	**Baseload**	*(MW)*	4,744	4,141	3,616	4,726	3,577	4,726
	Transportation	*(MW)*	1,295	958	1,184	1,036	1,652	1,040
	Heating	*(MW)*	1,324	2,477	1,718	3,339	692	3,378
Incremental	**Baseload**	*(MW)*	873	270	(255)	855	(294)	855
	Transportation	*(MW)*	1,277	940	1,166	1,018	1,634	1,022
	Heating	*(MW)*	1,301	2,454	1,695	3,315	669	3,355

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-38

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) At a very high level, what is the approximately difference in distribution system costs (gross $, $/kWh, and $kW) as between the consumer transformation scenario and the consumer transformation low scenario?

RESPONSE FROM ERM (A):

The FES Model does not output total distribution system costs.

RESPONSE FROM TORONTO HYDRO (A):

Toronto Hydro cannot provide distribution system cost estimates from the basis of a FES Model output without further engagement in extensive system planning.

QUESTION (B):

b) Are the investments outlined in the Toronto Hydro's application sufficient for the electricity system to be ready for the consumer transformation scenario? If not, what investments need to be added?

RESPONSE FROM TORONTO HYDRO (B):

Please refer to Exhibit 2B, Section D4.3, pages 11-13 for details on how Toronto Hydro considered the Consumer Transformation scenario in relation to its System Peak Demand Forecast. Please also refer to Toronto Hydro's response to interrogatory 2B-Staff-153.

QUESTION (C):

c) Please reproduce figure 5 showing summer and winter demand (GWh) instead of peak demand (GW).

RESPONSE FROM TORONTO HYDRO (C):

The information cannot be provided in the format requested as the Future Energy Scenario model does not break consumption down into winter and summer values.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-39

References: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

a) Please rank the scenarios in figure 5 for overall societal cost-effectiveness. Please explain and quantify as best as possible.

RESPONSE FROM ERM (A):

The FES Model does not calculate or output total societal cost. This comparison requires an agreed-upon method of valuing societal cost and benefit.

QUESTION (B):

b) Which of the scenarios in figure 5 are most likely to come to pass. Please explain.

RESPONSE FROM ERM (B):

As outlined in section 2, this project's scenario-based modeling is used to represent the range of uncertainties in the low carbon energy transition. The modeling does not attach probability to any of the scenarios.

QUESTION (C):

c) Please provide the full calculations and spreadsheets underlying the Element Energy report.

RESPONSE FROM TORONTO HYDRO (C):

The full set of underlying calculations would constitute the entire modelling methodology within the FES Model. The uptake methodologies for the drivers are provided in section 4 of the report. For details on how the load is modelled, please review section 5.1.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-40

Reference: Exhibit 2B, Section D4, Appendix B

QUESTION (A):

(a) After reviewing the following, would Element Energy agree that heat pumps are usually the cheapest way to heat buildings:

- Energy Futures Group Report - see p. 23.
- Dr. McDiarmid Report - see p. 11.
- Corporate Knights Report
- Ministry of Energy Paper - see pp. 10 & 11. Note, page 10 indicates that the lower cost numbers in the figure on page 11 are for heat pumps.
- November 2020 Ontario Auditor General Report - see p. 18. This refers to heat pumps as an alternative to gas "that is both lower cost and consistent with the government's Environment Plan."
- Enbridge evidence in recent gas expansion cases - see pdf p. 17. This evidence shows that heat pumps are cheaper than gas heating. But it underestimates those savings. If assumptions are corrected (such as accounting for the savings from avoiding fixed gas charges by getting off gas completely), the savings from heat pumps grow and it becomes clear that heat pumps with on electric backup are cheaper than heat pumps with a gas backup. For those additional details, see Hearing Transcript Vol. 5, p. 172, ln. 17 to p. 174, ln. 7.
- OEB DSM Decision - see page 28 and 30. The decision notes that heat pumps are cost-effective. It also allocates efficiency funding to heat pumps. That funding is restricted to cost-effective measures.

• OEB Decision re Enbridge Rates - see page 38. It says "the operating cost of a new all-electric house using a cold climate air source heat pump for space heating, is lower than a new gas and electricity serviced house."

RESPONSE FROM ERM (A):

The cheapest way to heat a building will depend on several factors including technology prices, fuel and electricity costs, thermal efficiency for the specific building, and other possible factors (e.g. human intervention / error). Please see section 4.2.1. for the modeling approach taken to determine the low carbon heating uptake used in this work.

QUESTION (B):

(b) What is the average cost per home and payback period for the retrofits described on page 36?

RESPONSE FROM ERM (B):

This is not produced as an explicit output from the FES model.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-41

References: Exhibit 2B, Section D4, Appendix B, Page 64

QUESTION (A):

a) What additional investments or steps does Element Energy recommend that Toronto Hydro take within the rate period with respect to V2G and V2B technology?

RESPONSE FROM ERM (A):

This is out of scope. Element Energy (now ERM) does not provide investment advice. As outlined in Section 2, this project's scenario-based modeling is used to represent the range of uncertainties in the low carbon energy transition.

QUESTION (B):

b) What costs are associated with those steps?

RESPONSE FROM ERM (B):

Please see the response provided to part a) above.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-42

Reference: Exhibit 2B, Section D4, Appendix B

a) For each scenario, please provide the assumptions for the use of gas versus electricity in new construction between now and 2030. Please compare that to Toronto Hydro's actual forecasts based on current realities.

RESPONSE FROM ERM:

Please review Table 9 of the report which outlines the ban dates for choosing Business as Usual heating fuels in building types (new builds or existing) across all scenarios. Please see how these scenarios map to each scenario world in Table 8.

RESPONSE FROM TORONTO HYDRO:

Toronto Hydro does not produce forecasts for the use of gas versus electricity in homes to which these could be compared to.

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-43

Reference: Exhibit 2

QUESTION (A):

a) How does Toronto Hydro's rate of distribution system energy losses compare to other leading LDCs inside and outside of Ontario? Please provide a comparison with equivalent peer utilities in Ontario.

RESPONSE (A):

Toronto Hydro's analysis in Figure 1 below, based on 8-year average historical line losses for the top 10 LDCs using RRR data, reveals that Toronto Hydro holds the third position for the lowest line losses, standing at approximately 2.91 percent. This places Toronto Hydro in a favorable position within Ontario, as the majority of LDCs experience line losses above 3.0 percent.

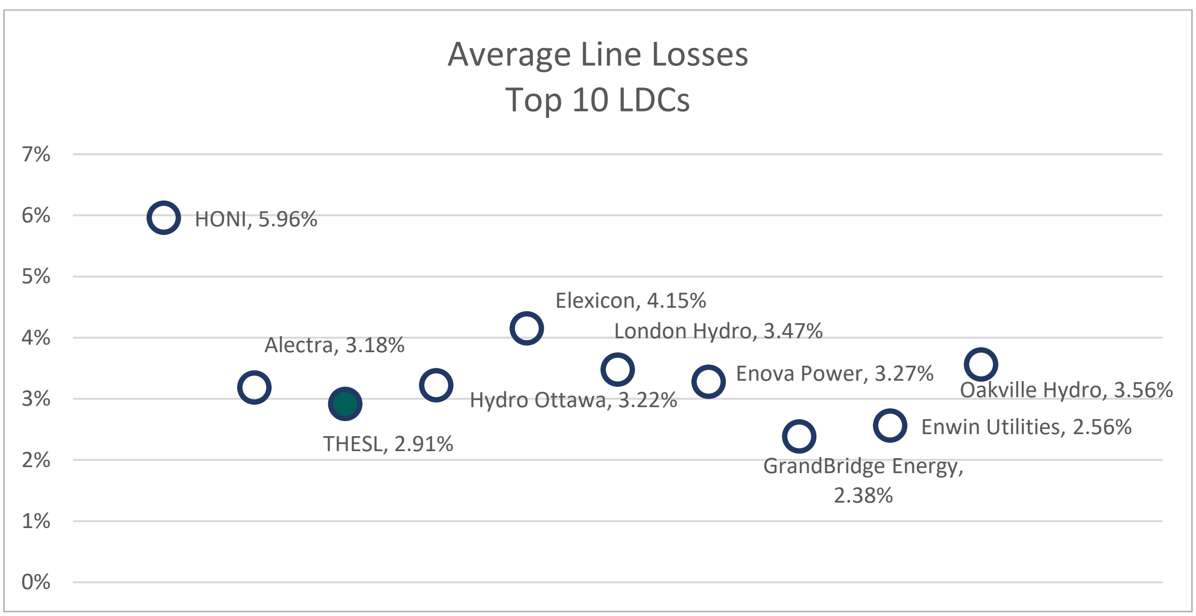

Figure 1: Average Line Losses for Top 10 LDCs

QUESTION (B):

b) How does Toronto Hydro compare to other LDCs in terms of its efforts to reduce distribution system energy losses? In what ways is or isn't Toronto Hydro a leader in this regard?

RESPONSE (B):

As shown in part (a), Toronto Hydro is among the leaders in Ontario for actual system energy losses. Toronto Hydro has not participated in any benchmarking studies that address this specific question, nor does the utility have sufficient direct knowledge of other comparable utilities' efforts to reduce energy losses to provide a meaningful response.

QUESTION (C):

c) What are the most important steps that Toronto Hydro has taken in the past 20 years to reduce distribution system energy losses?

RESPONSE (C):

Toronto Hydro's planning and operational processes are designed to optimize efficiency and reduce losses where feasible. Various measures are embedded into Toronto Hydro's processes to cost-effectively reduce distribution losses. These measures include but are not limited to:

- Continuous improvement of equipment procurement and standards development based on industry standards and best practices;
- Voltage conversions and system renewal where appropriate; and
- Regular maintenance and upgrades of the distribution infrastructure.

Toronto Hydro evaluates the appropriateness of implementing these measures holistically considering its fundamental pillars of safety and reliability. Factors such as cost-effectiveness, regulatory requirements, and customer needs are taken into account. Toronto Hydro is committed to optimizing its distribution system's efficiency, and its line losses have been relatively low due to the proactive measures implemented over the years and the inherent nature of its urban distribution system. Toronto Hydro operates in compliance with all applicable regulatory requirements and standards, including loss reduction provisions.

QUESTION (D):

d) Where does Toronto Hydro believe the greatest opportunities are to make additional reductions in distribution losses in the next 20 years?

RESPONSE (D):

Toronto Hydro believes that continued investment in modernizing, expanding, and renewing infrastructure will all be crucial to maintaining and improving Toronto Hydro's line loss levels. By deploying advanced technologies and implementing smart grid solutions, utilities like Toronto Hydro will create opportunities to enhance the efficiency and reliability of the distribution system, leading to potential reductions in losses.

QUESTION (E)

e) Does Toronto Hydro quantify and consider the potential value of distribution loss reductions for different options when procuring equipment (e.g. transformers) and deciding on the details of demand-driven capital projects (e.g. the type and sizing of conductors)? If yes, please explain how and provide documentation detailing the methodology used.

RESPONSE (E):

Toronto Hydro procures distribution equipment (e.g. transformers, conductors) based on market availability and industry standards. When designing distribution systems for all projects, factors such as nominal line voltage, equipment sizing, and loading are carefully considered, as they can impact losses. Distribution losses are factored into the development of preferred plans and alternatives, as detailed in various programs such as Exhibit 2B, Section E6.1 - Area Conversions, E6.2 - Underground System Renewal - Horseshoe, E6.5 - Overhead System Renewal, and E6.6

Stations Renewal. Please see response to part (g) for a list of operational measures Toronto Hydro takes to manage losses.

While Toronto Hydro does not possess a standalone document outlining the methodologies employed to minimize line losses, these strategies are integrated within the utility's numerous standards, processes, and practices.

QUESTION (F) :

f) If Toronto Hydro is considering the value to its customers of distribution loss reductions for planning purposes, how does it calculate the dollar value ($) of said loss reductions (kWh)? Is the value calculated based only on the HOEP or on all-in cost of electricity (e.g. including the GA)?

RESPONSE (F):

Toronto Hydro does not currently assign a dollar value to line loss reductions for the purposes of investment planning decisions.

QUESTION (G):

g) Please list and describe the operational measures that Toronto Hydro takes to cost-effectively reduce distribution losses.

RESPONSE (G):

A list of key operational measures Toronto Hydro takes to cost-effectively reduce distribution losses:

- Load Balancing – Phase balancing is assessed during the connection of new customers. Unbalanced phases are also identified by the grid operations team and are often corrected through switching orders or as a part of system renewal programs.

- Raising Nominal Voltage – Toronto Hydro seeks to connect new customers and actively converts existing customers using higher distribution system operating voltages, a practice reflected in renewal and conversion work.
- Adding an additional (parallel) feeder – Evaluated and recommended as part of customer connection assessment or system access projects (load demand).
- Voltage control – Toronto Hydro designs the distribution system per CSA C235-83 Preferred Voltage Level for AC Systems, 0 to 50,000V.
- Changing out a distribution transformer – Evaluated and recommended as part of customer connection assessment or replaced reactively as part of operational checks.
- Primary Conductor Size Increase – Evaluated and recommended as part of customer connection assessment or system renewal projects.
- Minimizing the use of multiple conductors – Large conductors with lower impedances are selected to minimize losses.
- Upsizing conductors or reconfiguring secondary network - Evaluated and recommended as part of customer connection assessment or system renewal projects (SDP).
- Optimizing voltages - Compliance with standards in optimizing voltages across the distribution network.
- Avoiding transformational steps in between and consolidating transformers where necessary, or adhering to Transformer Efficiency standards (CSA C802.1-13) for minimum efficiency values for liquid-filled distribution transformers.

QUESTION (H):

h) Please provide a table listing the technically available measures to cost-effectively reduce distribution losses and describe for each the respective responsibilities of Toronto Hydro, the IESO, and Toronto Hydro.

RESPONSE (H):

Toronto Hydro’s measures are discussed in parts (c), (e) and (g).

The IESO, Hydro One, and Toronto Hydro each play a role in the overall reduction of system energy losses, with the IESO focusing on system-wide planning and market mechanisms, Hydro One responsible for the transmission infrastructure, and Toronto Hydro managing the local distribution network.

QUESTION (I):

i) Please complete the following table

Value of Toronto's Distribution System Energy Losses - Historic						
	2020	2021	2022	2023	2024	Total
Electricity Purchases (MWh)						
Electricity Sales (MWh)						
Losses (MWh)						
Losses %						
All-In Cost of Electricity in ($/Mwh) – Annual Average						
Cost of Losses ($)						

RESPONSE (I):

Please see Table 1 below.

Table 1: Toronto Hydro's Historical Distribution System Losses

Value of Toronto's Distribution System Energy Losses - Historic						
	2020	**2021**	**2022**	**2023**	**2024**	**Average**
Electricity Purchases (MWH)	23,686,189	23,484,889	24,054,524	23,729,818	N/A	23,738,855
Electricity Sales (MWh)	22,958,448	22,775,842	23,359,362	23,094,573	N/A	23,047,056
Losses (MWh)	727,741	709,048	695,162	635,245	N/A	691,799
Losses %	3.17%	3.11%	2.98%	2.75%	N/A	3.00%
All-In Cost of Electricity in ($/Mwh) – Annual Average	$13.77	$28.30	$47.74	$29.81	N/A	$29.71
Cost of Losses ($)	$10,021,995	$20,068,452	$33,190,260	$18,937,777	N/A	$20,554,621

QUESTION (J):

j) Does Toronto Hydro anticipate the value of losses on its system to be materially higher or lower over the next five years?

RESPONSE (J):

Toronto Hydro does not forecast losses on its system. There are various factors that could influence the value of losses to be either higher or lower over the next five years. Toronto Hydro cannot provide specific projections at this time. Toronto Hydro remains committed to ensuring that losses are kept within benchmarks provided by the OEB.

QUESTION (K):

k) Please complete the following table:

GHG's from Toronto's Forecast Distribution System Energy Losses						
	2021	2022	2023	2024	2025	Total
Forecast Losses (MWh) [1]						
Carbon Intensity of Electricity (CO_2e/MWh)[2]						
GHGs (CO_2e)						

RESPONSE (K):

While the IESO's data provides valuable insights, Toronto Hydro cannot solely base these figures on the IESO's January 2020 Annual Planning Outlook. These figures cannot be directly applied to Toronto Hydro's jurisdiction as Toronto Hydro does not directly control the mix of generation that is transmitted to its service territory. Therefore, the figures provided in Table 2 are for illustrative purposes only. Note that Toronto Hydro does not forecast line losses.

[1] If no better numbers are available, the losses from 2019 or the average over 2015 to 2019 could be used for the purpose of this row of this response.

[2] Please base this figure on the IESO's January 2020 Annual Planning Outlook - http://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/Annual-Planning-Outlook-Jan2020.pdf?la=en;

Please note that the carbon intensity is calculated using Scenario 1 of IESO's 2020 Annual Planning Outlook. Figure 2 is used for Ontario's demand (2021 demand is taken from the 2021 year in review[3] as it was not provided in the data for the 2020 APO). Figure 37 is used for GHG emissions. The units are tonnes of CO_2e/MWh.

Table 2: GHG Emissions from Toronto Hydro's Distribution System Losses (Illustrative Only)

GHG's from Toronto's Forecast Distribution System Energy Losses						
	2021	**2022**	**2023**	**2024**	**2025**	**Total**
Forecast Losses (MWh)[4]	709,048	695,162	684,846	N/A	N/A	2,089,056
Carbon Intensity of Electricity (CO2e/MWh)[5]	0.027	0.031	0.042	0.048	0.054	0.033
GHGs (CO2e)	19,078	21,622	28,886	N/A	N/A	69,586

QUESTION (L):

l) Is Toronto Hydro willing to review its operational measures, investment planning, and other practices to consider whether it could be taking additional measures to cost-effectively reduce the energy losses occurring in its distribution system?

RESPONSE (L):

Toronto Hydro is not likely to prioritize changes in its operational measures, investment planning, or other practices specifically aimed at reducing energy losses in its distribution system. This is because the line losses are already within established benchmarks and consistently below the guidelines set by the OEB. While Toronto Hydro remains open to exploring enhancements in its practices, it appears that the current measures are effectively managing and keeping line losses at acceptable levels.

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[3] https://www.ieso.ca/en/Sector-Participants/IESO-News/2022/02/2021-Year-in-Review-Data-Now-Available

[4] If no better numbers are available, the losses from 2019 or the average over 2015 to 2019 could be used for the purpose of this row of this response.

[5] Please base this figure on the IESO's January 2020 Annual Planning Outlook - http://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/Annual-Planning-Outlook-Jan2020.pdf?la=en;

RESPONSES TO ENVIRONMENTAL DEFENCE INTERROGATORIES

INTERROGATORY 2B-ED-44

Reference: Exhibit 2B

QUESTION (A):

a) In EB-2019-0261, Hydro Ottawa agreed to, and the Board approved, the following: "Between 2021 and 2025, Hydro Ottawa shall endeavour to maintain its five-year average total system losses below the target of 3.02% set by the OEB in EB-2005-0381 through cost-effective measures." Is Toronto Hydro willing to agree to the same terms? If not, what commitments can Toronto Hydro make to the Board in this regard? In particular, please indicate what target Toronto Hydro is willing to meet.

RESPONSE (A):

As stated in the response to interrogatory 2B-ED-43, Toronto Hydro's ongoing efforts consistently ensure that the utility's distribution line losses remain below the thresholds set by the OEB. Toronto Hydro holds the third position for the lowest line losses, standing at approximately 2.91%. At present, Toronto Hydro finds no necessity for further commitments beyond the utility's existing obligations in this regard.

QUESTION (B):

b) In EB-2019-0261, Hydro Ottawa agreed to, and the Board approved, the following: "In addition, over the course of 2020-2021, Hydro Ottawa shall prepare a plan to reduce distribution losses as much as possible through cost-effective measures. The utility shall file the plan with the OEB when complete. In 2022-2025, Hydro Ottawa shall implement as many of the cost-effective measures set out in its plan as possible (e.g. any changes to planning and procurement processes to better mitigate losses, investments that can be made within current budgets, operational measures, etc.). All other cost-effective measures will be incorporated into the utility's next rebasing application and DSP." Is

Toronto Hydro willing to agree to the same terms? If not, what commitments can Toronto Hydro make to the Board in this regard?

RESPONSE (B):

Please refer to the response to interrogatory 2B-ED-43 parts (e) and (g) for detailed information on Toronto Hydro's planning and operational efforts regarding distribution line loss reduction. At present, Toronto Hydro finds no necessity for further commitments beyond utility's existing obligations in this regard.

QUESTION (C):

c) In EB-2019-0261, Hydro Ottawa agreed to, and the Board approved, the following: "Finally, as described in Hydro Ottawa's response to undertaking JT 3.10, a pilot of a Grid Edge Volt/VAr Control ("VVC") solution will be complete by the end of 2020. If this pilot is successful, Hydro Ottawa shall increase the deployment of these (or equivalent) units by conducting an analysis in 2021 to identify potential suitable locations and by deploying these units in a subset of locations which are deemed to be suitable and cost-effective, with an estimated investment of up to $1.0M over the five-year test period. The cost of these investments will be accommodated within the overall approved capital budget." Is Toronto Hydro willing to agree to implement similar technology through an equivalent commitment? If not, what commitments can Toronto Hydro make to the Board in this regard?

RESPONSE (C):

Distribution line losses are not a major concern for Toronto Hydro warranting a commitment to implementing specific technologies or undertaking investments in this area. Toronto Hydro's current plans are designed to effectively manage and mitigate line losses while strategically investing in areas of immediate priority. Toronto Hydro remains firm in its commitment to maintaining distribution line losses within regulatory benchmarks.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-24

Reference: Exhibit 2B, Section A3.4, Page 13

Preamble:

"For instance, in May 2022, an extreme wind event known as the Derecho Storm struck Southern Ontario and Quebec with 120+km/h winds. These extreme winds caused substantial damage to vegetation, which in turn damaged overhead distribution wires and equipment leaving approximately 142,000 customers (18 percent of Toronto Hydro's total customer base) without power at the peak of the storm. While the majority of customers were restored within 48 hours, it took approximately 5 days and cost approximately $2.35 million to restore power to all customers."

QUESTION:

Has Toronto Hydro previous prepared any projections for anticipated costs to restore service for extreme weather events? If so, please provide those past projections so they may be compared to the actual cost incurred in the May 2022 case of extreme weather.

RESPONSE:

Toronto Hydro does not project costs for restoration from extreme events. Due to the inherent unpredictability in the frequency, magnitude and specific system impacts of such exceptional events, actual costs vary significantly based on factors outside the utility's control.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-25

References: **Exhibit 2B, Section A3.5, Page 15**
Exhibit 2B, Section D4.3, Page 13
Exhibit 2B, Section E3.2, Page 3
Exhibit 2B, Section E5.5, Page 6

Preamble:

"By the end of the decade, Toronto Hydro expects to have over 4,400 DER connection projects representing a total installed capacity of approximately 517 MW, an increase of approximately 67 percent compared to 2022"

"Based on the capacity planning process outlined above, Toronto Hydro proposes investments in various programs to meet the utility's fundamental obligation to connect new and expanded services to the grid in this decade and beyond. These programs include expansion to increase grid capacity and enhancements to better utilize existing equipment. Through programs such as Load Demand, Stations Expansion, and Horseshoe and Downtown Renewal, Toronto Hydro is renewing and enhancing stations, buses, feeders, and other equipment that will facilitate load growth at the appropriate locations. In areas where Toronto Hydro expects customers to connect more DERs, programs such as Grid Protection, Monitoring and Control alleviate short-circuit capacity constraints."

"Toronto Hydro's 2023-2029 DER connection and capacity forecast considers a combination of historical trends, project pipeline, economic environment, and the current energy policies at the time of the forecast. Total DER projects are expected to contribute a total increase of 67 percent to total installations, reaching nearly 4,500 connections by the end of 2029, as shown in Figure 2. This represents a total DER installed capacity of approximately 516.7 MW by the end of 2029 in comparison to the 304.9 MW installed as of the end of December 2022, depicted in Figure 3."

"Currently, three station buses have reached short circuit capacity limits and are not able to connect additional DERs. Toronto Hydro anticipates that a total of eight station busses will exceed short circuit capacity by 2029. To arrive at the projected constraints in Table 4, Toronto Hydro mapped its overall forecast of 2029 DER capacity onto station busses by assuming that the geospatial distribution of DERs will continue to follow existing load connection patterns."

QUESTION (A):

a) How does Toronto Hydro determine where to expect customers to connect more DERs?

RESPONSE (A):

Toronto Hydro uses historical data to forecast the likelihood of customer DER connection locations. The forecast incorporates generation types and pipeline information to model the probability of DER connections in specific station areas. Please refer to Exhibit 2B, Section E3 for more details on the DER forecast.

QUESTION (B) - (D):

b) Please describe how Toronto Hydro would act in the event that more customers want to connect DERs than Toronto Hydro expects in a particular area.
c) How will Toronto Hydro ensure that it is not picking certain neighborhoods, such as only those that have previously shown demand to connect DERs, at the expense of other neighbourhoods for being able to benefit from connecting DERs?
d) If a neighbourhood ends up having greater demand for connecting DERs in the future than Toronto Hydro has planned for, please describe the approach Toronto Hydro would take to service those customers?

RESPONSE (B) - (D):

On an annual basis, Toronto Hydro evaluates DER connection capabilities. This process utilizes the most up to date information to help aid in the planning process to address DER hosting capacity constraints and help improve Toronto Hydro's DER adoption rate. Please see Exhibit 2B, Section E3 for the proposed planned investments. If demand for DER connections increases in a particular area, the utility would take corresponding actions as outlined in the 2025-2029 Investment Plan under GPMC (Exhibit 2B Section E5.5) and/or provide alternative options to customers such as connection to areas where capacity is available. This is why Toronto Hydro would require the necessary flexibility to adapt and align its investment plans to specific and localized system needs.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-26

References: Exhibit 2B, Section C1, Page 1

Preamble:

"A key theme of the Ontario Energy Board's guidance is that utilities should align their investment plans with customer needs, and adopt an outcomes-based approach to tracking their performance."

QUESTION (A):

a) Since the shift to more people working from home during and after the pandemic, has Toronto Hydro changed its approach to tracking reliability performance data in any way to align with the needs of more customers working from home and needing reliable power at residential addresses during working hours? If so, how has Toronto Hydro's approach to tracking reliability performance data changed?

RESPONSE (A):

Toronto Hydro is undertaking a multi-year project to upgrade its Outage Management System ("OMS") with Oracle's Network Management System ("NMS"). As part of this project, the utility will introduce a commercial interruption tracking and analytics platform—Oracle's Utility Analytics ("OUA")—to track interruption and reliability performance information. Enhanced telemetry information from these systems will address the needs of our customers, particularly concerns related to reliability, by informing future decision-making in system and maintenance planning, as well as grid operation related activities. Toronto Hydro also anticipates that the ongoing roll-out of next generation smart meters with "last gasp" capabilities will eventually provide the additional telemetry required to build more granular reliability analytics, including customer-specific reliability metrics.[1]

QUESTION (B):

b) Does Toronto Hydro track power outages of a few seconds or minutes (momentary interruptions) when compiling reliability performance data?

RESPONSE (B):

Toronto Hydro measures the frequency of momentary outages (less than one minute), excluding Major Event Days ("MEDs"). In accordance with the Ontario Energy Board's ("OEB's") Decision,[2] the utility reports its Momentary Interruption Frequency Index ("MAIFI") results on its 2020-2024 Custom Scorecard. Please refer to Exhibit 1B, Tab 3, Schedule 2 for the utility's historical performance.

QUESTION (C):

c) What is the minimum interruption time Toronto Hydro tracks when compiling Reliability Performance data?

RESPONSE (C):

Toronto Hydro tracks interruptions as prescribed by the OEB's Electricity Reporting and Record Keeping Requirements ("'RRR'"). As stated in the RRR, [3]

> *An "Interruption" means the loss of electrical power, being a complete loss of voltage, of a duration of one minute or more, to one or more customers, including planned interruptions scheduled by the distributor but excluding part power situations, outages scheduled by a*

[1] For further details about Toronto Hydro's smart meter investment plans, please refer to Exhibit 2B, Section E5.4.

[2] EB-2018-0165, Decision and Order (December 19, 2019) at page 50.

[3] Refer to OEB's Electricity Reporting & Recording Keeping Requirements for more information: https://www.oeb.ca/sites/default/files/RRR-Electricity-20230308.pdf

customer, interruptions by order of emergency services, disconnections for non-payment or power quality issues such as sags, swells, impulses or harmonics.

Please see Toronto Hydro's response to part (b) for momentary outages lasting less than one minute in duration. It's important to note momentary outages are not considered as interruptions.

QUESTION (D):

d) Are there any plans to change the tracked minimum interruption time with changing customer needs?

RESPONSE (D):

The minimum interruption time for reporting purposes is determined by the Regulator (the OEB) and not by the Distributor (Toronto Hydro). It should be noted that Canadian-based electricity utilities follow more stringent interruption reporting requirements compared to US-based utilities. For instance, the IEEE 1366 standard (followed by US utilities) defines sustained interruptions as interruptions that last more than five minutes. In contrast, Electricity Canada (formerly the Canadian Electricity Association) and the OEB use a criterion of one minute or more in duration.

QUESTION (E):

e) Does Toronto Hydro have a plan for reducing the frequency of momentary interruptions in service that may negatively impact customers working from home?

RESPONSE (E):

Toronto Hydro's System Renewal and Maintenance programs are designed to efficiently and proactively manage the risk of equipment failure and other causes of both momentary and sustained interruptions across the system to the benefit of all customers. The utility uses various leading indicators of future reliability performance (e.g. asset condition) in combination with historical performance trends and engineering judgement to identify the specific areas most in need of investment. When specific feeders begin to exhibit poor performance, Toronto Hydro may also take short-term actions to provide relief through its Worst Performing Feeder segment.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-27

References: Exhibit 2B, Section C2.6, Page 14

Preamble:

"On average, between 2018 and 2022, defective equipment was the main contributor to SAIFI and SAIDI, at 27.5 percent and 36.2 percent, respectively. However, in 2020 and 2022, defective equipment was surpassed by unknown caused outages as the top contributor to SAIFI."

QUESTION (A) AND (B):

a) Does Toronto Hydro view it as a problem that the number of outages by unknown causes is increasing? If not, why not?

b) As Toronto Hydro's data shows the number of outages with unknown causes is increasing, does Toronto Hydro have a plan for improving its ability to diagnosing unknown causes in the future? If so, what is the plan? If there is no plan, why is there no plan to address this increasing problem?

RESPONSE (A) AND (B):

Toronto Hydro considers reliability metrics SAIDI and SAIFI more informative for evaluating underlying system performance than assessing performance solely based on the number of interruptions. Unknowns are typically short-duration, high-impact interruptions, transient in nature, and do not require a truck roll for restoration; instead, they are typically restored through SCADA-controlled devices. About two-thirds of interruptions lasting between 1 to 5 minutes are attributed to Unknown causes. Similarly, about half of interruptions lasting between 5 to 10 minutes are attributed to Unknown causes. The high percentage of Unknowns is likely attributed to a variety of factors, including Toronto Hydro's operating and protection practices. These practices are intended to protect equipment and personnel, specifically related to circuit breaker protection settings and the issuance of Hold Offs[1] (including third-party tree trimming work).

Furthermore, operating authority for station feeder breakers within Toronto Hydro's territory is generally assigned to the transmitter (Hydro One) for equipment that is transmitter-owned. This includes operating authority over feeder circuit breakers at certain transformer stations in the Horseshoe region. In response to a trip of a feeder breaker under the operating control of the transmitter, the transmitter's control authority will contact the customer's control authority (Toronto Hydro). Communication between the two parties must be established, and when safe to do so, Toronto Hydro's control authority will request that the transmitter attempt a closure of the tripped circuit breaker. This process is further delayed if there are any hold-offs in effect for the affected feeder, as they would need to be surrendered before a reclose can be attempted.

While Toronto Hydro makes its best effort to investigate these events, it is not always possible to pinpoint the exact cause. The majority of these interruptions are usually non-permanent and self-clearing, stemming from potential causes including animal contacts, tree contacts, weather, and emerging equipment failures.

Nevertheless, Toronto Hydro leverages short interval control methods for the identification and mitigation of unknown interruptions. This includes, but is not limited to, performing fault localization analysis as part of an effort to identify problematic areas where past faults may have occurred in the distribution system. Targeted feeder patrols based on these fault localization results are conducted under the Corrective Maintenance program (see Exhibit 4, Tab 2, Schedule 4). The insights garnered from feeder patrols also aid in the identification of near-term corrective actions, as part of the Worst Performing Feeder program (see the Reactive and Corrective Capital program Exhibit 2B, Section E6.7). In addition, performing cable diagnostic testing is helping Toronto Hydro to improve the assessment of underground cables and cable accessories (see Exhibit 4, Tab 2, Schedule 2:

[1] When a hold-off is in effect on a line or other apparatus, it shall not be re-energized following an automatic trip until the holder surrenders the hold-off. It is a basic requirement of hold-off procedures that satisfactory communication be established and maintained with the holder of the hold-off.

Preventative and Predictive Underground Line Maintenance), which supports identifying the root cause of incipient cable faults.

Toronto Hydro notes that the SAIFI contribution from Unknown causes was down to 0.37 in 2023, which is lower than any year in the 2020-2022 period and more in line with performance from the 2015-2019 period.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-28

Reference: **Exhibit 2B, Section D4, Appendix A, Page 1**

Preamble:

"Government at all levels are implementing decarbonization policies, including GHG emission targets and incentives to encourage consumers to electrify their transportation and heating needs. Key policies and incentives include: Canada Greener Homes Grant provides up to $5,000 for electrified heating technologies such as heat pumps. This grant was introduced in December 2020 and is expected to stay in place for seven years."

QUESTION (A):

a) Has Toronto Hydro performed any analysis of the impacts on peak electricity demand in winter months for a sizable portion of residential customers converting their home heating to heat pumps? If not, why not?

RESPONSE (A):

Yes. The Future Energy Scenarios model includes electrified heating. Please see Exhibit 2B, Section D4, Appendix A and B for more information.

QUESTION (B):

b) Does Toronto Hydro presently expect the transition to heat pumps for home heating to have a material effect on peak electricity demand? If not, why not?

RESPONSE (B):

In the long-term, Toronto Hydro's view is that successful decarbonization of the energy system is very likely dependent upon the widescale adoption of heat pumps. This will ultimately have a material impact on peak electricity demand, including very likely the shift to a winter peak.

However, as illustrated by the Future Energy Scenarios, the extent and timing of the impact of heat pump adoption on peak electricity demand is highly uncertain, and dependent on many factors outside of Toronto Hydro's control.

QUESTION (C):

c) If significantly more residential customers install heat pumps in a particular area than Toronto Hydro has presently anticipated, how will this impact service reliability?

RESPONSE (C):

Toronto Hydro planning process is designed to support the maintenance and operation of a safe, stable and reliable grid. Toronto Hydro undergoes an annual update to its Peak Demand Forecast that reflects both emerging trends and updated planning assumptions. Toronto Hydro recognizes that the pathway through the energy transition is both uncertain and uneven with local needs and constraints becoming more evident before more regional needs are manifested. It is in recognition of that changing landscape, Toronto Hydro has approached the energy transition arming itself with new tools in its forecasting toolbox and increasingly sophisticated methods of understanding customer behaviour. For more information on Toronto Hydro's capacity planning approach to the energy transition, please refer to Exhibit 2B Section D4.2.

Toronto Hydro is also planning to invest in sensing technology that will provide useful data that will aid in determining load profiles at a level of granularity that will permit Toronto Hydro to respond to local system constraints in a targeted and cost-efficient manner. More information can be found under the system observability section of the Grid Modernization Strategy in Exhibit 2B Section D5.2.1.

If significantly more residential customers install heat pumps in a particular area, Toronto Hydro, through its normal planning process, will support the need by installing new transformers or upgrading existing transformers and other relevant infrastructure to ensure service reliability.

QUESTION (D):

d) Does Toronto Hydro have a plan in the event that significantly more customers install heat pumps in a particular area than anticipated?

RESPONSE (D):

Toronto Hydro used the Future Energy Scenarios to stress-test whether the utility's capacity plan can accommodate energy transition needs (e.g. building heating electrification) in the early part of the next decade. In an effort to adopt a proactive approach to managing forecasted local constraints, Toronto Hydro has outlined plans reflected in its Load Demand and Non-Wires Alternatives portfolio, to provide flexibility to adequately respond to local drivers that may result in capacity constraints. For more information on Toronto Hydro's Load Demand and Non-Wires Alternatives plans, please refer to Exhibit 2B Section 5.3 and 7.2 respectively.

While Future Energy Scenarios reveal that the impact of building electrification in the next two decades could be significant, there are notable differences (driven by policy, technology and consumer-behaviour choices) as to when and how building electrification could unfold. Due to this, Toronto Hydro acted with a higher degree of caution in terms of building new capacity to prepare the distribution grid for wide-scale building electrification in the next two decades, as the policy and consumer-behaviour drivers of this type of demand remain uncertain, and technology advancement could offer more cost-effective solutions in the future. Practically, this meant that Toronto Hydro decided to take a "wait and see approach" to investments in new capacity for accommodating wide-scale building electrification in the mid-2030s and beyond. For more information on Toronto Hydro's capacity plan, please refer to Exhibit 2B, Section D4.

RESPONSES TO ENERGY PROBE RESEARCH FOUNDATION INTERROGATORIES

INTERROGATORY 2B-EP-29

Reference: **Exhibit 2B, Section D4, Appendix A, Page 3**

Preamble:

"Consumer choices and behaviors regarding energy use are gradually changing. Activities that previously did not affect the electricity system (including fueling vehicles and space heating) now have the potential to change electricity consumption patterns and shift system peaks. For example, residential and fleet EV charging could create new system needs like real-time voltage control to support a sharp rise from morning and/or afternoon charging on a scale similar to that created by air conditioning demand on hot summer days. Additionally, as heating systems are electrified (e.g. heat pumps), electricity system peaks can shift from summers to winters."

QUESTION (A):

a) Are the demands on service areas expected to vary depending on whether the area has more residential EV charging activity vs fleet or commercial EV charging activity?

RESPONSE (A):

Various classes of electric vehicle charging infrastructure will have differing impacts on the grid due to their distinct demand profiles. The aggregate demand effect of EVs in a specific service area will depend on the amount of EV charging infrastructure of all types. For fleet/commercial charging in particular, the impact will further depend on the specific charging needs of each particular location (i.e., overall size, type of commercial activity, scheduled charging, etc.).

QUESTION (B):

b) Does Toronto Hydro have any projections for what areas of the city are likely to experience increases in fleet or commercial EV charging vs residential EV charging?

RESPONSE (B):

EV load was modelled with three vehicle classes: light-duty, medium-duty, and heavy-duty. For all EV classes, load was allocated geographically based on the existing distribution of EVs in the City of Toronto.

QUESTION (C):

c) Has Toronto Hydro identified areas in the city that require infrastructure upgrades to support projected EV charging needs?

RESPONSE (C):

EV charging needs are integrated within Toronto Hydro's Peak Demand Forecast, which is the primary basis for the investment plans outlined in the Stations Expansion (Exhibit 2B, Section E7.4) and Load Demand (Exhibit 2B, Section E5.3) programs.

QUESTION (D):

d) How will Toronto Hydro ensure that it does not pick certain neighbourhoods to provide sufficient capacity for future EV charging but not other neighbourhoods?

RESPONSE (D):

Capacity planning (and capital expenditure planning in general) is a dynamic process. Toronto Hydro regularly monitors system capacity needs and makes necessary adjustments to its plan to ensure investments are targeted at the right areas at the right time. The utility updates its 10-year Peak Demand Forecast annually and leverages this as part of the annual Investment Planning & Portfolio Reporting process, where priorities are re-evaluated and adjustments made as needed.

In addition, to further enhance its ability to anticipate and address the highly localized impacts of EV proliferation expected in the next decade, Toronto Hydro is planning to invest in enhanced forecasting, scenario analysis, and predictive analytics capabilities for system planning. Please refer to Exhibit 2B, Section D5.2.3.3 and Section D5.3.7.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-27

Reference: **This plan continues the utility's effort to renew a significant backlog of deteriorated and obsolete assets at risk of failure, and to adapt to the continuously evolving challenge of serving and operating within a dense, mature, and growing major city. [DSP Page 1]**

QUESTION (A):

a) Please explain what criteria (e.g. age or field condition assessment), data (e.g. how many assets have up-to-date field assessment information in the asset management system) and (system) approach (e.g. is this just harvesting statistical data from the asset management system, asset life statistic or using a different approach) THESL is using to determine that there is a large list of assets that are deteriorated and obsolete.

RESPONSE (A):

Toronto Hydro relies on a variety of data sources and approaches within its Asset Management System ("AMS") to manage its distribution system effectively and to maximize the value delivered by its assets. Toronto Hydro relies on both condition and age as key indicators of its asset demographics to determine the level of asset deterioration. Toronto Hydro also has a number of legacy asset types and system configurations that are functionally obsolete. These legacy assets pose elevated reliability, environmental and safety risks to the distribution system and personnel.

Toronto Hydro implements maintenance programs, outlined in Exhibit 4, Tab 2, Schedule 1 to 4, to identify and address system risks. Inspections play a crucial role in supplying the necessary data to pinpoint assets that are deteriorated or obsolete. Such information, including the detection of oil leaks or any other signs of equipment wear, is vital to manage the health of its assets.

Toronto Hydro also leverages a number of tools and system analytics to determine the probability and consequence of failure that underpin risk analyses for its assets. Please refer to Exhibit 2B, Section D3.2.1 for a detailed discussion on the key data sources and tools that Toronto Hydro relies on to manage it distribution system. For details on how these tools and approaches were leveraged to develop the proposed capital expenditure plan for the 2025-2029 period, please refer to Exhibit 2B, Section E2. For a comprehensive discussion on expected asset demographic changes over the 2025-2029 period, please refer to 2B-SEC-44.

QUESTION (B):

b) Please explain what (number & percent of total) of deteriorated and obsolete assets THESL addressed in the most recent rate period (2020-2024, or per data available) and how this helped reduce the burden for the new rate period (2025-2029). What residual number of deteriorate and obsolete assets remain.

RESPONSE (B):

Toronto Hydro does not maintain comprehensive historical records of the condition of its assets at the time that they were replaced. The challenge of maintaining precise and thorough records of the condition of replaced assets arises from limitations within the current information systems.

At the system level, Toronto Hydro has included a comparative analysis and discussion of its asset demographics in 2018, prepared as part of the last rate application, against the current condition demographics in Exhibit 2B, Section E2.2.1.1. Both condition and age demographics indicate a need for continued investment to manage asset deterioration.

In regards to obsolete assets, Toronto Hydro continues to manage a number of legacy assets and configurations within its system. These legacy designs typically consist of outdated components that lack available supplier support, require specialized labor to support maintenance, repair, or replacement, and present increased risks to reliability, safety, or the environment. Exhibit 2B, Section

E6 details a number of legacy and obsolete assets or configurations, including Toronto Hydro's 2020-2024 performance and the proposed approach for 2025-2029, specifically:

- Rear Lot Configuration (E6.1 Area Conversions)
- Box Construction (E6.1 Area Conversions)
- Direct Buried Cables (E6.2 Underground System Renewal – Horseshoe)
- Lead Covered Cables (E6.3 Underground System Renewal – Downtown)
- 4.16kV Feeder Lines (E6.2 Underground System Renewal – Horseshoe and E6.5 Overhead System Renewal)
- Non-submersible Network Units (E6.4 Network System Renewal)
- Electromechanical Relays (E6.6 Stations Renewal)

In addition, Toronto Hydro eliminated legacy Automatic Transfer Switches ("ATS") and Reverse Power Breakers ("RPB") through its Network System Renewal program during the 2020-2024 rate period.

QUESTION (C):

c) Please describe how THESL prioritizes which assets to replace against the list of deteriorated and obsolete assets.

RESPONSE (C):

Toronto Hydro's AMS, detailed in Exhibit 2B, Section D1 highlights the key processes that Toronto Hydro relies on to manage its assets. As indicated in Section D1.2.1.2, Toronto Hydro performs an Asset Needs Assessment that allows it to identify and prioritize its asset sustainment needs. Toronto relies on a Condition Based Risk Framework based on Asset Condition Assessments ("ACA") as well as assets past useful life and consideration of potential consequence of failures to guide its decision. Once asset level needs are identified, system planners combine this with additional information such as capacity constraints and other system planning drivers to develop scopes of work, targeting areas to maximize the overall benefit to the system, as detailed in Exhibit 2B, Section D1.2.2. Please see response to 2B-SEC-44 for additional discussion regarding asset replacement and pacing decisions.

QUESTION (D):

d) Please explain how THESL's proposal to increase the service life of assets (some up to double the current value per the Concentric Report) was taken into account when determining that assets are already deteriorated and obsolete.

RESPONSE (D):

The proposal to increase the service life of assets (based on the Concentric report) primarily effects the useful life assumptions used for the purposes of calculating depreciation. Toronto Hydro also leveraged the Concentric report to review mean useful life values used for the purpose of producing asset management metrics (such as the high-level Assets Past Useful Life ("APUL") metric). However, the changes for these asset management parameters were comparatively minor and are accounted for in the APUL values provided. Please see response to 2B-Staff-129 and 2B-Staff-131 for more information.

QUESTION (E):

e) Would increasing the asset life decrease the number of assets considered beyond their asset life based on current values? If not, why not?

RESPONSE (E):

In general, increasing asset life will decrease the number of assets considered to be beyond their service life to some extent (depending on the age distribution of the asset class). Please see response to part (d) for more information on how the updated depreciation lives relate to asset management.

It is important to note that Toronto Hydro never replaces an asset simply because it has crossed a threshold where it is now "beyond useful life." Furthermore, even in situations where the advanced age of an asset is an important consideration, the utility does not prioritize replacement on the basis of age alone. Factors including (but not limited to) detailed maintenance records, asset condition assessment, reliability, criticality (i.e., consequence of failure), resourcing, and cost are important considerations when developing capital projects. For more information, please see response to 2B-SEC-44.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-28

Reference: Exhibit 2B, Page 2

Preamble:

Through an outcomes-oriented, customer-focused integrated planning process, this plan was designed to achieve balance between price and service quality performance both in the near-and longer-term, while readying the grid with least regrets investments to serve the needs of an increasingly electrified economy. [DSP Page 2]

QUESTION (A):

a) Please provide details on the tools, plans or documents that THESL is using to identify metrics/outcome and gauge progress against there over the longer term (i.e. across rate terms and out to 2030/2050).

RESPONSE (A):

Toronto Hydro's Asset Management System ("AMS") outlines the processes it relies on to plan, prioritize, and optimize its expenditures to deliver on key outcomes in alignment with corporate goals and objectives, while creating value to its customers. Toronto Hydro relies on its AMS, specifically its Integrated Planning and Portfolio Reporting ("IPPR") process, to monitor progress and refine its plan on a continuous basis. Toronto Hydro's AMS and associated processes are detailed in Exhibit 2B, Section D1. As part of the AMS, Toronto Hydro relies on a number of key analyses and tools to support its decision-making process and to optimize its asset lifecycles, which are detailed in Exhibit 2B, Section D3. Toronto Hydro leveraged its AMS and related tools to develop its Distribution System Plan for the 2025-2029 period, the details of this planning process are included in Exhibit 2B, Section E2.

QUESTION (B):

b) Please provide an documents THESL has to indicate where it currently is against its long-term outcome-oriented objectives and where it expects to be by the end of the new rate period (end of 2029).

RESPONSE (B):

Toronto Hydro proposed a number of outcome-oriented objectives and measures as part of its Performance Incentive Mechanism ("PIMs") along with its commitments for these measures by the end of the 2025-2029 rate period, which are detailed in Exhibit 1B, Tab 3, Schedule 1.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-29

Reference: Exhibit 2B, Figure 2: Percentage of Assets Past Useful Life

QUESTION (A):

a) Please provide the number of assets against the percentages included in Figure 2. If the detailed breakdown is available in evidence filed already, please provide the reference.

RESPONSE (A):

Please see Table 1 below for the number of assets contributing to the percentages in Figure 2, Exhibit 2B, Section A.

Table 1: Asset Count for Assets Past Useful Life – 2023

	Non-Linear Assets (Units)	Linear Assets (km)
Additional Assets to Reach Useful Life by 2030	298,632	2,637
Assets at End of Useful Life by 2023	473,316	4,363
Assets Not at End of Useful Life	427,829	33,511

QUESTION (B):

b) Please provide the equivalent pie chart, percentages and units underlying the percentages for 2020 information (the start of the current rate period, or as close as possible based on information available).

RESPONSE (B):

Please see Figure 1 below containing the assets at and past useful life for 2020.

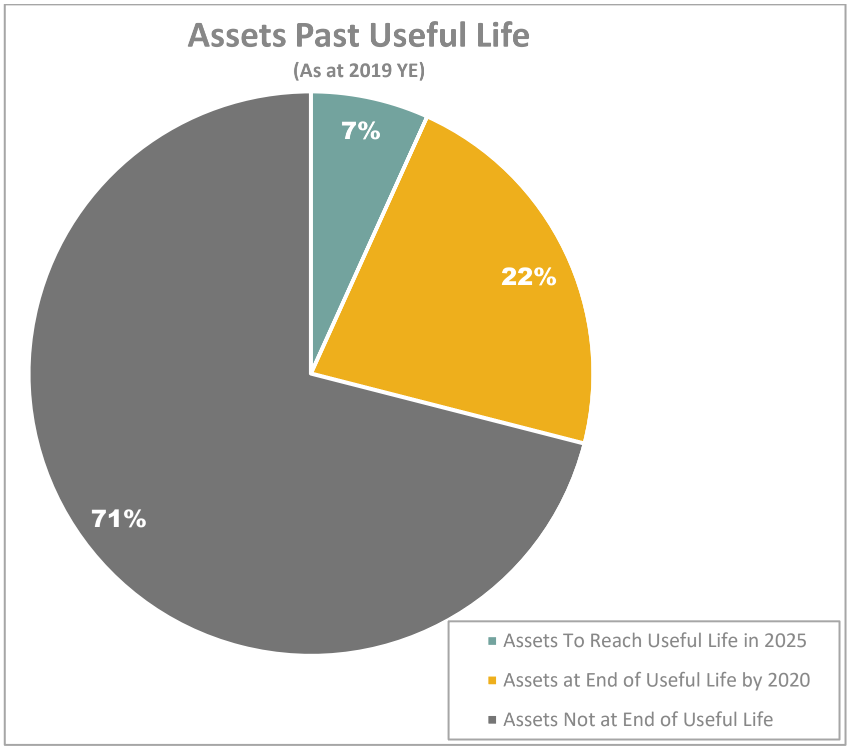

Figure 1: Assets Past Useful Life for 2020

Please see Table 2 below for the number of assets contributing to the percentages for Figure 1 above.

Table 2: Asset Count for Assets Past Useful Life – 2020

	Non-Linear Assets (Units)	Linear Assets (km)
Additional Assets to Reach Useful Life by 2025	601,229	1,125
Assets at End of Useful Life by 2020	50,578	3,572
Assets Not at End of Useful Life	362,818	35,270

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-30

Reference: **Exhibit 2B, Page. 27, Footnote 42**
PollutionProbe_IR_AppendixB_Assessment-of-IESO-Pathways-to-Decarbonization

QUESTION (A):

a) One of the references used by THESL is the Enbridge Pathways to Net Zero Report prepared by Guidehouse. There were 3 versions of the report issued in support of EB-2022-0200 Phase 1 and there was general consensus that the report over-estimated electrification costs and facilities, while under-estimating gas costs and facilities. Please confirm what analysis THESL did (if any) to validate or adjust for the residual errors in that report.

RESPONSE (A):

Toronto Hydro did not rely upon the Enbridge Pathways to Net Zero Report in the development of its proposals in this rate application. The utility has not undertaken a detailed analysis of the study.

QUESTION (B):

b) THESL references the IESO Pathways to Decarbonization Report and there has been recent analysis and reports that provide an objective assessment and a focus on the alignment of that study with municipal climate action plans. An example is included as Appendix B noted above. Please provide copies of any analysis THESL did (if any) to validate what was in the IESO report. Please also provide what consideration THESL has given to the Assessment-of-IESO-Pathways-to-Decarbonization Report.

RESPONSE (B):

Toronto Hydro did not rely upon the IESO Pathways to Decarbonization Report to develop its proposals in this rate application, nor has the utility undertaken a detailed analysis of the study.

As to the "Assessment-of-IESO-Pathways-to-Decarbonization Report," Toronto Hydro has not reviewed this report in detail and understands the focus of the report to be the IESO's provincial pathways study as opposed to local distribution system planning. As discussed in Exhibit 2B, Section D4, Municipal Energy Plans are one of several key elements of peak demand forecasting and capacity planning that Toronto Hydro enhanced for the 2025-2029 period.

QUESTION (C):

c) If the information outlined in the Assessment report were applied, please confirm that a lower amount of capital investment would be required. If not correct, please explain.

RESPONSE (C):

As noted in response to part (b), Toronto Hydro has not reviewed the referenced report in detail and is unsure about which elements of the report Pollution Probe believes would result in lower capital investment needs.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-31

Reference: Exhibit 2B, Section B, Needs Assessment Report

QUESTION (A):

a) The Technical Working Group for the Needs Assessment only included utilities. Please explain why no other stakeholders such as the City of Toronto were included in the TWG.

RESPONSE (A):

Please refer to Toronto Hydro's response to 2B-PP-33 part (b).

QUESTION (B):

b) THESL's application and related evidence relies heavily on funding/actions THESL believes are needed to meet customers' needs from the Energy Transition and City of Toronto Net Zero by 2040 objectives. The Needs Assessment, RIP and Infrastructure Plan include needs and recommendations only for traditional poles-and-wires solutions. Please reconcile this discrepancy between the poles-and-wires recommendations and the THESL application which highlights a broader plan.

RESPONSE (B):

As described in detail in Exhibit 2B, Section B, Regional Planning focuses on the facilities that provide electricity to transmission-connected customers such as distributors and large directly-connected customers, which typically includes the transformer stations that supply the load and the transmission circuits between the stations. It also includes the 115 kV and 230 kV auto-transformers and their associated switchyards. From a resource perspective, regional planning considers local distributed generation, Conservation and Demand Management ("CDM"), as well as other forms of

Non-Wires Solutions ("NWS") that could be developed to address supply and reliability issues in a region or local area.[1]

While Regional Planning was an input to Toronto Hydro's capital plans, as the local distributor, Toronto Hydro is responsible for assessing its capacity needs and ensuring reliability across the entire distribution system, down to the more granular elements of the system, such as substation buses and feeders. It is at this more granular level of distribution need that the proposed use of non-wires alternatives were considered and applied where appropriate. Please refer to Exhibit 2B, Section E7.2 and the responses to interrogatory 1B-Staff-88 and 1B-Staff-89 for more information about the targeted use of non-wires solutions in the next rate period.

QUESTION (C):

c) Please explain how THESL's application (and in particular the DSP and Capital Plan) will deliver on needs and recommendations outlined in the Needs Assessment and subsequent documents [Integrated Regional Resource Plan (IRRP) and Regional Infrastructure Plan (RIP)] that resolve the recommendations from the Needs Assessment.

RESPONSE (C):

As described in Exhibit 2B, Section E7.4 (updated January 29, 2024), Toronto Hydro's proposed plan and investments align with Hydro One's 2022 Needs Assessment and 2020 RIP.

QUESTION (D) AND (E):

d) Please describe how (if at all) Non-Wires Solutions (including DERs) will be included in the current cycle of planning, such as the
   - Needs Assessment
   - Scoping Assessment

[1] The Toronto Region Integrated Regional Resource Planning (IRRP) process is currently underway under the IESO's leadership. Planning activities include forecasting the expected growth in electricity demand for 25 years, and evaluation conservation, distributed generation, and transmission and distribution investments to meet future customer needs in the Toronto Region.

- Integrated Regional Resource Plan (IRRP); and
- Regional Infrastructure Plan (RIP)

e) Please describe how (if at all) stakeholder input (including the City of Toronto) will be identified and included in the current cycle of planning, such as the
   - Needs Assessment
   - Scoping Assessment
   - Integrated Regional Resource Plan (IRRP); and
   - Regional Infrastructure Plan (RIP)

RESPONSE (D) AND (E):

Please refer to Exhibit 2B, Section B3.2 at pages 6-9 for details on whether and how non-wires solutions are considered in as well as a list of the stakeholders participating at each stage of the Regional Planning process.

QUESTION (F):

f) Please explain how Non-Wire Solutions (including DERs) can be considered and implemented instead of poles-and-wires solutions when they were not included in the regional planning exercise and related reports.

RESPONSE:

Please see the answer to parts (b) and (d).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-32

Reference: n/a

The previously Toronto RIP was completed in March 2020 and was filed. However, the updated IRRP and RIP are currently in progress. The Toronto RIP for the current cycle is scheduled for completion in March 2025 based on the Needs Assessment completed December 2022 and the Scoping Assessment report in March 2023.

Based on the updates in progress, please outline what significant changes are expected from the 2020 RIP and what impact it could have on the 2025-2029 period and beyond.

RESPONSE:

The IESO's Integrated Regional Resource Plan ("IRRP") planning process is currently underway; however, the assessment of needs for this cycle has yet to be undertaken by the IRRP Technical Working Group. As a result, it is not yet possible to provide the requested information.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-33

Reference: Exhibit 2B, Section B, Appendix E, Scoping Assessment Outcome Report dated March 21, 2023

QUESTION (A):

a) The Scoping Report indicates that "The implementation of recommendations from the previous planning cycle should continue". Would locking poles-and-wires recommendations in from the previous planning cycle provide a barrier to more current solutions such as DERs? If not, why not.

RESPONSE (A):

The Toronto Region is currently undergoing its IRRP, which will take both wires and non-wires solutions into consideration. At the end of that process, the optimal solution(s) will be selected.

QUESTION (B):

b) Would THESL support City of Toronto being a member of the Technical Working Group? If not, why not.

RESPONSE (B):

Toronto Hydro strongly supports the City of Toronto's involvement in regional energy planning in the Toronto region. Active involvement is not dependent on participating on the Technical Working Group. Toronto Hydro was active in the OEB's Regional Planning Process Advisory Group (RPPAG), and endorses its Report to the OEB dated December 7, 2022, including its emphasis on drawing municipalities and municipal information into the regional planning process. The RRPAG report does not recommend that Technical Working Groups be expanded beyond the IESO, transmitters, and distributors.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-34

Reference: Exhibit 2B, Section D4.1.1.4 Electric Vehicle Demand Driver Analysis

QUESTION (A):

a) Figure 1 is called "Peak Demand Forecast" but appears to be just the forecasted number of EVs. Please confirm why the term 'peak' was used.

RESPONSE (A):

Toronto Hydro confirms Figure 1 refers to the number of EVs used in the System Peak Demand Forecast. The term 'peak' was used to represent the system peak demand forecast inclusive of EV volumes.

QUESTION (B):

b) Please confirm how the number of EVs forecasted is translated into system peak demand forecast and how the following adjustments are factored in.
   - Off-peak Ultra Low EV charging rates (migrating to off peak)
   - Consumer choice and behaviour to charge off peak
   - DER integration or programs to decrease peak load or increase local generation.

RESPONSE (B):

Toronto Hydro considered the impact of managed versus unmanaged EV charging, as well as the impact of Off-peak Ultra Low EV charging rates, in the updated System Peak Demand forecast which was filed on January 29, 2024. Please see 2B-SEC-61 for more information about this update. With respect to DER integration or programs please see Toronto Hydro's responses to 1B-PP-07.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-35

Reference: Exhibit 2B, Section D4, Figure 4

QUESTION (A):

a) Please provide the numbers underlying the Figure 4.

RESPONSE (A):

Table 1: Toronto Hydro System Peak Demand Forecast by Driver (%)

Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Base Forecast	99%	99%	98%	97%	95%	94%	92%	92%	91%	89%
Electric Vehicle	0%	0%	0%	1%	1%	1%	2%	2%	2%	3%
Electrified Transit	0%	0%	0%	0%	1%	2%	2%	2%	2%	2%
Municipal Energy Plans	0%	0%	0%	0%	0%	0%	1%	1%	1%	2%
Data Centres	1%	1%	1%	2%	3%	3%	3%	3%	4%	4%

QUESTION (B):

b) Figure 4 appears to forecast EV as increasing demand only rather than EVs being a potential DER resource. Please provide details on how THESL plans to leverage EVs to benefit the system over the rate period and beyond.

RESPONSE (B):

Please refer to the response to interrogatory 2B-ED-11(i).

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-36

Reference: **Exhibit 2B, Section D4, Appendix B, Future Energy Scenarios, Report by Element Energy**

QUESTION (A):

a) Was the Future Energy Scenario Report peer reviewed? If yes, please provide a list of participants and their feedback.

RESPONSE FROM ERM (A):

No.

QUESTION (B):

b) Please provide a list of the stakeholders consulted or stakeholders otherwise part of the information input, modeling inputs and/or report development process.

RESPONSE FROM TORONTO HYDRO (B):

The following external stakeholders were engaged as part of the information input stage: City of Toronto, Toronto Transit Commission, and Plug'N Drive. Internally, Toronto Hydro formed a steering committee to guide the development of the project, which consisted of subject matter experts across the organization.

QUESTION (C):

c) Please provide the source of information and related references for each row in Table 1: Technology uptake scenarios

RESPONSE FROM ERM (C):

Table one of Exhibit 2B, Section D4, Appendix B is provided as a summary of decisions and choices that indicate the relative make-up of each of the technology uptake scenarios. In-report referencing is detailed throughout the report. For example, the details for each of the parameters (including sources of information and related references) for “Core Demand”, “Low-Carbon Transport”, and “Decarbonized Heating” are detailed in sections 4.1, 4.2, and 4.3 respectively. The sources of information and related references for each parameter can be found in the summary table below.

Table 1: Net Zero by 2050 Parameter

Parameter	Reference(s)
Net zero by 2050?	Modeling decision based on Element Energy expertise and agreed scenario narrative

Table 2: Core Demand Parameters

Parameter	Reference(s)
Electrical efficiency	• ENERGY STAR, 2022, ENERGY STAR 2022 Most Efficient, available from: https://www.energystar.gov/products/most_efficient • Natural Resources Canada, 2000-2018, Energy Efficiency Trends Analysis Tables, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/analysis/tables.cfm • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • 2018 CDM data provided by Toronto Hydro • Natural Resources Canada, 2015, 2015 Survey of Household Energy Use, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/sheu/2015/tables.cfm *Residential Sector Canada Table 37: Appliance Stock by Appliance Type and Energy Source* • Natural Resources Canada Comprehensive Energy Use Database (2000 – 2018) | Commercial/Institutional Sector – Ontario • Natural Resources Canada, Canada-wide Energy Use Database (2000 – 2018) | Total End-Use Sector - Energy Use Analysis

Parameter	Reference(s)
	• Toronto Public Health, Protecting Vulnerable People from Health Impacts of Extreme Heat, July 2011
Building stock growth	• City of Toronto, 2016, Neighbourhood profiles, available from: https://open.toronto.ca/dataset/neighbourhood-profiles/ • City of Toronto, 2016, Ward Profiles, 2014-2018 Wards, available from: https://open.toronto.ca/dataset/ward-profiles-2014-2018-wards/ • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Natural Resources Canada, 2000-2018, 2015 Survey of Household Energy Use (SHEU-2015) Data Tables, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/sheu/2015/tables.cfm • City of Toronto, 2022, Data requested through Toronto Hydro • Growth Scenario GP 2012NH used (Provincial Growth Plan 2013) • Watson & Associates Economists Ltd , 2008 - City of Toronto 2008 Development Charge Background Study (Recommended by City of Toronto) • City of Toronto, 2022, Data requested through Toronto Hydro • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Watson & Associates Economists Ltd , 2008 - City of Toronto 2008 Development Charge Background Study (Recommended by City of Toronto) • City of Toronto, About Toronto Neighbourhoods, 2022. *Note that since the time of analysis, some neighbourhoods have been split up because of very high population growth. Effective after April 12, 2022, the number of neighbourhoods in Toronto is 158.* • North American Industrial Classification System NAICS & SIC Identification Tools | NAICS Association • Toronto Data Management Group, Traffic Zones Boundary Files, 2006 (Toronto Hydro's network area covers 677 traffic zones). • City of Toronto, SmartTrack Stations Program, 2021

Table 3: Low Carbon Transport Parameters

Parameter	Reference(s)
Cars and light trucks	• Element Energy, 2022, Electric vehicle Consumer Choice model (ECCo). • Element Energy, 2022, Cost & Performance model • Canada Energy Regulator, 2021, Canada's Energy Future 2021, available from: https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/

Parameter	Reference(s)
	• City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Ontario vehicle population data, 2016, available from: https://data.ontario.ca/en/dataset/vehicle-population-data/resource/c61643a9-8338-47c9-b0a8-00f7c6298d05 • Statistics Canada vehicle registration data, 2015-2019, available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310006701&pickMembers%5B0%5D=1.7&cubeTimeFrame.startYear=2015&cubeTimeFrame.endYear=2019&referencePeriods=20150101%2C20190101 • Element Energy, 2015, Consumer survey of 2,000 new car buyers in Great Britain • Government of Canada, Incentives for Zero-Emissions Vehicles (iZEV), April 2022 • Statistics Canada, New zero-emission vehicle registrations, January 2022 • Bloomberg NEF, Electric Vehicle Outlook, 2021 • Element Energy and WSP Parsons Brinckerhoff, Plug-in electric vehicle uptake and infrastructure impacts study, 2016 • Element Energy, Electric Vehicle Charging Behaviour Study, 2019 • Statistics Canada, 2021 Census of population, 2021 • Toronto Metropolitan University, Household car ownership, 2018 • City of Toronto Open Data Portal, Land use zoning by-law, 2022
Medium / heavy trucks and Buses	• High targets: Californian Air Resource Board, available from: https://afdc.energy.gov/laws/12473 • Medium targets: Government of Canada, Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles Program, July 2022 • Element Energy, 2022, HGV Cost & Performance model • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Ontario vehicle population data, 2016, available from: https://data.ontario.ca/en/dataset/vehicle-population-data/resource/c61643a9-8338-47c9-b0a8-00f7c6298d05 • Statistics Canada vehicle registration data, 2015-2019, available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310006701&pickMembers%5B0%5D=1.7&cubeTimeFrame.startYear=2015&cubeTimeFrame.endYear=2019&referencePeriods=20150101%2C20190101 • Element Energy work for HGV vehicle operators • Toronto Transit Commission, 2022, TH Connection Assessment tracking • Element Energy, 2022, HGV Cost & Performance model • Toronto Transit Commission, 2022, TH Connection Assessment tracking • Element Energy work for bus operators

Parameter	Reference(s)
	• Toronto Transit Commission, Service Summary 2021, January 2022 • Toronto Transit Commission, TTC Green Initiatives, 2022 • Element Energy for Transport & Environment, Battery electric HGV adoption in the UK: barriers and opportunities, November 2022
Rail	• Metrolinx, 2022, Greater Toronto Region Projects, available from: https://www.metrolinx.com/en/greaterregion/projects/default.aspx • Toronto Transit Commission, 2019, Line 1 Capacity Requirements - Status Update and Preliminary Implementation Strategy (For Action), available from: https://ttc-cdn.azureedge.net/-/media/Project/TTC/DevProto/Documents/Home/Public-Meetings/Board/2019/April_11/Reports/18_Line_1_Capacity_Requirement_and_Preliminary_Implementatio.pdf?rev=812341c5088e48fa8a0bc0d7e68ff199&hash=01979E9C12FC9BAE9B9CE8B70D026760 • The City of Toronto, Transit Expansion, June 2022
Smart charging / V2G	• fleetcarma, 2021, Charge the North, available from: https://fncdn.blob.core.windows.net/web/1/smart-transport-resources/charge-the-north-results-from-the-worlds-largest-electric-vehicle-charging-study.pdf • Previous analysis conducted by Element Energy • Element Energy, V2GB – Vehicle to Grid Britain Requirements for market scale-up (WP4), June 2019 • Bauman, J. et. al., Residential Smart-Charging Pilot Program in Toronto: Results of a Utility Controlled Charging Pilot, June 2016 • IAEE, Driver Experiences with Electric Vehicle Infrastructure in Ontario, Canada and the Implications for Future Policy Support, Fourth Quarter 2020

Table 4: Decarbonized Heating Parameters

Parameter	Reference(s)
Heat pump	• Natural Resources Canada, 2021, Canada Greener Homes Grant, available from: https://www.nrcan.gc.ca/energy-efficiency/homes/canada-greener-homes-grant/23441 • Canada Energy Regulator, 2021, Canada's Energy Future 2021, available from: https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/ • International Energy Agency, 2021, Are renewable heating options cost-competitive with fossil fuels in the residential sector?, available from: https://www.iea.org/articles/are-renewable-heating-options-cost-competitive-with-fossil-fuels-in-the-residential-sector
Thermal efficiency	• Natural Resources Canada, 2000-2018, Comprehensive Energy Use Database, Residential Sector, Ontario, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/comprehensive/trends_res_on.cfm

Parameter	Reference(s)
	• Efficiency Canada & Carleton University, 2021, Canada's Climate Retrofit Mission, available from: https://www.efficiencycanada.org/wp-content/uploads/2021/06/Retrofit-Mission-FINAL-2021-06-16.pdf • City of Toronto, 2021, TransformTO Net Zero Strategy, https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • City of Toronto, 2021, Net Zero Existing Buildings Strategy, https://www.toronto.ca/wp-content/uploads/2021/10/907c-Net-Zero-Existing-Buildings-Strategy-2021.pdf • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Natural Resources Canada, 2000-2018, Energy Efficiency Trends Analysis Tables, available from: https://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/menus/trends/analysis/tables.cfm • City of Toronto, 2021, Net Zero Existing Buildings Strategy, available from: https://www.toronto.ca/wp-content/uploads/2021/10/907c-Net-Zero-Existing-Buildings-Strategy-2021.pdf • Efficiency Canada & Carleton University, 2021, Canada's Climate Retrofit Mission, available from: https://www.efficiencycanada.org/wp-content/uploads/2021/06/Retrofit-Mission-FINAL-2021-06-16.pdf
Gas heating in 2050	• The Independent Electricity System Operator, Pathway to Decarbonization – Assumptions for Feedback, March 2022 • The Canadian Gas Association, Potential Gas Pathways to Support Net Zero Buildings in Canada, October 2021 • Modeling decision based on Element Energy expertise and agreed scenario narrative
Gas grid availability	
Gas grid composition	

Table 5: Distributed Generation Parameters

Parameter	Reference(s)
Solar PV	• Canada Energy Regulator, 2021, Canada’s Energy Future 2021, available from: https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/ • National Renewable Energy Laboratory, 2021, Solar Futures Study, available from: https://www.nrel.gov/analysis/solar-futures.html • Independent Electricity System Operator, microFIT Program, available from: https://www.ieso.ca/en/Get-Involved/microfit/news-overview • Government of Canada, 2020, Photovoltaic potential and solar resource maps of Canada, available from: https://www.nrcan.gc.ca/our-natural-resources/energy-

Parameter	Reference(s)
	sources-distribution/renewable-energy/solar-photovoltaic-energy/tools-solar-photovoltaic-energy/photovoltaic-potential-and-solar-resource-maps-canada/18366 • Ontario Energy Board, Historic electricity Rates, 2022, available from: https://www.oeb.ca/consumer-information-and-protection/electricity-rates/historical-electricity-rates • Rapid Shift, Solar carports: how do they work and how much do they cost?, available from: http://www.rapidshift.net/solar-carports-how-do-they-work-and-how-much-do-they-cost/ • Solar Electricity Supply, Inc. Commercial Solar Carports: Carport Mounted Shade Structure Solar Systems for Commercial PV Applications, available from: https://www.solarelectricsupply.com/commercial-solar-systems/solar-carport • Alternative Energy, How Much Do Solar Carports Cost?, available from: https://powersolarphoenix.com/carport-solar-panels-cost/ • Government of Canada, Canada Greener Homes Grant, available from: https://www.nrcan.gc.ca/energy-efficiency/homes/canada-greener-homes-grant/23441 • Independent Electricity System Operator, Capacity Auction, 2022, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Capacity-Auction • Data provided by Toronto Hydro • Independent Electricity System Operator, Active Generation Contract List, available from: https://www.ieso.ca/en/Power-Data/Supply-Overview/Distribution-Connected-Generation • City of Toronto, Toronto Green Standard, available from: https://www.toronto.ca/city-government/planning-development/official-plan-guidelines/toronto-green-standard/ • City of Toronto, 2018, Forest and Land Cover, available from: https://open.toronto.ca/dataset/forest-and-land-cover/ • City of Toronto, 2021, 3D Massing, available from: https://open.toronto.ca/dataset/3d-massing/ • City of Toronto, 2019, Physical area of parking lots, available from: https://open.toronto.ca/dataset/3d-massing/ • Google Insights, Environmental Insights Explorer, available from: https://insights.sustainability.google/places/ChIJpTvG15DL1IkRd8S0KlBVNTI • City of Toronto, SolarTO, available from: https://www.toronto.ca/services-payments/water-environment/environmental-grants-incentives/solar-to/ • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/

Parameter	Reference(s)
	• National Renewable Energy Laboratory, 2021, The North American Renewables Integration Study (NARIS): A Canadian Perspective, available from: https://www.nrel.gov/analysis/naris.html
Onshore wind	• Data provided by Toronto Hydro • City of Toronto, 2018, Forest and Land Cover, available from: https://open.toronto.ca/dataset/forest-and-land-cover/ • Mackay, D., 2008, Sustainable Energy - Without the Hot Air, available from: https://www.withouthotair.com/ • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/
Biogas	• Data provided by Toronto Hydro • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • City of Toronto, Turning Waste into Renewable Natural Gas, available from: https://www.toronto.ca/services-payments/recycling-organics-garbage/solid-waste-facilities/renewable-natural-gas/ • The Department for Business, Energy, and Industrial Strategy, 2017, Hybrid Heat Pumps, available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700572/Hybrid_heat_pumps_Final_report-.pdf • Ontario Clean Air Alliance, 2021, Ontario Municipalities that have endorsed gas power phase-out, available from: https://www.cleanairalliance.org/ontario-municipalities-that-have-endorsed-gas-power-phase-out/
Other non-renewable generation	• Data provided by Toronto Hydro • City of Toronto, 2021, TransformTO Net Zero Strategy, available from: https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/ • Ontario Clean Air Alliance, Ontario Municipalities that have endorsed gas power phase-out, March 2021

Table 6: Battery Storage Parameters

Parameter	Reference(s)
Domestic battery storage	• National Renewable Energy Laboratory, 2021, Cost Projections for Utility-Scale Battery Storage: 2021 Update, available from: https://www.nrel.gov/docs/fy21osti/79236.pdf

Parameter	Reference(s)
	• KPMG, 2016, Development of decentralised energy and storage systems in the UK, available from: https://www.r-e-a.net/resources/development-of-decentralised-energy-and-storage-systems-in-the-uk-2/ • Data provided by Toronto Hydro • Ontario Energy Board (OEB), Frequency of Regulated Price Plan Switching Under Consumer Choice, 2021
I&C behind-the-meter battery storage	• National Renewable Energy Laboratory, 2021, Cost Projections for Utility-Scale Battery Storage: 2021 Update, available from: https://www.nrel.gov/docs/fy21osti/79236.pdf • KPMG, 2016, Development of decentralised energy and storage systems in the UK, available from: https://www.r-e-a.net/resources/development-of-decentralised-energy-and-storage-systems-in-the-uk-2/ • Independent Electricity System Operator, 2021, Annual Planning Outlook, available from: https://www.ieso.ca/en/Sector-Participants/Planning-and-Forecasting/Annual-Planning-Outlook • Independent Electricity System Operator, Accessed 2022, Hourly Ontario Energy Price (HOEP), available from: https://www.ieso.ca/en/Power-Data/Price-Overview/Hourly-Ontario-Energy-Price • Independent Electricity System Operator, Accessed 2022, Capacity Auction, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Capacity-Auction • Independent Electricity System Operator, Accessed 2022, Operating Reserve Markets, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Operating-Reserve-Markets • Independent Electricity System Operator, Accessed 2022, Ancilliary Services, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Ancillary-Services-Market • Independent Electricity System Operator, Accessed 2022, Global Adjustment Class A Eligibility, available from: https://www.ieso.ca/en/Sector-Participants/Settlements/Global-Adjustment-Class-A-Eligibility • Convergent, Accessed 2022, Energy Storage Versus Generators: the Case for Battery Storage in Ontario, available from: https://www.convergentep.com/portfolio/energy-storage-versus-generators-the-case-for-battery-storage/ • Independent Electricity System Operator, Accessed 2022, Energy Efficiency Auction Pilot, available from: https://www.ieso.ca/en/Sector-Participants/Market-Operations/Markets-and-Related-Programs/Energy-Efficiency-Auction-Pilot • Data provided by Toronto Hydro

QUESTION (D):

d) Please indicate if/how the modeling was validated against the City of Toronto energy and emissions plan information, modeling and data.

RESPONSE (D):

Response from ERM:

Nothing by the name of the “City of Toronto energy and emissions plan” was used. The modeling takes many sources of Toronto-specific data as input, however. Please review the second and third paragraphs in section 2 (page 3) where TransformTO is referred to as the most significant existing resource that was used. Please feel free to also see the references listed in the above table.

Response from Toronto Hydro:

Note that the FES model was an independent exercise not intended to validate or reproduce results of any City of Toronto energy and emissions models.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-37

Reference: Grid Modernization Strategy

Please explain how THESL will pick where to deploy each of the Grid Modernization elements (i.e. are there specific geographies or areas of the grid, or will it be spread diffusely across the system).

RESPONSE:

As noted in Exhibit 2B, Section D5, grid modernization elements are present across a number of investment programs and encompass different technologies. Each of these programs and technologies require different strategies for deployment. However, all strategies are grounded in the basic principles of identifying those areas of the system where the technologies will have the greatest benefit, reduce the greatest amount of risk, or both. The only exception may be very early-stage modernization initiatives (such as innovation projects), where the area for deployment may be based on specific demonstration project criteria.

While summaries are provided in Sections D5.2.1, D5.2.2, and D5.2.3, more detail can be found when referring to the investment programs themselves. Table 2 starting at page 19 and Table 3 started at page 34 provide references to the investment program(s) associated with each grid modernization element/technology. These program narratives provide greater detail on the strategy for deployment.

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-38

Reference: DER connections have grown in recent years as a result of government policies and declining costs of technologies such as solar panels. By the end of the decade, Toronto Hydro expects to have over 4,400 DER connection projects representing a total installed capacity of approximately 517 MW, an increase of approximately 67 percent compared to 2022. [Investment Plan Section 2.3.1]

Please provide a breakdown by major category of the current and expected (end of decade or best available information) DERs by count and MW contribution.

RESPONSE:

Table 1: DERs by Count and MW Contribution

Generation Type	2022 (Units)	2022 (MW)	2029 (Units)	2029 (MW)
Renewable	2280	116.2	4263	200.4
Energy Storage	28	18.7	82	89.5
Non-Renewable	116	170.0	147	226.8
Total	2424	304.9	4492	516.7

RESPONSES TO POLLUTION PROBE INTERROGATORIES

INTERROGATORY 2B-PP-39

Reference: **Exhibit 2B, Section E3.2.1 Forecasted Connections for Renewable - Between 2023 and 2029, Toronto Hydro forecasts over 1700 additional renewable connections (totaling over 74 MW) to the distribution system.**

Please summarize what THESL is doing to promote and enable customers to invest in and connect the over 1700 additional renewable resources.

RESPONSE:

In accordance with the Distribution System Code, Toronto Hydro promotes renewable generation connections by providing cost limiting measures. Capital assets such as the SCADA monitoring equipment under the Generation Protection, Monitoring and Control (GPMC) program (Exhibit 2B Section E5.5) provides customers the required telemetry monitoring component to provide system controllers visibility on remote generation assets, ensuring the safe delivery of distributed energy.

Toronto Hydro is committed to meeting timelines throughout the DER Connections process, such as Connection Impact Assessments, to ensure timely project completions. Please see Exhibit 1B, Tab 3, Schedule 1 at page 24.

Toronto Hydro has also performed informational outreach presentations to promote and enable DERs. One example is the Climate Action and Solar Connection Process For Connections < 10kW presentation conducted by Toronto Hydro for the Harbord Village Residents' Association (HVRA), which is a volunteer organization of residents representing and engaging home owners and renters living in Toronto between Bloor, College, Spadina, and Bathurst Streets.

For more information, please refer to Toronto Hydro's response to interrogatory 1B-PP-8.