Q. **Reference: Application**

With respect to metering:

a) Is Hydro concerned that its current metering infrastructure could soon become stranded? What is the expected cost for Hydro to implement AMI infrastructure?

b) Could time-of-day rates combined with various timer technologies (such as a smart plug and the Alexa app) be used as a passive means for managing EV home charging via Level 1 chargers? What are the pros and cons of such an approach versus direct control of Level 2 chargers via telematics or an alternative means?

A. **a)** Newfoundland and Labrador Hydro ("Hydro") is not concerned that its automated meter reading ("AMR") infrastructure that is currently being implemented will soon become stranded.[1]

When Hydro prepared its 2022 Capital Budget Application,[2] the estimated capital cost for automated metering infrastructure ("AMI") was $12.4 million compared to $5.4 million for the approved AMR project. The Dunsky Report[3] could not justify AMI based on savings through dynamic rates until 2034. Therefore, Hydro is not studying transitioning to AMI at this time.

b) There are a number of important factors to take into account in the design of customer programming which seeks to successfully manage the load from electric vehicles ("EV") in a

[1] Hydro's "Replace Metering System" project was included in Hydro's 2022 Capital Budget Application and was approved in *Public Utilities Act*, RSNL 1990, c P-47, Board Order No. P.U. 37(2021), Board of Commissioners of Public Utilities, December 20, 2021.
[2] "2022 Capital Budget Application," Newfoundland and Labrador Hydro, rev. September 17, 2021 (originally filed August 2, 2021).
[3] "Conservation Potential Study – Final Report (Volume 1 – Results)," Dunsky Energy Consulting, submitted as Attachment A to Newfoundland Power's response to PUB-NP-104 in relation to the *Rate Mitigation Options and Impacts Reference* proceeding, <http://www.pub.nl.ca/applications/2018ratemitigation/responses/PUB-NP-104.PDF>.

cost-effective manner. These factors include the underlying charging technology, electrical system impacts, and consumer choice.

EV Charging Technology

Level 1 EV charging typically refers to charging via a standard household outlet; this technology is typically limited to a supply of 1.3 kW,[4] before losses.[5] To fully recharge an EV with a 75 kWh battery pack on a typical Level 1 charger would take approximately three days. To replenish the battery from 60 km of daily driving would require 12 hours of Level 1 charging.[6] As a result, Level 1 charging typically requires that EV drivers be charging at all times.

Level 2 EV charging can range from 5.8 kW to 19.2 kW; however, Hydro's forecast assumes that most Level 2 chargers will operate at 7.2 kW, before losses.[7] To fully recharge an EV with a 75 kWh battery pack, most Level 2 chargers would require approximately ten hours of charging. To replenish the battery from 60 km of daily driving would require less than two hours of charging.

Electrical System Impacts

Time-of-use rates are a type of dynamic rate which give customers a financial incentive to shift their electrical consumption away from peak periods (which attract a higher price) towards off-peak periods (which receive a lower price). Another type of dynamic rate, called Critical Peak Pricing, is employed by Hydro-Québec in a jurisdiction with similar characteristics as Newfoundland and Labrador (i.e., winter peaking, with high levels of electric space heating, and EVs).

Any move to dynamic rates will require investment in metering infrastructure. Newfoundland Power Inc. ("Newfoundland Power") has the largest number of retail

[4] Most Level 1 chargers operate at 12A on a 120V supply.
[5] Charging losses include operation of the EV's battery management system, which typically results in less than 1.0 kW of EV battery charging on a Level 1 charger. The battery management system must operate with both Level 1 and Level 2 charging.
[6] Assuming an EV efficiency of 20 kWh/100 km. Winter driving would be less efficient, as additional energy is required for cabin heating.
[7] 30A at 240V.

customers and therefore the largest number of installed meters in the province. As noted in Newfoundland Power's Capital Budget Application:

> Over the longer term, increased peak demand due to EV adoption may result in dynamic rate structures becoming cost-effective for customers. A 2019 market potential study completed by Dunsky Energy Consulting determined that dynamic rates may become cost-effective for customers between 2030 and 2034. Dynamic rate structures will take several years and require investments in Advanced Metering Infrastructure ("AMI"). [Newfoundland Power] anticipates commencing a transition to meters with advanced functionality such as interval data, time-of-use data, demand read and reset, and remote disconnect capabilities as early as 2027.[8]

The impacts on the electrical system from Level 1 and Level 2 EV charging are quite different. Level 1 charging at 1.3 kW has a relatively low impact on the electrical system from a demand perspective. In contrast, a Level 2 charger at 7.2 kW represents a 550% increase in demand versus a Level 1 charger. The impact can be even larger as certain electric pickup trucks can accept up to 19.2 kW for home charging. Programming aimed at managing the demand impact associated with Level 2 chargers will therefore drive the greatest benefits for the electrical system. Given the costs associated with full AMI implementation, programming which aims to more directly manage EV load is more cost effective at this time.

Consumer Choice

In order to manage the demand from EVs in a cost-effective manner, utilities must take into account consumer behavior and choice. As noted previously, Level 1 charging typically requires that EV drivers be charging at all times in order to replenish their battery and be ready for use the following day. As a result, Hydro does not expect programming designed around Level 1 charging to be of interest to consumers as they would be unlikely to engage in time-shifting behaviors.

In contrast, there are significant opportunities to shift Level 2 EV charging load to off-peak periods without impacting the range of customer's EVs. A 2023 study by J.D Power found

[8] "Newfoundland Power 2024 Capital Budget Application," Newfoundland Power Inc., 2024-2028 Capital Plan, p. 3.

that more than 80% of EV owners utilize Level 2 charging.[9] This study is consistent with Hydro's expectation that programming designed around internet connected Level 2 chargers will be the most effective at managing peak demand impacts from EVs in the near term.

EV Load Management Pilot Project

Newfoundland Power proposed an EV Load Management Pilot Project which seeks to assess the cost-effectiveness of strategies to shift the charging of light-duty EVs to off-peak periods. Hydro provided a letter of support for the proposal's approach to determining what strategies are most appropriate for Newfoundland and Labrador. The Pilot Project has since been approved by the Board.[10]

[9] "Rising Rates Short Circuit Electric Vehicle Home Charging Satisfaction, J.D. Power Finds," J.D. Power, March 16, 2023, <https://www.jdpower.com/business/press-releases/2023-us-electric-vehicle-experience-evx-home-charging-study>.
[10] *Public Utilities Act,* RSNL 1900, c P-47, Board of Commissioners of Public Utilities, Board Order No. P.U. 23(2023), August 31, 2023.