Elson Advocacy

BY EMAIL AND RESS

October 27, 2021

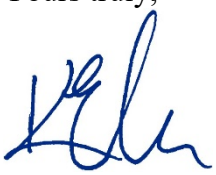
Ms. Christine Long
Board Secretary
Ontario Energy Board
2300 Yonge Street, Suite 2700, P.O. Box 2319
Toronto, Ontario M4P 1E4

Dear Ms. Long:

Re: EB-2021-0110 – Custom IR Application (2023-2027) for Hydro One Networks Inc. Transmission and Distribution

Enclosed please find a revised version of Environmental Defence's interrogatories that makes a number of minor corrections and includes two additional interrogatories.

Yours truly,



Kent Elson

cc: Parties in this proceeding

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EB-2021-0110
Hydro One Joint Transmission and Distribution – 2023-2027

Interrogatories of Environmental Defence

Interrogatory # A-ED-1

Reference: EB-2021-0110, Exhibit A, Tab 3, Schedule 1, Page 29

Questions:

(a) How many kilometres of transmission lines does HONI expect to replace over 2023-2027? Please provide a table showing an estimate for each year and an estimated total over the whole period.
(b) How many kilometres of distribution lines does HONI expect to replace over 2023-2027? Please provide a table showing an estimate for each year and an estimated total over the whole period.

Interrogatory # B-ED-2

Reference: EB-2021-0110, Exhibit B-1-1, Section 1.2, Page 17

Questions:

(a) Please provide a status update on the Merivale TS to Hawthorne TS – 230kV Conductor Upgrade (T-SS-03).
(b) Please provide the expected in-service date and advise whether this has changed since approval of the leave to construct.

Interrogatory # A-ED-3

Reference: EB-2021-0110, Exhibit B-1-1, Section 1.2, Page 15

Questions:

(a) Please provide a list of all RIP projects that involve new conductors or replaced conductors of 1 km in length or longer.
(b) For the list of projects in (a), please complete the following table:

Project	Forecast cost	Current conductor size	Proposed conductor size	Maximum conductor size without tower replacement	Would an upsized conductor be cost-effective if losses are	Has an upsized conductor been screened

					valued at $120/MWh?	out? If yes, why.
Project 1						
…						
Project n						

(c) Please provide a list of all RIP projects with a current cost estimate of more than $10 million.

Interrogatory # B-ED-4

Reference: Exhibit B-1-1, Section 1.2, Page 23

Preamble: The evidence lists the following project:

> Supply Capacity need to Kingsville – Leamington area:
> - Build new switching station at Leamington Junction (Lakeshore TS),
> - Build Leamington Area Transformer Stations – South Middle Road DESN1 and DESN2 (referred to as "Leamington Area Station #4") in T-SA-10; and
> - Build 230 kV double-circuit transmission line from Chatham SS to the new Lakeshore TS (Station costs reflected in T-SS-07, transmission line costs have been excluded, see Exhibit A-03-01 for further information) .

Questions:

(a) What is the status of this project?
(b) What is the forecast cost?
(c) Will HONI be conducting further analysis to determine if all or part of the project can be avoided or deferred cost-effectively through distributed energy resources?

Interrogatory # B-ED-5

Reference: Exhibit B-2-1, Section 2.1, Page 5

Preamble:

> "Transmission Line Components Refurbishment (T-SR-04 to T-SR-08, T-SR-13, T-SR-17) – 16 individual investments that target the refurbishment of 1,571 km poor condition conductors, and other capital programs that replace poor condition lines components such as wood poles, insulators, shieldwires at the cost of $1,919M over the five-year period."

Questions:

(a) Please complete the following table for the 16 individual investments mentioned above.

Project	Forecast cost	Length of lines to be replaced	Current conductor size	Proposed conductor size	Maximum conductor size without tower replacement	Would an upsized conductor be cost-effective if losses are valued at $120/MWh?	Has an upsized conductor been screened out? If yes, why.
Project 1							
…							
Project n							

(b) Please indicate for each of the 16 projects whether leave to construct will be required, and if not, why not.

Interrogatory # B-ED-6

Reference: Exhibit B-2-1, Section 2.1, Page 5

Questions:

(a) Please complete the following table:

Project	Forecast cost	Current conductor size	Proposed conductor size	Maximum conductor size without tower replacement	Would an upsized conductor be cost-effective if losses are valued at $120/MWh?	Has an upsized conductor been screened out? If yes, why.
West of Chatham Transmission Reinforcement (T-SS-07)						
West of London Transmission Reinforcement (T-SS-09)						

Interrogatory # B-ED-7

Reference: Exhibit B-2-1, Section 2.1, Page 20

Preamble: The evidence states:

> Hydro One plans to renew its stations facilities at the Bruce A and Bruce B switching stations that connect the Bruce A and B Nuclear Generating Stations (NGS). Hydro One has similar plans at Cherrywood TS which connects the Pickering NGS and Darlington NGS. Hydro One also plans to undertake renewal work at the Milton TS and Claireville TS which receive power coming from the Bruce NGS and serve as major hubs of the southern Ontario transmission system

Questions:

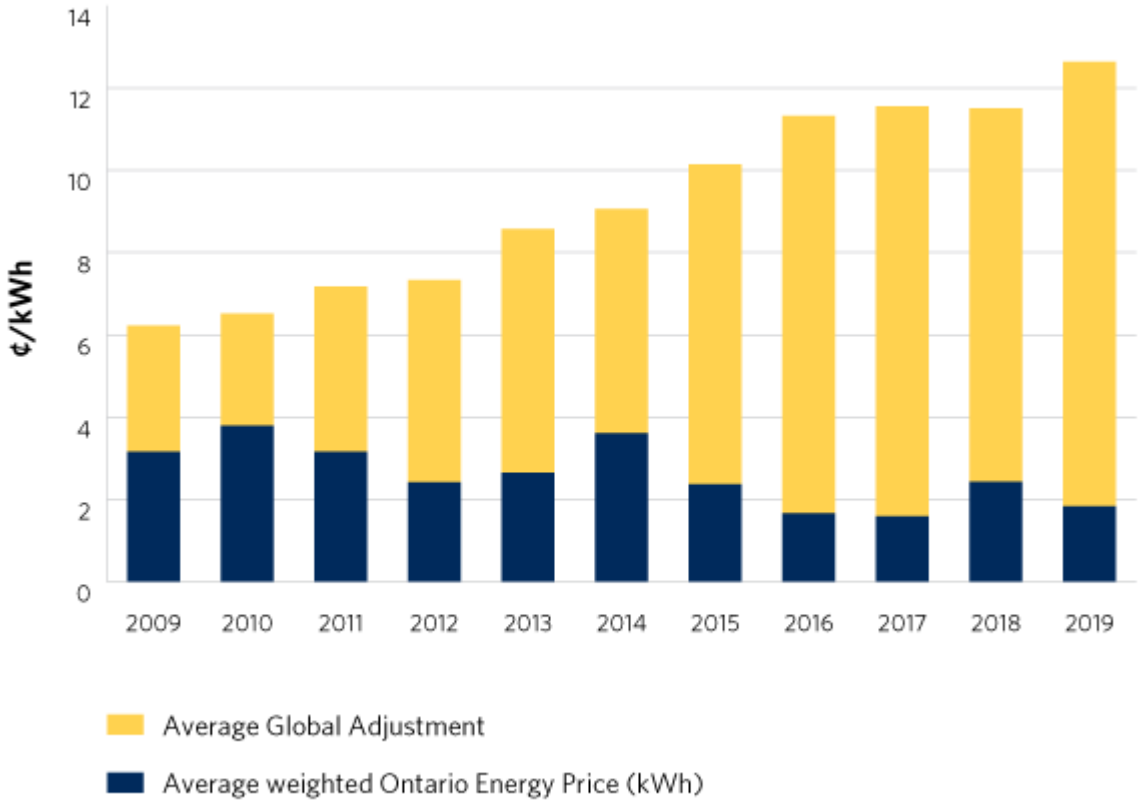
(a) Please provide a table listing the cost of each of the above projects and a total cost for all of those projects.
(b) For each of the above-referenced projects, please indicate whether the renewal will increase the station capacity, and if yes, by how much and the rationale for the increased capacity.

Interrogatory # B-ED-8

Reference: Exhibit B-2-1, Section 2.3, Attachment 4

Questions:

(a) Please provide a list of all documentation provided to Stantec.
(b) Please provide a copy of all documentation provided to Stantec.
(c) In preparing its report, did Stantec consider the appropriateness of valuing transmission losses based on the HOEP? If yes, please provide all analysis of this.
(d) Does the Stantec report address the appropriateness of valuing transmission losses based on the HOEP?
(e) In Stantec's opinion, is it appropriate to value loss reductions based on the HOEP?
(f) In Stantec's opinion, does the HOEP represent the full avoided cost of electricity? If yes, please explain how that can be the case in light of the below figure from the IESO's website:



(g) Please explain why the Transmission Line Loss Guidelines requires planners to calculate the cost of annual losses based on the HOEP (per step 4 on page 25).
(h) Does Hydro One take the position that it must follow a loss valuation methodology set out by the IESO? Please confer with the IESO to determine if it agrees with Hydro One's answer to this question.
(i) Is Hydro One or the IESO responsible for the decision to value transmission losses at the HOEP? Please confer with the IESO to determine if it agrees with Hydro One's answer to this question.
(j) Please provide an update of the figure cited in (f) above that incudes 2020.
(k) Please confirm that transmission loss reductions can lower capacity needs.
(l) Please confirm that transmission losses are taken in to account when determining resource adequacy.
(m) Please discuss the options considered by Hydro One aside from the HOEP for the valuation of transmission losses. For example, did Hydro One consider using the avoided energy and capacity costs as set out in the Annual Planning Outlook and the full wholesale cost (HOEP & GA)? Please fully explain the rational for Hydro One's decisions in this regard. Please also provide the original documentation wherein the analysis took place.
(n) Do the transmission line loss guidelines apply to system renewal projects where lines will be replaced? If not, why not and how will transmission lines be considered?

(o) Has the guideline been applied to the 16 line refurbishment projects described on Exhibit B-2-1, Section 2.1, Page 5? If yes, please provide a copy of the outcome of that analysis for each project.
(p) Please provide a live excel copy of the workbook at page 30.
(q) Does the guideline cover other equipment replacement, such as transformers? If not, please provide the guideline for this other equipment, including the document which details the appropriate valuation of losses.
(r) Please prepare a side-by-side document comparing the steps in Hydro One's guideline for assessing potential transmission loss reduction opportunities with the steps it uses for distribution loss reduction opportunities.

Interrogatory # B-ED-9

Reference: Exhibit B-2-1, Section 2.3, Attachment 4

Preamble:

> In a letter dated May 14, 2021, Environmental Defence provided the following summary of its comments on the Transmission Line Loss Guideline:

1. Use forecast demand figures to estimate loss reductions, not historic figures;
2. Use a net-present-value ("NPV") calculation over the asset lifetime, not a first-year cost comparison, at least for the more detailed calculations;
3. Use accurate avoided electricity cost assumptions, not only the HOEP;
4. Use hourly or seasonal avoided electricity cost figures in the detailed calculations to account for the fact that transmission losses are highest when electricity costs are highest;
5. Consider loss reductions alongside other monetized benefits (e.g., capacity on the bulk electricity system), not in isolation, including these steps:
    a. Explore with the IESO whether there are other benefits of increased conductors that can be monetized and document the outcome of this exploration; and
    b. Ensure the detailed loss valuation calculations are completed and added to overall cost-benefit evaluations; and
6. Conduct sensitivity analysis: (a) for projects over a certain cost threshold, and (b) for all projects until the completion of the IESO-coordinated work on avoided electricity cost figures.

Questions:

(a) Are these comments still under consideration?

(b) Please provide a response to each of those comments (for further details please see the letter of May 14, 2021).
(c) Please file a copy of the May 14, 2021 letter as an attachment to this response.
(d) Did Hydro One make any changes to its proposed guideline as a result of its consultation with stakeholders? If not, why not?
(e) Is Hydro One still in the process of finalizing the guidelines and open to refinements?

Interrogatory # B-ED-10

Reference: Exhibit B-2-1, Section 2.3, Attachment 4

Questions:

(a) Please list the various electricity price forecasts that Hydro One uses for various planning purposes.
(b) Please provide a copy of the forecasts listed in (a).
(c) Please list the various capacity price forecasts that Hydro One uses for various planning purposes.
(d) Please provide a copy of the forecasts listed in (c).

Interrogatory # B-ED-11

Reference: EB-2021-0110, ISD T-SA-01 to T-SA-10

Questions:

(a) Please complete the following table for T-SA-01 to T-SA-10:

	Total Cost	Total CIAC	Total forecast incremental revenue
T-SA-01			
…			
T-SA-10			

(b) Does Hydro One's application include projects that are 100% customer funded? If not, please estimate the cost of these projects over 2023-2027.
(c) Please provide a table showing the system access costs for each year from 2018 (historic) to 2027 (forecast) broken down by those funded by the customers being connected and those recovered from all ratepayers through the revenue requirement.

Interrogatory # B-ED-12

Reference: ISD T-SR-01, Page 31

Questions:

(a) Please reproduce the table at page 31 removing the columns showing the annual capital investments but adding the following columns: (i) capacity pre-construction, (ii) capacity post-construction, (iii) ancillary benefits ($).
(b) When Hydro One upgrades transfer stations, does it consider whether to increase their capacity? If yes, what factors are considered?

Interrogatory # B-ED-13

Reference: ISD T-SR-13, p. 22

Preamble: Hydro One plans to spend $833.2 million on transmission line complete refurbishments.

Questions:

(a) Please reproduce the table at page 22 removing the columns showing the annual capital investments but adding the following columns: (i) current conductor size, (ii) proposed conductor size, (iii) maximum conductor size without tower replacement, (iii) has the transmission loss guideline analysis been undertaken for this project?, (iv) would an upsized conductor be cost-effective if losses were valued at $120/MWh, (v) has an upsized conductor been screened out? If yes, why.
(b) Please provide the documentation produced in the process of applying the transmission line loss guideline to each of the projects in the table on page 22.

Interrogatory # B-ED-14

Reference: Exhibit B-2-1, Section 2.1, Page 21

Preamble: Section 4.1 of the 2015 OEB CDM Guidelines states:

> "Distributors may apply to the Board for funding through distribution rates to pursue various activities such as CDM programs, demand response programs, energy storage programs and programs reducing distribution losses for the purpose of deferring the capital investment for specific distribution infrastructure. Any such application must include a consideration of the projected effects to the distribution system on a long-term basis.
>
> Applications can be filed at any time. The Board expects that as part of its long-term planning processes, a distributor will consider applications for CDM programs to defer distribution infrastructure. The distributor should explain the proposed program in the

context of the distributor's five-year Distribution System Plan ("DSP") or explain any changes to its system plans that are pertinent to the program."

Questions:

(a) Is Hydro One permitted to seek approval for CDM programs to cost-effectively defer or avoid transmission system upgrades? Please include excerpts of the applicable rules or guidelines.
(b) Is Hydro One proposing any CDM programs to defer transmission infrastructure in this application? If not, why not.
(c) Please describe the steps taken by Hydro One to consider CDM as an alternative to each transmission system service project over 2023-2027. Please address each project and sub-project separately.
(d) What is the main entity responsible for considering non-wires-alternatives to transmission system service projects?

Interrogatory # B-ED-15

Reference: Exhibit B-3-1, Section 3.4, Page 2

Preamble: "Hydro One continues to apply the DSC rules related to Renewable projects by funding a portion of the expansion cost (up to $90,000/MW) and 100% of Renewable Enabling Improvement (REI) investments."

Questions:

(a) Please describe the eligibility criteria for the above funding. Please attach the relevant sources for the eligibility.
(b) What discretion does HONI have in interpreting the eligibility criteria.
(c) Does this apply to storage? If not, why not?

Interrogatory # B-ED-16

Reference: Exhibit B-3-1, Section 3.4, Page 2

Preamble:

"Since 2018, the DER applications received by Hydro One have been primarily combined heat and power/co-generation, natural gas, diesel and BESS. The cost for connecting these non-renewable energy projects to Hydro One distribution system is 100% recoverable from the DER customers."

Questions:

(a) Why does Hydro One consider Battery Energy Storage Systems (BESS) to be non-renewable? Is this Hydro One's interpretation of eligibility rules? Please explain and provide sources.
(b) Storage systems are also system loads and thus generate revenue for the distribution system. Are the connection costs for storage systems reduced by forecast revenues for the purposes of calculating customer capital contributions? Please explain why or why not. Please provide an answer for (i) a stand-alone storage device and (ii) a storage system added to an existing load customer.

Interrogatory # B-ED-17

Reference: Exhibit B-3-1, Section 3.4, Page 3-7

Questions:

(a) Please describe the DERs that are capacity allocation exempt, and why.
(b) Please provide a table showing the forecast for each year up 2027 in DERs (total kW) for storage, fossil gas, diesel, solar, wind, and other.
(c) Does the restricted DS and TS list on page 7 include all the stations that do not have capacity to connect DER? If not, please provide the complete list.
(d) Please reproduce Table 4 adding columns to indicate the approximate number of customers and MW load served by each station.
(e) If the restrictions on the feeders in Table 4 were eliminated, approximately how many DERs would likely apply for connections on those feeders (# and MW)? Please provide an estimate based on the average numbers of DER connections elsewhere in Hydro One's service area.

Interrogatory # B-ED-18

Reference: ISD D-SS-04

Preamble: "This investment involves implementing battery energy storage solutions to improve reliability for customers who experience long interruption durations. The primary trigger of the investment is reliability. The investment is expected to improve reliability for vulnerable customers at locations where traditional reliability solutions are not economically viable or practical."

Questions:

(a) Will these storage systems also be used to peak shave to serve a portion of the demand at peak times? If not, why not?
(b) Could these storage systems be used to peak shave during periods where the chance of outages are very low, such as times of calm weather?
(c) Page 5 describes outages in Aroland First Nation. Please provide a list of these outages and the cause (e.g. storm)

(d) Please provide a table showing the proposed investments and the MW capacity of each.
(e) Page 6 states that "Hydro One proposes to install residential battery storage at around 2100 homes across the province over the plan period." Please describe (i) the range of capacity (kW) and average capacity of these units, (ii) the total cost of each unit, (iii) the total cost of installation and overhead, (iv) the portion of the costs covered by the customer vs. ratepayers.
(f) Please confirm that the new electric Ford F150 advertises an ability to provide backup power to a home for 10 days if electricity is conserved.
(g) Will Hydro One consider provide assistance for customers to purchase bi-directional electric vehicle chargers as a way to cost-effectively increase reliability?
(h) For each of grid-connected the storage systems Hydro One plans to install, please calculate the benefit of using the storage system to smooth out system peaks during times of low outage risks. Please include the benefits in terms of lower energy and capacity costs as well as lower transmission losses. Please include all calculations. Please make assumptions as necessary and state every assumption.

Interrogatory # B-ED-19

Reference: Exhibit B-3-1

Preamble: Section 4.1 of the 2015 OEB CDM Guidelines states:

> "Distributors may apply to the Board for funding through distribution rates to pursue various activities such as CDM programs, demand response programs, energy storage programs and programs reducing distribution losses for the purpose of deferring the capital investment for specific distribution infrastructure. Any such application must include a consideration of the projected effects to the distribution system on a long-term basis.
>
> Applications can be filed at any time. The Board expects that as part of its long-term planning processes, a distributor will consider applications for CDM programs to defer distribution infrastructure. The distributor should explain the proposed program in the context of the distributor's five-year Distribution System Plan ("DSP") or explain any changes to its system plans that are pertinent to the program."

Questions:

(a) Please file any guidelines, standards, or processes that Hydro One uses to "consider applications for CDM programs to defer distribution infrastructure" as outlined in the above except from the OEB CDM guidelines.
(b) Is Hydro One proposing any CDM programs to defer distribution infrastructure in this application? If not, why not.
(c) Please describe the steps taken by Hydro One to consider CDM as an alternative to each of the projects listed in Exhibit B-3-1, Section 3.11, pages 1-2. Please address each project and sub-project separately with a particular focus on system service.

(d) What is the main entity responsible for considering non-wires-alternatives to system service projects?
(e) What steps will Hydro One take to revaluate its plans for 2023-2027 if the proposed changes to the CDM guidelines are implemented by the OEB?

Interrogatory # B-ED-19

Reference: Exhibit B-3-1, Section 3.6, Page 9

Questions:

(a) Please elaborate on the following excerpt and confirm whether Hydro One declined to update its line loss study as directed by the OEB:

Update its distribution line loss study for consideration in its next rebasing application, which should include an assessment of the actual line losses for a five-year period.	151	Hydro One assessed the actual line losses for a five-year period and is filing the results of this assessment, which indicates that the anomalous variation that caused the OEB to require an updated study is not present in the previous five-year period.	L-06-02 L-06-02-01	Clement Li and Bijan Alagheband

(b) Please file a copy of any distribution line loss studies completed by Hydro One since 2000.
(c) Does Hydro One Distribution 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.
(d) If Hydro One Distribution 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)?
(e) Further to the above question, Hydro Ottawa and Burlington Hydro use the all-in cost of electricity. If Hydro One Distribution's practice differs, please explain whether there are aspects of its system that would justify this.
(f) Please complete the following table:

Value of Hydro One Distribution System Energy Losses –						
	2015 (historic)	…	2027 (forecast)	Historic annual average	Forecast annual average	Total
Electricity Purchases (MWh)						
Electricity Sales (MWh)						
Losses (MWh)						
Losses %						
All-In Cost of Electricity						

($/MWh) – Annual Average						
Cost of Losses ($)						

(g) Please complete the following table:

GHG's from Hydro One's Forecast Distribution System Energy Losses						
	2023	2024	2025	2026	2027	Total
Forecast Losses (MWh)[1]						
Carbon Intensity of Electricity[2] (CO2e/MWh)						
GHGs (CO2e)						

(h) 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 Hydro One willing to agree to the same terms? If not, what commitments can Hydro One make to the Board in this regard? In particular, please indicate what target Hydro One is willing to meet.

(i) 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 Hydro One willing to agree to the same terms? If not, what commitments can Hydro One make to the Board in this regard?

(j) 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 Hydro One willing to agree to implement similar technology through an

[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; see also the data tables at http://www.ieso.ca/-/media/Files/IESO/Document-Library/planning-forecasts/apo/Annual-Planning-Outlook-Data-Tables-Jan2020.xlsx?la=en.

equivalent commitment? If not, what commitments can Hydro One make to the Board in this regard?

(k) Please complete the following table:

Distribution Losses – Correlated with Consumption and Peak Demand				
	2010	…	2020	Average
Annual distribution losses (MWh)				
Annual consumption (MWh)				
Losses as % of consumption (%)				
Peak demand (MW)				
Ratio of loss % to peak demand				

Interrogatory # D-ED-20

Reference: Exhibit D, Tab 4, Schedule 1 (transmission load forecast)

Questions:

(a) Please provide Hydro One Transmission's best estimate of the following data for the *average* electrically heated MURB customer, per building and per unit if possible:
   i. Total kWh demand;
   ii. Peak kW demand for each month;
   iii. Total kWh demand for space heating only; and
   iv. Peak kW demand for each month for space heating only.

(b) Please provide Hydro One's best estimate of the following data for all electrically heated MURB customers:
   i. Total kWh demand;
   ii. Peak kW demand for each month;
   iii. Total kWh demand for space heating only;
   iv. Peak kW demand for each month for space heating only;
   v. Number of customers; and
   vi. Number of units.

Interrogatory # D-ED-21

Reference: Exhibit D, Tab 5, Schedule 1 (distribution load forecast)

Questions:

(a) Please provide Hydro One Distribution's best estimate of the following data for the *average* electrically heated MURB customer, per building and per unit if possible:
    i. Total kWh demand;
    ii. Peak kW demand for each month;
    iii. Total kWh demand for space heating only; and
    iv. Peak kW demand for each month for space heating only.
(b) Please provide Hydro One's best estimate of the following data for all electrically heated MURB customers:
    i. Total kWh demand;
    ii. Peak kW demand for each month;
    iii. Total kWh demand for space heating only;
    iv. Peak kW demand for each month for space heating only;
    v. Number of customers; and
    vi. Number of units.

Interrogatory # E-ED-22

Reference: Exhibit E, Tab 3, Schedule 3, Page 10

Preamble:

> "A potential key contributor to energy demand growth in Ontario will be the electrification of transportation. Hydro One is actively monitoring developments related to electric vehicles, and participating in a variety of industry forums such as Electric Power Research Institute (EPRI) and the Centre for Energy Advancement through Technological Innovation (CEATI). In addition to electric vehicles (cars), it is expected that other forms of electric transportation will emerge quickly, such as electric buses. If transit authorities in the province decide to deploy a large number of electric buses, significant demands on lines and station assets will result."

Questions:

(a) Please file a copy of any reports in Hydro One's possession containing forecasts for the numbers of electric vehicles in Ontario and/or Hydro One's service area.
(b) Please file a copy of any reports in Hydro One's possession on the impacts of electric vehicles on (i) utility revenue and (ii) utility costs.
(c) What is Hydro One's best estimates of the number of electric cars in its service area total and incremental between now and 2030?
(d) Please describe all steps that Hydro One is taking or considering to encourage customers to charge their cars at off-peak times.
(e) Please describe all steps that Hydro One is taking or considering to encourage customers to use their car batteries to off-set the peak load of their building via bi-directional chargers.
(f) Please estimate the impact on Hydro One's revenues and costs as a result of electric vehicles over 2023-2027. Please consider whether Hydro One will experience additional

revenues than costs as described in the following Synapse energy study: https://www.synapse-energy.com/sites/default/files/EVs-Driving-Rates-Down-8-122.pdf. Please explain the response.

(g) Please describe Alectra's optional EV rate pilot project.

(h) Is Hydro One open to offering an optional EV rate structure to encourage EV owners to charge at off-peak times? What regulatory applications and approvals would be necessary to do so?

Interrogatory # B-ED-23

Reference: Exhibit B & Exhibit G, Tab 1, Schedule 2, Page 35

Preamble: Hydro One states as follows:

> "Additionally, objectives related to decarbonisation and electrification may result in increased adoption of electric vehicle or fuel switching, which are likely to drive changes to forecasts for service upgrades."
>
> For all of the below questions, please provide an answer on a best efforts basis and please make and state any assumptions and caveats as necessary.

(a) Please complete the following table:

Hydro One Customers – Characteristics by Sector			
	2022	…	2027
Total 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			

(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[3]) (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									

(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 &	Average Peak Winter Demand (GSHP & HPWP, sCOP=5) (kWh)

[3] Equivalent to ~sCOP=2.9 (2.96516)

				HPWP, HSPF Region 5=10[4]) (kW)					
	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									

(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[5]) (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									

(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, Hydro One 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		
	Standard unit		

[4] Equivalent to ~sCOP=2.9 (2.96516)
[5] Equivalent to ~sCOP=2.9 (2.96516)

Air source heat pumps in hybrid systems (if different)	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		

Interrogatory # B-ED-24

Reference: Exhibit B & Exhibit G, Tab 1, Schedule 2, Page 35

Preamble: Hydro One states as follows:

> "Additionally, objectives related to decarbonisation and electrification may result in increased adoption of electric vehicle or fuel switching, which are likely to drive changes to forecasts for service upgrades."

Questions:

(a) What investments is Hydro One making over 2023-2027 to accommodate an expansion of electric vehicles? Please describe these and provide the dollar total.
(b) What investments is Hydro One making over 2023-2027 to accommodate fuel switching over that period? Please describe these and provide the dollar total.
(c) Please confer with staff for the Canada Greener Homes Grant to obtain estimates of: (i) the number of customers in Ontario that will use the grant to switch from fossil fuel heating to an electric heat pump and (ii) the number of customers that will use the grant to switch from electric resistance heating to an electric heat pump. Please provide a response on an annual basis if possible.

Interrogatory # B-ED-25

Reference: Exhibit B & Exhibit G, Tab 1, Schedule 2, Page 35

Questions:

(a) Does a residential customer need to notify or seek approval from Hydro One before installing a high-speed electric vehicle charger? Please explain and provide any relevant excerpts from the relevant document containing said requirement.
(b) Does a residential customer need to notify or seek approval from Hydro One before installing a high-speed bi-directional electric vehicle charger (under 10 kW) that does not export to the grid? Please explain and provide any relevant excerpts from the relevant document containing said requirement.
(c) How many applications to install bi-directional EV charges has Hydro One received?
(d) Can Hydro One require a residential customer to make a financial contribution toward distribution system upgrades necessary to allow the customer to install a high-speed one-directional EV charger? If yes, would Hydro One do so? Please explain.
(e) Can Hydro One require a residential customer to make a financial contribution toward distribution system upgrades necessary to allow the customer to install a high-speed bi-directional EV charger (non-exporting)? If yes, would Hydro One do so? Please explain.
(f) Generally speaking, what protective devices would be needed for a residential customer to install a bi-directional EV charger that is not meant to export to the grid to ensure that there is no damage in the event of a grid outage?
(g) Is Hydro One obligated to undertake the upgrades necessary for residential customers to install EV chargers if they choose to do so?
(h) How many electric vehicles will Hydro One buy over 2023-2027?
(i) How many electric vehicle chargers will Hydro One buy over 2023-2027?
(j) Please provide all data and estimates that Hydro One has on the number of EV chargers on its network and their charging rates (kW) and a breakdown by customer class.

Interrogatory # L-ED-26

Reference: Exhibit L, Tab 2, Schedule 1, Page 10

Questions:

(a) Please complete the following table for all non-residential metered customers (GSe, GSd, UGe, UGd, DGen, ST, AUR, AUGe, AUGd, AR, AGSe & AGSd). Please provide a copy in a live excel spreadsheet.

Fixed Charges – Actual and Estimated vs. OEB Maximum			
	2010 (actual)	…	2027 (estimated)
Fixed Charge			
Gse			
…			
AGSd			
Maximum Fixed Charge (minimum system with PLCC adjustment)			
Gse			
…			
AGSd			

Number of Customers			
Gse			
…			
AGSd			
Revenue from Fixed Charges			
Gse			
…			
AGSd			
Total			
Revenue if Fixed Charge Set at Maximum			
Gse			
…			
AGSd			
Total			

(b) Please reproduce the above table for 2023 to 2027 as if Hydro One were to set its fixed rates in accordance with the following ruling in Hydro Ottawa's rates case: "[T]he OEB finds that fixed charges should be set by comparing the fixed charge resulting from Hydro Ottawa's standard rate design approach with the previous year's level for the five year rate term. In years where maintaining the current fixed/variable revenue split results in a higher fixed charge than the previous year, Hydro Ottawa shall maintain the fixed charge at the previous year's level. In years where maintaining the current fixed/variable revenue split results in a lower fixed charge than the previous year, Hydro Ottawa shall maintain the fixed charge at the lower value."

Interrogatory # B-ED-27

Reference: Exhibit B-3-1

Question:

(a) If Hydro One determines that an infrastructure need can be met more cost-effectively through a non-wires-alternative (NWA) during the 2023-2027 period, is Hydro One able to use the revenue requirement approved in this application to undertake that NWA? Please explain if additional OEB approval is required, why, and the trigger for any such requirement. If the answer depends on a number of factors, please describe those factors.

Interrogatory # B-ED-28

Reference: Exhibit B & Exhibit G, Tab 1, Schedule 2, Page 35

Questions:

(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.
(b) Please describe all steps Hydro One is taking to (a) assist its customers in installing or purchasing electric vehicle chargers and (b) install electric vehicle chargers for its own use.
(c) With respect to Hydro One's efforts to install electric vehicle chargers, what proportion will be bi-directional chargers?
(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 Hydro One consider a similar pilot? Would this require additional regulatory approvals if it were to occur prior to 2027?
(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 Hydro One considering similar pilots? If not, why not. Would this require additional regulatory approvals if it were to occur prior to 2027? Please explain.
(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?
(h) Please comment on the following potential non-wires-alternative to traditional infrastructure and whether Hydro One 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 – see right)
    - 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 Hydro One 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 Hydro One 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
  - 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
  - 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
  - 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

(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.)

(l) Does Hydro One 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?