EB-2022-0059
PUC Distribution Inc. – Cost of Service Application

Interrogatories of Environmental Defence

1. **Reference: Distribution System Plan**

Questions:

(a) Please describe how PUC sizes new equipment to ensure it will be able to handle the future load from electrification.
(b) For the three largest capital spending items in the distribution system plan, please provide the following:
    i. What is the approximate threshold of electric vehicle penetration (%) in the relevant area at which point an additional upgrade would be required to the proposed investment?
    ii. What is the approximate threshold of the percentage of customers that electrify their fossil fuel heating with high-efficiency cold climate heat pumps in the relevant area at which point an additional upgrade would be required to the proposed investment?
    iii. What is the approximate threshold of the percentage of customers that electrify both their vehicles and fossil fuel heating in the relevant area at which point an additional upgrade would be required to the proposed investment?

    These questions will require a number of assumptions to be made to provide an answer. Please make and state those assumptions as necessary. To address uncertainties, please state all caveats and/or provide a range of possible figures. An order-of-magnitude answer on a best-efforts basis is sufficient.

2. Reference: Distribution System Plan

Question:

(a) We are trying to explore the ballpark impact on unit costs that might arise from possible large increases in demand from electrification. If annual and peak demand were to double over the next decade, but the load factor were to remain constant, would the additional distribution infrastructure costs lead to increases or decreases in unit distribution costs (i.e. total distribution costs per MW peak demand or total distribution costs per MWh of annual demand)? Please explain why and comment as best as you can on the order of magnitude. We understand that no concrete answer can be provided – directional and order of magnitude commentary is sufficient.

3. Reference: Distribution System Plan

Questions:

(a) What percent of PUC's customers are on restricted feeders?
(b) Please provide a list of investments in the DSP that PUC considers as potential candidates for a non-wires alternative (NWA), including CDM.
(c) Will PUC consider implementing any cost-effective NWAs prior to the expiry of its DSP in 2027?
(d) If PUC implements an NWA in lieu of a currently-planned capital project, how would it account for the change in costs, including any migration of capital costs to operating costs?

4. Reference: Distribution System Plan

Questions:

(a) Please describe and itemize all proposed spending to enable the implementation of DER's by DER's customers.
(b) The market for DERs is rapidly changing, as are the regulatory processes and technology for connecting them to the grid. If PUC decides between now and 2027 that additional DER-enabling investments should be made before the end of the DSP, which are not part of the proposed DSP, how would PUC cover those costs?

5. Reference: Distribution System Plan

Questions:

(a) Please file a copy of any reports in PUC's possession containing forecasts for the numbers of electric vehicles in PUC's service area.
(b) Please file a copy of any reports in PUC's possession on the impacts of electric vehicles on (i) utility revenue and (ii) utility costs.
(c) What is PUC's best estimates of the number and percent of electric cars in its service area total and incremental between now and 2030?
(d) Please describe all steps that PUC is taking or considering to encourage customers to charge their cars at off-peak times.
(e) Please describe all steps that PUC 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 PUC's revenues and costs as a result of electric vehicles over 2023-2027. Please consider whether PUC 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) What investments is PUC making over 2023-2027 to accommodate an expansion of electric vehicles? Please describe these and provide the dollar total.

(h) Does a residential customer need to notify or seek approval from PUC before installing a high-speed electric vehicle charger? Please explain and provide any relevant excerpts from the relevant document containing said requirement.
(i) Does a residential customer need to notify or seek approval from PUC 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.
(j) Can PUC 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 PUC do so? Please explain.
(k) Can PUC 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 PUC do so? Please explain.
(l) 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?
(m) Is PUC obligated to undertake the upgrades necessary for residential customers to install EV chargers if they choose to do so?
(n) How many electric vehicles will PUC buy over 2023-2027?
(o) How many electric vehicle chargers will PUC buy over 2023-2027?

6. Reference: Distribution System Plan, 5.3.2.1.3

Questions:

(a) Does PUC 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.
(b) If PUC 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)?
(c) Further to the above question, Hydro Ottawa and Burlington Hydro use the all-in cost of electricity. If PUC's practice differs, please explain whether there are aspects of its system that would justify this.
(d) Please provide a table showing PUC's annual historic (past 5 years) and forecast (future 5 years) losses as a percent of annual consumption and as a ratio to the peak demand.
(e) What would a reasonable target be for PUC's average losses over 2023-2027 as a percent of annual consumption?
(f) Has PUC completed studies to determine cost-effective measures to reduce losses? If yes, please file those.

7. Reference: Distribution System Plan, s. 5.3.5 (Smart Grid Project)

Questions:

(a) Table 5.3-28 provides the NPV of annual net benefits and the NPV of projected reliability benefits. Is there overlap between the tables? Please provide the NPV of all quantifiable benefits, including reliability benefits, and a breakdown of each item included therein.
(b) Please provide an update of PUC Undertaking Responses - JTC1.8 from the smart grid ICM case, which calculated the 10-year carbon price savings of avoided GHG emissions, accounting for Ontario's plans to increase gas generation.

8. Reference: Distribution System Plan

Question:

(a) Please review the Sustainable Brooklin project proposed by Elexicon Energy in EB-2022-0024. Would PUC consider pursuing a similar project between 2023 and 2027?

9. Reference: Distribution System Plan

Questions:

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 provide any analysis that PUC has produced or reviewed to examine heat pumps as a replacement for resistance electric heating as a way to reduce distribution costs (e.g. as part of an NWA).
(b) Please complete the following table:

PUC 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			

(c) 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									

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

(d) 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									

(e) 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									

(f) Please complete this table of cooling efficiencies:

Cooling Efficiencies of Various Equipment Types			
		SEER	EER
Central air conditioners	Average of current stock (best estimate, PUC customers or Ontario average)		
	Standard unit		

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

	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		